



MICRODIS



**MICRODIS: Integrated Health, Social and Economic
Impacts of Extreme Events: Evidence, Methods and Tools**

**Combined Literature Review
(Social, Health and Economic Literature Reviews)**

**RESEARCH INSTITUTE FOR MINDANAO CULTURE
(RIMCU),XAVIER UNIVERSITY**

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Disaster – Facts and Figures

RRL - 001

Title At Risk: Natural Hazards, People's Vulnerability, and Disasters
Chapter Eight: Earthquakes, volcanos and landslides

Author(s) Piers Blaikie, Terry Cannon, Ian Davis, Ben Wisner

At Risk: Natural Hazards, People's Vulnerability, and Disasters, 1994.

Routledge, Taylor & Francis Group London, Bookpoint Ltd, 130 Milton Park, Abingdon, Oxon OX14 4SB, UK

Key theme(s) Disaster – Definitions, Facts and Figures

Abstract

Earthquakes, volcanic eruptions and landslides, for all their dramatic impact, do not remotely match the scale of casualties that result from droughts, floods, and coastal storms (Sapir and Lechat 1986). This century to the end of 1990 there have been an estimated 1.52 million officially reported deaths from earthquakes. Almost half this total have occurred in China, which also suffered the most devastating single event in the 1976 Tangshan earthquake which resulted in 242,000 deaths (Coburn and Spence 1992).

The seventeen most severe volcanic eruptions of this century have resulted in 75,000 deaths, with the most catastrophic eruption occurring in Mount Pelee in Martinique in 1902 when 29,000 were killed, and the second most severe event being the eruption of Nevado del Ruiz in Colombia in 1985 with the loss of 23,000 lives. Thus the remaining fifteen volcanic eruptions averaged 1,582 deaths per event (Wood 1986; United Nations 1985).

In the case of landslides, 40 sudden impact landslides have been reported this century causing 271,072 deaths. However this includes the most damaging landslide of this century, which took place in Gansu province, China in 1920, when 200,000 were reported killed. In 50 percent of these disasters less than a hundred were killed (Alexander 1989). Thus it can be seen that in global terms, landslides have relatively low casualty statistics relative to other hazards. However, the data is misleading, since landslides often occur as a secondary consequence of another type of hazard, such as flooding, a cyclonic storm, or as a result of an earthquake. So landslide casualties are often added to the total of deaths and injuries attributable to these broader events, and those specifically linked to landslides are probably under-reported.

Research Question(s)

- a. Which impacts and risks are important to mention in the case of a) earthquakes, b) landslides and c) volcanos and related hazards?
- b. Which approaches can reduce the risks?

Finding(s)

Earthquakes

- 1) Over ninety-five percent of all deaths in earthquakes result from building failures (Alexander 1985).
- 2) Buildings at Risk: Variations in mortality among different countries are primarily due to differences in building styles and density of settlements. The overwhelming majority of people who die in earthquakes are killed by the collapse of manmade structures, particularly domestic dwellings (Seaman et al. 1984).
- 3) Society at Risk: In contrast to physical hazard mapping, human vulnerability analysis covers a bewildering diversity of topics that concern social patterns and institutions (termed 'structures of domination' in the access model), society-wide and intra-household social relations, and economic activity (gender and age relations are particularly important as noted earlier), and the psychology of risk.
- 4) The Local Economy at Risk: Firstly there are direct losses (e.g. of a building or factory in a future disaster); or secondary losses (e.g. fire damage ignited by the earthquake); or through indirect losses (e.g. the loss of income as a result of the local population not being able to purchase goods due to their temporary loss of income, or because of interruptions to supplies).
- 5) Vulnerability to Hazard Warnings: Hazard mapping will reveal the location and probable severity of earthquakes and landslides. Long-term predictions, based on a 'gap-theory' about the anticipated general location of a forthcoming earthquake may also be useful. But the current state of knowledge gives no precise warning of their timing. It would appear that this lack of earthquake warning is a significant factor in maintaining the vulnerability of people. Early warning of drought, cyclone and flood is already reducing the vulnerability of communities previously at risk and significantly reducing deaths and injuries. But an earthquake prediction can result in other problems, such as panic in evacuation, or the more mundane issue of blighted property and falling values in areas thought to be targets.

Landslides

- 1) Causes: The first commonly-cited cause is deforestation. Poorly located road building and environmental damage to sub-soil stability are also frequently cited as causes. Changes in the water table can occur due to leaking tube wells, stand pipes and septic tanks.
- 2) Warning systems for predicting water flow and arranging the evacuation of communities at risk are often lacking in urban areas.

Volcanos and related hazards

Associated hazards include earthquakes, and mud and rock slides.

- 1) Volcanic eruptions endanger any person living within the high-risk zone whether rich or poor, landowner or landless farm labourer, man or woman, old or young, member of ethnic minority or majority.
- 2) It may be argued that wealthy people have more access to knowledge, which can include an awareness of volcanic risk, and therefore they are better able to respond to warnings to evacuate in the event of a likely eruption. But there is growing evidence that poor people living near active volcanos are aware of the risks. Once they observe

signs of volcanic activity they are just as likely to follow evacuation orders as their rich neighbours (Kuester and Forsyth 1985; Tayag n.d.; Zarco 1985).

- 3) The term 'hazard' is not strictly accurate since in many cases they bring major benefits as well as havoc: irrigation and fertile silt from flooding, or the rainfall over drought-prone land from tropical cyclones. This process is probably better seen in the case of volcanos than any other geological hazard, since there are no obvious benefits from landslides and earthquakes. The products of volcanos can be highly beneficial to any society, and include extremely fertile soils resulting from the weathering of volcanic ashes and pyroclastic materials.

Policy Response and Mitigation

Four approaches to risk reduction in the face of geological hazards are suggested:

- 1) First, earthquake, landslide and volcanic disasters can be used to change unjust structures. Popular development organizations can capitalise on a disaster event to challenge and possibly change vulnerable, unjust political, social and economic structures.
- 2) Second, and following from the first, local institutions can be strengthened and the capability of families to reduce their own vulnerability can be improved.
- 3) Third, the disaster provides an opportunity to develop effective risk assessment with good cost-benefit arguments for protective measures.
- 4) Finally, disasters provide an opportunity to educate political leaders and decision makers about the true nature of vulnerability to disaster risk. Authorities may be ignorant, or they may deliberately avoid recognising their own role in increasing risks. However, they may respond to messages such as that of the financial calculation noted above, that action in developing protective measures will be to their benefit later.

To conclude, the four verbs that introduced these final suggestions imply the opposite of any passive acceptance of the inevitability of geological disaster losses: to 'change', to 'strengthen', to 'develop' and to 'educate'.

Title CRED CRUNCH "Disaster Data: A Balanced Perspective"

Published in CRED Newsletter, 2006 ISN 5.

Centre for Research on the Epidemiology of Disasters (CRED), Université catholique de Louvain, 30.94 Clos Chapelle-aux-Champs 1200 Brussels, Belgium

Key themes Disaster – Definitions, Facts and Figures

Summary

Injury to death ratios if validated from future epidemiological studies would provide useful insights for preparedness and planning in high risk zones.

Research Question(s)

- a. Which disasters have a high ratio of injuries to death?
- b. How is the expected death ratio for earthquakes?

Finding(s)

The ratio of injuries to deaths in acute natural disasters is a useful indicator for many purposes. It describes a disaster type by the epidemiological profile of its immediate impact on populations. For instance, a high injury to death ratio could be expected in certain types of disasters such as cyclones, and a lower one in earthquakes where people tend to die or survive. While injuries in earthquakes are serious, they are rarely widespread.

Earthquakes, the most frequent acute disasters, were responsible for almost 27% of all deaths from natural disasters over the last 30 years. This is the highest proportion of deaths from any disaster type, with droughts coming in a close second with 25%. The top 10 earthquake disasters by number of persons killed (table 2) represent 84% of all earthquakerelated deaths from 1976 to 2005, highlighting the catastrophic impact of these large events.

Previous research on earthquakes by epidemiologists has indicated that 3.0 to 3.5 injured to one death may be the expected ratio. The ratio calculated from the EM-DAT database generates a ratio of 2.6, which is below the figure estimated by the studies and indicates an under-reporting of injuries in the regular impact reporting process. Further research to establish how these ratios can vary as a function of the different characteristics of the event, such as by time of day, the type of disaster, or the definitions of injury will increase our understanding of the impacts.

The integration of epidemiology with engineering, architecture, the social sciences and other fields of the medical sciences is essential to develop the knowledge base on the risks of injury and mortality from earthquakes and on the methods to mitigate these. Furthermore, epidemiology can assist decision-makers in identifying the relief supplies, equipment, and qualified personnel that are necessary to respond effectively to earthquakes.

RRL - 003

Title 2006 disasters in numbers :Epidemics and Insect Infections not included
Source of data: EM-DAT: The OFDA/CRED International Disaster Database
www.em-dat.net

Key theme(s) Disaster – Definitions, Facts and Figures

Research Question(s)

- a. Which trends developed in natural disasters between 1975 and 2006?
- b. Which countries were most hit by natural disasters in 2006?
- c. How was the human impact, referring to different disaster types?
Etc.

Finding(s)

- 1) Natural disasters by number of deaths – 2006
 - I. Earthquake May, Indonesia: 5778 deaths
 - II. Typhoon Durian, December, Philippines: 1399 deaths
 - III. Landslide, February, Philippines: 1112 deaths
 - IV. Heat wave, July, Netherlands: 1000 deaths
 - V. Heat wave, July, Belgium: 940 deaths
 - VI. Typhoon Bilis, July, China: 820 deaths
 - VII. Tsunami, July, Indonesia: 802 deaths
 - VIII. Cold Wave, January, Ukraine: 801 deaths
 - IX. Flash Flood, August, Ethiopia: 498 deaths
 - X. Typhoon Samoai, August, China: 373 deaths
- 2) Countries most hit by natural disasters -2006
 - I. China (35)
 - II. United States (26)
 - III. Indonesia, Philippines (20)
 - IV. India (17)
 - V. Afghanistan (13)
 - VI. Vietnam (10)
 - VII. Australia, Burundi, Pakistan (8)
 - VIII. Ethiopia, Mexico, Romania (7)
 - IX. Germany (6)
 - X. Bangladesh, Canada, Japan, Kenya, Russia, Malaysia, Papua New guinea, Somalia (5)
- 3) Victims (killed and affected) of natural disasters per 100,000 inhabitants – 2006
Highest number in Malawi: 34,331
- 4) Time trends of natural disasters (County-level disasters), 1975-2006: increasing!
- 5) Annual reported economic damages from natural disasters: 1975-2006

In 2006 economic damages were relatively low, compared with the up- and down-going trend of the last years.

6) Human impact by disaster types

In average, droughts (1), floods (2) and windstorms (3) affected the biggest number of people. 2006 Windstorms were more often than in the average year. The total numbers of affected people (134,584,778) and killed people (21,342) in 2006 lie clearly under the average. Most people were killed by earthquakes, followed by floods, windstorms and extreme temperatures. There were considerably few people killed by waves and surges in 2006 but more people killed by windstorms than in an average year.

7) Natural disaster occurrence by disaster type

In 2006 more floods and less windstorms occurred than in the average of 2000-2005. The total number of disasters was very near at the average.

8) Percentage of people killed by natural disasters by continent

Most people were killed in Asia (74.20% in 2006). This agrees with the average numbers of 2000-2005.

RRL - 004

Title Annual Disaster Statistical Review: Numbers and Trends 2006

Author(s) P. Hoyois, R. Below, J-M. Scheuren, D. Guha-Sapir
Centre for Research on the Epidemiology of Disasters (CRED), 2007.
WHO Collaborating Centre for Research on the Epidemiology of Disasters,
School of Public Health, Catholic University of Louvain

Key theme(s) Disaster – Definitions, Facts and Figures

Abstract

This first Annual Disaster Statistical Review is an analysis of the disaster figures in 2006 compared to 2005 and 2000-04. Since 1998, we have learned that a consolidated, rapidly produced statistical overview is much more than a number of crunch: it is an invaluable tool for both planning and advocacy. The 2006 disaster figures remind us once more that *all* countries and *all* human populations are vulnerable to disasters.

Research Question(s)

- a. Which trends are notable in disasters between 1987 and 2006?
- b. How was the year 2006 in comparison with year 2005 and 2000-2004?

- c. What is notable in the regional distribution of disasters?

Research Methodology

Analysis of the disaster figures in 2006 compared to 2005 and 2000-04.

Finding(s)

1. In 2006, we observed a return to a kind of “normality” after the major events of the last few years. Even though the disasters in 2006 have not captured as much attention as those of the recent past, it is important to remember that they have had devastating impacts. In 2006, there were 427 reported natural disasters that killed more than 23,000 people, affected almost 143 million others, and were the cause of more than US\$ 34,5 billion in economic damages.
2. Asia remains the continent most hit by disasters with over 44% of all reported disasters occurring in the region. The two deadliest disasters in 2006 were the Indonesian earthquake that killed 5,778 people in May and Typhoon Durian in the Philippines which resulted in 1,399 deaths in December.
3. The 2006 numbers remind us that it is not just developing countries that are severely affected by disasters. Four European countries – France, the Netherlands, Belgium and the Ukraine – rank among the top 10 countries most affected by deadly disasters, taking 3rd, 5th and 9th place respectively.
4. In terms of disaster occurrence, the figures show an increase in the number of floods, with 235 reported events accounting for 55% of all disasters registered in 2006. Floods and windstorms continued to be the two major causes of economic damage. When combined, these two extreme events caused more than US\$ 25,1 billion in economic losses.
5. Global climate change will have an impact of the occurrence and magnitude of extreme events. These impacts are envisaged to increase human vulnerability to natural disasters, thus emphasizing the needs for improved measures of preparedness in every part of the world.

RRL - 005

Title EM-DAT Glossary

Author(s) CRED

<http://www.emdat.be/glossary/9>

EM-DAT: The International Disaster Database/Centre for Research on the Epidemiology of Disasters (CRED)
School of Public Health, Université catholique de Louvain

Key theme Disaster – Definitions, Facts and Figures

Summary

EM-DAT Glossary for all disaster-related terms and vocabulary

RRL - 006

Title World Disasters Report 2006

International Federation of Red Cross and Red Crescent Societies (IFRC)

Key theme(s) Disaster – Definitions, Facts and Figures

Summary

Which people are missing out on humanitarian aid because no journalists report on them, no donors are interested in them, no agencies have assessed their needs, or because their governments ignore them?

This year's report ventures into the shadows lying behind the brilliantly illuminated disasters of 2005-2006. It combines first-hand reporting from the field with critical analysis of aid flows and donor preferences to highlight places and issues starved of attention. The report calls on aid organizations, journalists, governments and academics to work together to address the symptoms - and causes - of neglected humanitarian crises.

Research Question

Which people are missing out on humanitarian aid because no journalists report on them, no donors are interested in them, no agencies have assessed their needs, or because their governments ignore them?

Finding(s)

- 1) Governments and individuals donated record-breaking sums in 2005. But millions are still neglected. Aid coverage remains inequitable and media coverage uneven.

- 2) The number of boat migrants registered as arriving in Spain's Canary Islands soared from 4,715 in 2005 to 10,896 in the first six months of 2006 alone. Numbers of migrants arriving on the tiny Italian islands of Lampedusa and Linosa rose nearly 50 percent over the same period (Spanish government, Spanish Red Cross, Medici Senza Frontiere). An estimated 2,000 irregular migrants drown every year around the Mediterranean trying to reach Europe – but no agency is collating accurate, regional data (Michael Pugh, professor of peace studies at Bradford University).
- 3) Hurricane Stan exposes Guatemala's vulnerability. Torrential rains that accompanied Hurricane Stan affected 1,156 communities; over a third of Guatemala's total area. Hardest hit were areas inhabited largely by indigenous people living in extreme poverty (CONRED, national disaster reduction agency).
- 4) Food aid fails to solve Malawi's chronic hunger: During 2004-2005, production of maize, Malawi's most important staple, fell to 55 per cent of the 2.1 million tonnes needed each year to sustain the nation (Famine Early Warning Systems Network). In 2005, half of Malawi's children were stunted, one-third were underweight and 50,000 were severely malnourished (Mary Shawa, HIV/AIDS and nutrition secretary in the office of Malawi's president). The UN's emergency appeal attracted three-quarters of its food aid requirements but raised just a fifth of the funds needed for agricultural recovery (OCHA FTS). For every dollar of aid Malawi received for its food crisis during 2005, it paid a dollar back in debt repayments (OCHA FTS, Reserve Bank of Malawi).
- 5) Vulnerability of women neglected. Following the South Asia earthquake, 17,000 disaster-affected women in Pakistan were estimated to be about to give birth. Around 1,200 would face major complications and 400 would require surgery. Yet there was a critical lack of female doctors and health workers (United Nations Population Fund (UNFPA)). In Nepal, 5,000 to 6,000 mothers die each year in childbirth. This death-toll of one woman every 90 minutes makes Nepal one of the deadliest places in the world to give birth (Nepal Ministry of Health and Population, United Nations). Maternal and neonatal mortality have claimed about 25 times more lives than Nepal's conflict since 1996 (World Disasters Report analysis).

RRL - 007

Title Hurricane Basics
In Hurricane Preparedness
<http://www.nhc.noaa.gov/HAW2/english/basics.shtml>
Key theme(s) Disaster – Definitions, Facts and Figures

Summary

Definitions and basic information about hurricanes.

Research Question(s)

- a. What is a hurricane?
- b. What are basic hurricane safety actions?
- c. What is the difference between watching and warning?

Finding(s)

The ingredients for a hurricane include a pre-existing weather disturbance, warm tropical oceans, moisture, and relatively light winds aloft. If the right conditions persist long enough, they can combine to produce the violent winds, incredible waves, torrential rains, and floods we associate with this phenomenon.

Each year, an average of eleven tropical storms develop over the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Many of these remain over the ocean and never impact the U.S. coastline. Six of these storms become hurricanes each year. In an average 3-year period, roughly five hurricanes strike the US coastline, killing approximately 50 to 100 people anywhere from Texas to Maine. Of these, two are typically "major" or "intense" hurricanes (a category 3 or higher storm on the Saffir-Simpson Hurricane Scale).

What is a Hurricane?

A hurricane is a type of tropical cyclone, which is a generic term for a low pressure system that generally forms in the tropics. The cyclone is accompanied by thunderstorms and, in the Northern Hemisphere, a counterclockwise circulation of winds near the earth's surface.

Tropical cyclones are classified as follows:

- Tropical Depression (38 mph or 33kt** or less)
- Tropical Storm (39-73 mph or 34-63 kt)
- Hurricane (74 mph or 64 kt or higher)

Hurricanes are categorized according to the strength of their winds using the Saffir-Simpson Hurricane Scale. A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the strongest. These are relative terms, because lower category storms can sometimes inflict greater damage than higher category storms, depending on where they strike and the particular hazards they bring. In fact, tropical storms can also produce significant damage and loss of life, mainly due to flooding.

Basic Hurricane Safety Actions

- * Know if you live in an evacuation area. Know your home's vulnerability to storm surge, flooding and wind. Have a written plan based on this knowledge.
- * At the beginning of hurricane season (June 1st), check the supplies for your disaster supply kit, replace batteries and use food stocks on a rotating basis.
- * During hurricane season, monitor the tropics.
- * Monitor NOAA Weather Radio. It is an excellent / official source for real-time weather information and warnings.
- * If a storm threatens, heed the advice from local authorities. Evacuate if ordered.
- * Execute your family plan

WATCH vs. WARNING - KNOW THE DIFFERENCE

* **TROPICAL STORM WATCH:** An announcement that tropical storm conditions (sustained winds of 39 to 73 mph) are possible within the specified coastal area within 48 hours.

* **TROPICAL STORM WARNING:** An announcement that tropical storm conditions (sustained winds of 39 to 73 mph) are expected somewhere within the specified coastal area within 36 hours.

* **HURRICANE WATCH:** An announcement that hurricane conditions (sustained winds of 74 mph or higher) are possible within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds.

* **HURRICANE WARNING:** An announcement that hurricane conditions (sustained winds of 74 mph or higher) are expected somewhere within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds.

RRL - 008

Title Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews

Author(s) Beverley J Shea, Jeremy M Grimshaw, George A Wells, Maarten Boers,
BMC Medical Research Methodology, 2007, Vol 7.

Key theme(s) Disaster – Definitions, Facts and Figures

Summary

Background

The objective was to develop an instrument to assess the methodological quality of systematic reviews, building upon previous tools, empirical evidence and expert consensus.

Methods

A 37-item assessment tool was formed by combining 1) the enhanced Overview Quality Assessment Questionnaire (OQAQ), 2) a checklist created by Sacks, and 3) three additional items recently judged to be of methodological importance. This tool was applied to 99 paper-based and 52 electronic systematic reviews. Exploratory factor analysis was used to identify underlying components. The results were considered by methodological experts using a nominal group technique aimed at item reduction and design of an assessment tool with face and content validity.

Results

The factor analysis identified 11 components. From each component, one item was selected by the nominal group. The resulting instrument was judged to have face and content validity.

Conclusion

A measurement tool for the 'assessment of multiple systematic reviews' (AMSTAR) was developed. The tool consists of 11 items and has good face and content validity for measuring the methodological quality of systematic reviews. Additional studies are needed with a focus on the reproducibility and construct validity of AMSTAR, before strong recommendations can be made on its use.

Research Question(s)

How to develop an instrument to assess the methodological quality of systematic reviews, building upon previous tools, empirical evidence and expert consensus?

Research Methodology

A 37-item assessment tool was designed by combining items from two available instruments: the enhanced Overview Quality Assessment Questionnaire (OQAQ) containing 10 items and a checklist created by Sacks containing 24 items. We supplemented this with three additional items based upon methodological advances in the field since the development of the original two instruments: *Language restriction*: Language restriction in systematic reviews remains controversial. Some studies have suggested that systematic reviews that include only English

language publications tend to overestimate effect sizes, whereas other studies suggest that such language restrictions may not do so. An item was added to determine whether a language restriction was applied in selecting studies for the systematic review. 2) *Publication bias*: Publication bias refers to the tendency for research with negative findings to get published less frequently, less prominently, or more slowly, and the tendency for research with positive findings to get published more than once. Publication bias has been identified as a major threat to the validity of systematic reviews. Empirical research suggests that publication bias is widespread, and that a variety of methods are now available to assess publication bias. An item was added to determine whether the authors assessed the likelihood of publication bias. 3) *Publication status* of studies suggests that published trials are generally larger and may show an overall greater treatment effect than studies published in the 'grey' literature. The importance of including grey literature in all systematic reviews has been discussed. The assessment of the inclusion of grey literature considers whether or not the authors reported searching for grey literature.

Finding(s)

Objective 1

The items were subjected to factor analysis, and only those items that loaded highly on one component ($>.50$) were retained. The described factor analysis made it possible to reduce the 37-item instrument to a shorter (29-item) instrument that measured 11 components.

Objective 2

The nominal group discussed all 11 components¹. The items most appropriate for the components, were included in the draft instrument. The instrument is an 11-item questionnaire that asks reviewers to answer yes, no, can't answer or not applicable. A separate question on language was identified in the factor analysis as a significant issue, but the nominal group felt that the contradictory evidence in the literature warranted removing this item from the shortened item list and capturing it under the question on publication status.

A measurement tool for *assessment of multiple systematic reviews* (AMSTAR) was developed. The tool consists of 11 items and has good face and content validity for measuring the methodological quality of systematic reviews. Additional studies are needed with a focus on the reproducibility and construct validity of AMSTAR, before strong recommendations can be made on its use.

RRL - 009

Title Earthquakes

Author(s) Kaye M. Shedlock, Louis C. Pakiser

USGS Public Interest Publication, 1994. U.S. Geological Survey (USGS)

Key theme(s) Disaster – Definitions, Facts and Figures

Abstract / Summary

One of the most frightening and destructive phenomena of nature is a severe earthquake and its terrible aftereffects. An earthquake is a sudden movement of the Earth, caused by the abrupt release of strain that has accumulated over a long time. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface slowly move over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free. If the earthquake occurs in a populated area, it may cause many deaths and injuries and extensive property damage.

Today we are challenging the assumption that earthquakes must present an uncontrollable and unpredictable hazard to life and property. Scientists have begun to estimate the locations and likelihoods of future damaging earthquakes. Sites of greatest hazard are being identified, and definite progress is being made in designing structures that will withstand the effects of earthquakes.

This publication summarizes information about earthquakes in history, their occurrences, seismographic background and measuring methods, as well as methods to predict them.

Definition

Where Earthquakes Occur

- 1) There are three types of plate boundaries: spreading zones, transform faults, and subduction zones. At spreading zones, molten rock rises, pushing two plates apart and adding new material at their edges. Most spreading zones are found in oceans; for example, the North American and Eurasian plates are spreading apart along the mid-Atlantic ridge.
- 2) Transform faults are found where plates slide past one another. An example of a transform-fault plate boundary is the San Andreas fault, along the coast of California and northwestern Mexico. Earthquakes at transform faults tend to occur at shallow depths and form fairly straight linear patterns.
- 3) Subduction zones are found where one plate overrides, or subducts, another, pushing it downward into the mantle where it melts. An example of a subduction-zone plate boundary is found along the northwest coast of the United States, western Canada, and southern Alaska and the Aleutian Islands. Subduction zones are characterized by deep-ocean trenches, shallow to deep earthquakes, and mountain ranges containing active volcanoes.

- 4) Earthquakes can also occur within plates, although plate-boundary earthquakes are much more common. Less than 10 percent of all earthquakes occur within plate interiors.

How Earthquakes happen

- 1) Most destructive quakes, however, are caused by dislocations of the crust. The crust may first bend and then, when the stress exceeds the strength of the rocks, break and "snap" to a new position. In the process of breaking, vibrations called "seismic waves" are generated. These waves travel outward from the source of the earthquake along the surface and through the Earth at varying speeds depending on the material through which they move.
- 2) A fault is a fracture in the Earth's crust along which two blocks of the crust have slipped with respect to each other. Geologists have found that earthquakes tend to reoccur along faults, which reflect zones of weakness in the Earth's crust. Even if a fault zone has recently experienced an earthquake, however, there is no guarantee that all the stress has been relieved.

Measuring Earthquakes

- 1) The vibrations produced by earthquakes are detected, recorded, and measured by instruments called seismographs. The zig-zag line made by a seismograph, called a "seismogram," reflects the changing intensity of the vibrations by responding to the motion of the ground surface beneath the instrument. From the data expressed in seismograms, scientists can determine the time, the epicenter, the focal depth, and the type of faulting of an earthquake and can estimate how much energy was released.
- 2) The Richter Scale, named after Dr. Charles F. Richter of the California Institute of Technology, is the best known scale for measuring the magnitude of earthquakes. The scale is logarithmic so that a recording of 7, for example, indicates a disturbance with ground motion 10 times as large as a recording of 6. A quake of magnitude 2 is the smallest quake normally felt by people. Earthquakes with a Richter value of 6 or more are commonly considered major; great earthquakes have magnitude of 8 or more on the Richter scale.

Predicting Earthquakes

- 1) Scientists study the past frequency of large earthquakes in order to determine the future likelihood of similar large shocks. But in many places, the assumption of random occurrence with time may not be true, because when strain is released along one part of the fault system, it may actually increase on another part.
- 2) Another way to estimate the likelihood of future earthquakes is to study how fast strain accumulates. When plate movements build the strain in rocks to a critical level, like pulling a rubber band too tight, the rocks will suddenly break and slip to a new position. Scientists measure how much strain accumulates along a fault segment each year, how much time has passed since the last earthquake along the segment, and how much strain was released in the last earthquake. This information is then used to calculate the time required for the accumulating strain to build to the level that results in an earthquake. This simple model is complicated by the fact that such detailed information about faults is rare.

RRL - 010

Title Flood Definitions

Author(s) USGS
Flood watch
<http://ks.water.usgs.gov/waterwatch/flood/definition.html>
Kansas Water Science Center USGS

Key theme(s) Disaster – Definitions, Facts and Figures

Abstract / Summary

Floods are caused by weather phenomena and events that deliver more precipitation to a drainage basin than can be readily absorbed or stored within the basin. This website explains all terms and vocabulary related to floods

Definition

Acre-foot.

Volume of water required to cover 1 acre of land (43,560 square feet) to a depth of 1 foot; equivalent to 325,851 gallons.

Cubic feet per second (ft³/s).

A unit of measurement expressing rates of discharge. One cubic foot per second is equal to the discharge of a stream of rectangular cross section, 1 foot wide and 1 foot deep, flowing water an average velocity of 1 foot per second. Equivalent to 448.8 gallons per minute.

Discharge.

Rate of flow--a volume of fluid passing a point per unit time, commonly expressed in cubic feet per second, million gallons per day, or gallons per minute.

Drainage basin.

A part of the surface of the Earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water. Land area drained by a stream or river.

Flash flood.

The result of heavy or excessive amounts of rainfall within a short period of time, usually less than 6 hours, causing water to rise and fall quite rapidly.

Flood.

An overflow or inundation that comes from a river or other body of water and causes or threatens damage. Any relatively high streamflow overtopping the natural or artificial banks in any reach of a stream.

Flood frequency.

Refers to a flood level that has a specified percent chance of being equaled or exceeded in

any given year. For example, a 100-year flood occurs on average once every 100 years and thus has a 1-percent chance of occurring in a given year.

Flood plain.

A strip of relatively flat-lying land that borders a stream and is underlain by sediment carried by the stream and dropped in the slack water beyond the influence of the swiftest current.

Flood stage.

The stage at which overflow of the natural streambanks begins to cause damage in the reach in which the elevation is measured. Flood stages for each USGS gaging station are usually provided by the National Weather Service.

Gage datum.

An arbitrary datum plane that is established for a particular gaging station to which water-surface elevations can be compared.

Gage height.

See Stage.

Gaging station.

A site on a stream, canal, lake, or reservoir where systematic observations of gage height or water discharge are obtained by a gage, recorder, or similar equipment.

Peak stage.

The maximum height of a water surface above an established datum. Same as peak gage height.

Precipitation.

Rain, snow, hail, or sleet.

Real-time data.

Data collected by automated instrumentation and telemetered and analyzed quickly enough to influence a decision that affects the monitoring system.

Recurrence interval.

The average interval of time within which the magnitude of a given event, such as a flood, will be equaled or exceeded one time.

Stage.

The height of a water surface above an established datum. Used interchangeably with gage height.

Streambank.

The margins of a stream channel. Banks are called right and left as viewed facing the direction of flow.

Streamflow.

The discharge or flow that occurs in a natural channel. Although the term discharge can be

applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course.

Surface runoff.

That part of the runoff that travels over the soil surface to the nearest stream channel. It also is defined as that part of the runoff of a drainage basin that has not passed beneath the surface following precipitation.

Surface water.

Water on the surface of the Earth.

Water year.

The water year deals with the surface-water supply for a 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 out of the 12 months. Thus, the year ending September 30, 1999, is called the "1999 water year."

NOTE: Some definitions were excerpted from other sources.

*Terms

1. Current and historic stream water levels are reported as stage above a gage datum or as water-surface elevation above sea level. which is the addition of the stage to the gage datum.
2. Datum for each site can be found in the station description by clicking on the site of interest in the streamflow conditions table and looking under GAGE for datum of gage.
3. Stream elevation could be useful during flooding for comparison to elevation of structures such as building pads or road surfaces.
4. The elevation of structures and roads can be obtained from surveys and topographic maps.

RRL - 011

Title

Definitions

In Health action in crises

<http://www.who.int/hac/about/definitions/en/index.html>

World Health Organization

Key Concepts

Disaster – Definitions, Facts and Figures

Summary

Glossary of Humanitarian Terms

RRL - 012

Title Natural hazards

In http://www.wmo.ch/pages/themes/hazards/index_en.html

Key theme(s) Disaster – Definitions, Facts and Figures

Abstract / Summary

Natural hazards are severe and extreme weather and climate events that occur naturally in all parts of the world, although some regions are more vulnerable to certain hazards than others. Natural hazards become natural disasters when people's lives and livelihoods are destroyed. Human and material losses caused by natural disasters are a major obstacle to sustainable development. By issuing accurate forecasts and warnings in a form that is readily understood and by educating people how to prepare against such hazards, before they become disasters, lives and property can be protected.

The World Meteorological Organization presents a collection of definitions of natural hazards with explanations for general term. (Drought, Tropical cyclones, Air pollution, Desert locusts, Floods and flash floods, Landslide or mudslide (mudflow), Avalance, Duststroms/sandstorms, Thermal extremes, Thunderstormes, Lightning, and Tornadoes, Forest or Wildland Fire, Heavy rain and snow and Strong winds).

Gender and Disasters

RRL - 013

Title Gender and Hurricane Mitch: Reconstructing subjectivities after disaster
Author Cupples, Julie
Published in *Disasters*, 2007, 31(2): 155–175. © 2007 The Author(s). Journal compilation © Overseas Development Institute, 2007.

Published by Blackwell Publishing, 9600 Garsington Road, Oxford, OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA

Key themes (s) Gender and Disasters

Abstract

Much of the gender and disaster literature calls for more gender-sensitive disaster relief and research by focusing on the ways in which women are more vulnerable in a disaster or on their unique capabilities as community leaders or natural resource managers which are often overlooked or underutilised in emergency management strategies. As well as seeking to overcome the (strategic) essentialism that is part of these calls and debates, this paper pays closer attention to gender identity and subjectivity as these are constructed and reworked through the disaster process to highlight the complexities and contradictions associated with women's responses to a disaster. The paper suggests that the experience of disaster is shaped not only by pre-disaster vulnerabilities and forms of resilience but also by the discursive positioning facilitated by the disaster itself. This focus, while crucial to gaining a deeper understanding of the gendered dimensions of disaster, also complicates attempts to create more gender-sensitive frameworks for disaster response

Research Question(s)

- a. How does the participants involvement in the disaster process impacts their subjectivities?
- b. How are gendered identities destabilised or reproduced in disaster contexts?

Research Methodology

This article draws on qualitative research conducted with 12 participants in urban and rural communities in the department of Matagalpa, Nicaragua, who were displaced or made homeless by Hurricane Mitch in 1998. It formed part of a broader doctoral study that explored the intersections between motherhood, work and political activism, in which a total of 33 women were interviewed. In-depth semi-structured interviews were conducted and participants were interviewed between two and four times each in 1999 and 2001.

Concepts/Conceptual frameworks used Implicitly:

Gender dimensions in Disaster: In 1990s, Gender and disaster studies were initiated to rectify the gender blind understandings of disasters. Following the Women in Development (WID) and Gender and Development (GAD) paradigms these studies tended to focus on different

responses and coping mechanisms of women and men in disasters. They highlighted how women were more vulnerable than men in disasters by women in the wake of a disaster – thereby essentialising women or reporting women as victims in disasters. In stead, the author suggests that following from Fordham and Ketteridge (1998), we must engage with gendered dimensions of disaster without resorting to stereotypical or deterministic notions of women's needs and behaviour. It is important to acknowledge the differences as well shifting identities and subjectivities of women whilst forging practical common agendas as well.

Finding(s)

- 1) Often reconstruction and recovery processes in disasters reinforce traditional roles of women, although the reality is very much complex.
- 2) Communities respond in different ways showing different levels of solidarity, political mobilisation and dependency in post disaster situations.
- 3) Responses of women were different - due to gender differences on national, regional and community levels leading to divergent subjectivities amongst survivors.
- 4) There can be new kinds of dependencies making recovery more difficult. Disasters have differentiated effect and can generate heterogeneities leading to new gender and social identities. Dominant disaster paradigms do not explain multiple and diverse forms of disaster responses and their gendered dimensions.
- 5) The narratives of women show that gender sensitive disaster analysis has to go beyond generalised notions of vulnerabilities and explain and address the reconfigurations of self that emerge during disaster response processes.
- 6) The narratives show that women move in and out of states of resistance, accommodation, vulnerability and strength, sacrifice and self assertion. This is because of number of identities active at that time and their boundaries being very fluid. Although women are disadvantaged due to cultural constructions, they also draw upon them strategically and construct their subjectivities discursively. Disaster process then becomes a space where gender is performed differently and or hegemonic gender identities used strategically.

RRL - 014

Title

Gendering Vulnerability Analysis : Towards a more nuanced approach

Author

Maureen Fordham

In 'Mapping vulnerability: Disasters, Development and People' edited by Greg Bankoff, Georg Frerks and Dorothea Hilhorst, Earthscan publication, UK & USA 2004; (pg174-182)

Key themes

Gender, Vulnerability and Disaster

Summary

This paper critically engages with the vulnerability perspective in disaster theory through gendered lenses. The vulnerability perspective has shifted the dominant perspective of control of physical hazard agents to engaging with the social structures and inequalities.

The vulnerability approach shifts the emphasis from post disaster response to predisaster mitigations of conditions which create a disaster. Blackie et al 1994: 233 argues ' Vulnerability is deeply rooted, and any fundamental solutions involve political change, radical reform of the international economic system, and the development of public policy to protect rather than exploit people and nature'

The above analysis suggests that real change from vulnerability to resilience cannot be made without a political economy approach and disturbing the status quo.

A critique of the hazard approach can also be made – given that these models were generally top down and centralised in their approach – the response centred command and control approach – as highly masculine giving emphasis to technical rather than the social. In response to such approaches have now emerged the community engagement model with participatory forms emphasising bottom up approaches in which community groups have a clear place (Fordham 2000).

While this shift to analysis of social structures was crucial in vulnerability perspective, homogeneity rather than diversity of the communities – or the gendered nature of the communities was the acknowledged. This paper looks into why gender as an analytical category is important; what is the justification of understanding vulnerability through women's eyes. It then goes on to argue for a more complex and a nuanced approach to gendered vulnerability analysis as key feature of any analysis and interventions.

Why gender as an analytical category is important?

Disasters are not social levellers but that their impacts can be felt through race, class and gender parameters in specific historical contexts (Enarson and Fordham 2001). Research has shown that due to women's invisibility they are more vulnerable before and after the disaster (Fordham 2000; Enarson and Fordham 2001).

The case for claiming women's greater vulnerability

Literature shows that men as a group enjoy more opportunities than women – given that we live in a patriarchal society. Women across the world to varying degrees have triple roles of

reproduction, production and community work. The unequal opportunities lead to less power, and freedoms making women more vulnerable in particular locations and times. Further if disaster vulnerability cannot be separated from everyday reality as Blackie et al 1994 suggests; gender differentials are bound to affect the disaster outcomes. Gender blind decisions can impact their work load and increase violence after a disaster and women may be marginalised from decision making. This then becomes the context for viewing vulnerability from women's eyes in disaster contexts.

Towards a more nuanced approach

Recent works by Andrea Cornwall (1997; 2000) suggests a rethinking of gender and participatory development analysis and a need to shift to analytical frame that addresses power and powerlessness which in broadest sense must include men. Cornwall (2000) suggests that a focus on women can obscure other forms of exclusion and powerlessness as these are not only a female condition.

It is critiqued that even a GAD framework has not really changed the frame of analysis as women rather than forms of powerlessness continues to be the frame of analysis. The author however cautions against giving up the gendered frame of analysis completely to a more nuanced one which goes beyond the checklist of vulnerable groups and adopts a nuanced, critical and a reflexive approach. The author suggests ' the question, then, becomes not *whether* to include men and masculinity in the analysis but the *degree of centrality* that they should assume' .

The nuanced approach would focus also on capacity and vulnerability analysis rather than vulnerability analysis alone – given that women are not just victims but also active agents constructing their own reality. As Cornwall (1997: 21) suggests, the inclusion of men and masculinities should not simply count men in but broaden and deepen our understandings of power and inequality.

RRL - 015

Book Title Gender Dimensions in Disaster Management : A guide for South Asia

Author(s) Madhavi Malagoda Ariyabandhu and Maitree Wickramasinghe
Published by ITDG South Asia Publication, Colombo, Srilanka Dec 2003

Key themes Gender and Disasters

Abstract

This book aims to raise awareness on gender issues amongst the policy makers as well as practitioners across South Asia. It addresses the issue of how gender and development concerns are reflected in the disaster contexts.

The main arguments of the book are:

- The risk posed by natural hazards is a variable, and had direct impact on the livelihoods in particular
- Disaster risk management is a part of 'managing the livelihoods' for millions of people in subcontinent.
- Gender concerns raised in the development context are applicable to the disaster contexts with a specific sensitivity to the vulnerabilities and capacities arising from the different stages of disasters.
- The specific vulnerabilities and capacities of men and women and social dynamics are often not visible in the disaster contexts. Detailed livelihood analysis as well as specific sensitivity is needed to locate and address them.

After different disaster and development model, this book also discusses following main issues:

- Following the PAR (Pressure and Release Model) by Blackie et al, it suggests that it is vital that we recognise that disasters not only arise out natural hazards but that they are an outcome of various political, social and economic forces of development. Thus there is a socio-economic and natural side to any disaster.
- The alternative perspective – as adopted by Duryog Nivaran therefore suggests that we look at the underlying causes and reasons – as to why certain sections of the society are more vulnerable than others. Understanding of these links will help us plan to deal with them.
- All in all, women, and especially poor women are vulnerable even before the disaster strikes. Therefore a woman's position can only be exacerbated in disaster contexts.
- There are specific gender issues that need to be understood and addressed in disaster contexts for eg, women's workload may increase after the disaster.
- A people oriented planning framework can be used to do vulnerability and gendered planning, and gendered vulnerability analysis in disaster context.
- Gender roles need to be understood and social perceptions need to be addressed – for eg widows and those living without male protection may face social marginalisation. There would also be certain gendered economic impacts.
- There would also be differences in the psychological impacts – where studies have shown that women are emotionally affected more than men.
- Violence against women may increase after the disaster.
- Due to gendered roles, there would be gender based differences in the coping –

however women are not just helpless victims, it is important to recognise their capacities and skills. They use their indigenous knowledge for disaster preparedness and try to protect their belongings in the event of disaster. They also share warnings through informal networks.

- Currently, there is an absence of gender sensitivity in disaster management – that is absence of sufficient analysis of communities from the gender perspective leads to their invisibility or stereotyping of women.
- Lack of awareness about legal and cultural discrimination against women leads to their denial of rights and wrong policy assumptions. It also leads to superficial assistance.
- To make development and disaster management holistic and sustainable, the policies need to transfer their focus from emergency management to risk management; ensure that implementing persons/officials are aware about these concepts; ensure relief and rehabilitation integrated into long term disaster preparedness and development and that gender sensitivity is embedded in all cycles of disaster management.
- Ensure that women's practical as well as strategic gender needs are met in emergency response.
- Gender sensitive disaster management would require context specific social and gender analysis in a given context; turning gender concepts into policy guidelines; commitment to enforce gendered policies; agreement to minimum standards.
- Special attention needs to be paid to conditions of landlessness; exploitative working conditions; female malnutrition; illiteracy; inadequate health care; lack of access to information and inadequate legal support.
- Special attention needs to be provided to highly vulnerable women such as poor or low income women; refugee and homeless; elderly women; women with disabilities; women headed households; widows, indigenous women, new migrants; women with language barriers; those belonging to subordinated cultural groups, socially isolated women; caregivers with a number of dependents; women living alone, or living in shelters' women subject to assault or violence/abuse; chronically ill women; undocumented women and malnourished girls and women.

RRL - 016

Title Gender, Emergencies and Humanitarian Assistance

Author(s) Bridget Byrne with Sally Baden
Report commissioned by the WID desk, European Commission, Directorate General for Development November 1995, BRIDGE Report No 33, IDS, Brighton Sussex.

Key themes Gender and Disaster

Summary

WID or GAD in Emergencies:

There is growing international consensus on the need to consider gender issues in emergencies and humanitarian assistance. This is because women are most affected in emergencies and the internal impetus within the agencies to respond to them. However this response is influenced by gender and development work – and within that specifically the WID framework rather than the GAD framework – that is focusing on women's specific needs and their role as mothers. While this is driven by an understanding that women are primary victims of the emergencies, there is a limited analysis of the role of social relations, and specifically gender relations in determining who suffers in emergencies and the opportunities to change this situation. A gender approach is important to identify men's and women's differing vulnerabilities to crises as well as their different capacities and coping strategies, in order to build on these, in order to design effective relief programmes. Gender analysis can illuminate the unequal power relations underlying social institutions, to ensure that women are not further marginalised by relief interventions. Gender analysis can also assist in understanding changes in gender relations and identities which occur during crisis and conflict situations and thus highlight the potential for positive change.

Gender issues in emergencies

Disasters are never solely 'natural' events: their impact depends on the social and political context and importantly on the social composition of the population affected. The concept of vulnerability is important in identifying which groups are at risk in emergencies. Vulnerability thus also denotes the internal capacity to cope. A gendered analysis would suggest that gender is an important if not the sole determinant of vulnerability. Vulnerability assessment involves understanding the coping strategies – which are in part also determined by gender. Relief is often targeted at women but with little understanding of the gender relations underlying the livelihoods of household. A GAD approach would analyse men and women's differential access to power and resources with the household and how it might be affected by relief interventions. It also draws attention to division of labour between women and men and particularly women's reproductive labour. It also looks at women's strategic interests as well as practical needs. Further analysing cultural constraints faced by women they also identify the way it affects their mobility and response in disaster situations. Households's coping capacity would also be influenced by age, class, status with a family. Further female headed households may be further restricted and humanitarian assistance needs to ensure that it does not increase the vulnerability of these groups by undermining their coping capacities or reinforcing those coping capacities which are damaging. Further, it is still less known as how decision-

making and negotiation takes place in the household in disaster situations. Ultimate breakdown in negotiation occurs with family break-up, often with the abandonment of women, children, or the elderly, whose claims for support have been rejected. In the wider community, disaster situations can have differing impacts on women's public participation – they may provide opportunities to women to take on leadership positions, but may also increase the demand on their already overburdened time.

Gender ideology and identities are also subject to rapid change in conflict situations. This can produce more conservative attitudes to women's behaviour decreasing their rights and mobility. Women are sometimes upheld as the symbolic bearers of caste, ethnic or national identity in conflict situations which can lead to them being singled out for attack. On the other hand, liberation struggles can promote new roles and opportunities for women as part of wider social revolution. Overall, however, conflict is more likely to reinforce, than to challenge, traditional views of men and women.

Gender sensitivity in responses to emergencies

A planning framework is needed in order to introduce gender analysis into emergency response. Various frameworks have been developed for gender planning in emergencies, arising mainly from the work of NGOs in this field. Each has different strengths and weaknesses and is suitable for use in different contexts, or in combination with the others. It is also crucial to consult with women, as well as men, in the planning and implementation of emergency interventions. Failing to do so means not only that the needs of women are neglected but also that women may lose access to resources they are accustomed to control and that their skills and capacities are not utilised and built upon.

The use of participatory methods for information gathering, programme design, monitoring and evaluation - can illuminate men's and women's different needs and experiences as well as building on women's capacities, increasing their decision-making power and aiding group cohesion. Gender-awareness is required in the use of these methods. The other challenge is about how to prevent violence in disaster contexts. There is also a strong case for building a gender dimension into emergency response at the levels of early warning, preparedness and capacity building. Local-level early warning systems particularly could incorporate gender-specific indicators and capacity building should give attention to strengthening women's organisations.

The policy and institutional environment for integrating gender into relief work

There are a number of constraints, political and institutional, to the introduction of a gender perspective in relief work. Some of these relate to the separation of relief and development work, the practical need to respond to emergencies quickly and the tendency of relief operations to be characterised by top-down, donor-dependent, expatriate-run operations, drawing on separate funds, with minimal appraisal and approval procedures, in comparison to development programmes. Unlike the general feeling, introducing a gender approach into relief programmes need not slow down the delivery of relief and but can render assistance more effective and inclusive. Other issues include new approaches to staffing and training, and monitoring and evaluative procedures to ensure that they are gender sensitive and inclusive. Gender analysis is a flexible and dynamic tool and its application does not readily translate into

universally applicable guidelines. The approach adopted to gender issues should be geared to the specific circumstances of each emergency and to factors such as the social composition of the affected population and the likely duration of the emergency, the particular intervention planned and the type of organisation that is going to carry out the programme.

Integrating gender concerns into relief programmes

The adoption of gender policy in emergency work is a long-term project and must begin with a development of a gender analysis from the beginning of any response to an emergency situation. This will require the employment of staff with gender training, or the training of existing staff, with gender as a prime consideration in methods chosen to distribute resources. Involving women in consultation and giving them decision-making power is perhaps the key element in a gender-aware approach. New mechanisms may be required in order to ensure the full participation of women. There is also a need to learn from/ and establish the best practices - that is a systematic institutional analysis is required to highlight strategic points of intervention, barriers to implementing gender policy and the resources, structures, procedures and incentives which might be necessary to overcome these.

RRL - 017

Title Gender Differentiation and Aftershock Warning Response

Author(s) Paul W. O' Brien and Patricia Atchinson
In 'The gendered Terrain of Disaster : Through Women's eyes' edited by Elaine Enarson and Betty Hearn Morrow; Praeger Publishers, USA 1998, pg 173-183

Key themes Gender and Disaster

Abstract

Drabek (1992) identifies gender as one of the factors that affects the risk perception along with disaster experience and other factors. Fitzpatrick and Mileti (1994) report on the relationship between attributes of the receiver, such as gender and socio-economic status and how disaster warnings are heard, understood, personalized and responded to. Quarentelli, Turner, Yanomoto also report that women are more likely to believe in warnings than men (Fitzpatrick and Mileti 1994). Lott (1994) assesses a number of studies and suggests that 'behaviour does not always confirm the stereotypes, and careful reviews across the empirical literature typically fails to support generally accepted conclusions of stable gender differences across situations'. Barrie Thorne (1997) suggests that gender should be moved from the realm of 'dualisms' to 'fluid and situated gender'. This study suggests there are significant differences in 1) how men and women experienced the earthquake 2) early actions undertaken 3) information received about aftershocks 4) action undertaken in the three months. 5) opinions related to the disaster.

Research Methodology

The context chosen is the 1989 Loma Prieta earthquake in northern California. The results of the findings are based on over 1600 California residents who were surveyed in two different communities after the Earthquake hit the state. The areas were San Francisco and Santa Cruz.

Finding(s)

Gender differences in aftershock warnings:

- 1) The research suggested that women were more likely to get information from informal sources. Respondents on information seeking behaviours suggested a slight differences in the use of media; with 4% more men reporting access to radios after the earthquake. On what information was actually received in the first seventy-two hours, it was found that more men reported receiving official information about the aftershocks than did women (33% versus 22%). Women more often received word of mouth information (30% Versus 22%). Further they received information from their social networks such as relatives and friends (41% versus 27%). Thus consistent with the notions of male instrumentality and female expressiveness, men sought to gain after shock information from authoritative or official sources while women relied upon informal networks.
- 2) Women were more likely to perceive damage : More women reported on feeling the earthquake. Males reported lower levels of neighbourhood damage than women. Women also reported higher levels of damage to household items such as furniture etc.
- 3) Women were more likely to take household action : Women were found to be more concerned about personal, family, and home damage than men (54% versus 42%). Also women were found significantly more likely to take action consistent with their expressed beliefs than men
- 4) Men were more likely to help outside the household : Men were found to be more involved in search and rescue operation (6% versus 2%) and to have directed traffic (3% Versus 1%). More women (30%) than men (22%) provided food or water to others.

The data suggests that consistent with expressiveness, women are more likely to show concern to their home, families – however higher involvement of women in planning, information seeking reflect instrumentality. The author concludes by suggesting that the data suggests a gender fluidity related to a context and that instrumental/expressive gender dichotomy is vastly oversimplified.

For the policy suggestions, the author suggests that there is a need to understand how gender affect public risk communication and the differences in risk perception and response.

RRL - 018

Title Women Victims view of Urban and Rural Vulnerability

Author(s) Bhatt, Ela Bhatt
In 'Understanding Vulnerability' edited by John Twigg and Mihir Bhatt
Duryog Nivaran, ITDG publication, Colombo, Sri Lanka 1998

Key themes Gender, coping capacity, Vulnerability and Disasters

Summary

This paper discusses 'vulnerability' from and through the voices of urban and rural women in Gujarat. Some of these women are affected by repeated disasters such as floods or multiple disasters such as drought and floods as well as riots which had taken place in Gujarat in 1969 and 1985.

The characteristics of their vulnerability is voiced by the women and are different for the urban and rural women.

Rural women:

Irrespective of the regional variations, culture and morphology and climatic conditions, the rural women identified their vulnerability due to :

- lack of resource base
- poor resource quality such as degraded land
- lack of productive assets such as wells, bullocks, and poultry
- lack of access to better seeds, marketing
- lack of absence in the non farm sector
- high indebtedness to meet various relief, rehabilitation and consumption needs
- irregular and seasonal work available before and after the disaster
- low wages

The women also said that their situation was compounded by illiteracy, lack of education and information about disasters (beyond direct experience); lack of awareness about govt prog for relief and rehabilitation, rigidity in govt relief distribution programmes; malpractices and role of middlemen in rehabilitation efforts, and Patriarchy prevalent in the relief to rehabilitation cycle.

Nearly all women from different castes, and age groups identified widows and deserted women as some of the most vulnerable groups in rural areas.

Two key points emerge out of the narratives of women – namely that women were clearly able to see their vulnerability as a product of a variety of deprivations and emerging conditions. Secondly there were able to see their position as victims of disasters but also as women. During disasters women not only had to carry the dual burden of productive and reproductive work but also had to attend to mitigation, revival and rehabilitation.

The urban women:

Living in the slums and chawls (low income settlements) the women – belonging to the

'marginalised castes' as well as muslim women from the city said that they were vulnerable due to may reasons such as:

- Lack of employment
- Irregularity of jobs
- Lack of employment protection
- Low wages
- High indebtedness
- Lack of timely and sufficient credit for their petty trades and micro-enterprises

This situation was further worsened due to :

- Constant fear of eviction from slum pockets
- Fear of police and municipal authorities
- Lack of relatives and community support during crisis
- No or meagre family support for the old, widows and deserted women
- Loss of productive assets and killing of the family members during the riots
- Ill health of the earning members
- Expensive health services
- Lack of education,
- Hazardous and extremely congested living and alcoholism in the areas where they stayed

Like the rural women, the urban women also linked their vulnerable conditions to the overall environment in which they lived. Again widows, old and deserted, chronically ill were identified as the weakest among the vulnerable.

The author concludes that the narratives and the perceptions of women on vulnerability brings about the following important points:

The first is their vulnerability locked position which does not allow them to escape the condition. The individuals and households inherit the vulnerable conditions due to related lack of opportunities to enhance their resource base and empower them to negotiate with the market powers. Their vulnerability increases to the point that it makes them destitute and often one catastrophe is enough for them to be pushed down the ladder. This in turn leads to household mortgaging and distress sale of their possessions – the households tends to develop coping mechanism that are weaker than the former ones. Many have no coping mechanisms and which leads to marginalisation of the whole household with the female children and women facing the most burden.

The second point is that vulnerability compels women to expand their work opportunities to earn a higher wage in informal sectors. This leads to their exploitation by the system as well as they are at the receiving end of the domestic clashes and violence. These vulnerable families are often women headed households and many women being widows and deserted wives.

RRL - 019

Title A gendered Perspective : The voices of Women

Author(s) Enarson, Elaine and Morrow, Betty Hearn
in 'Hurricane Andrew' ed by Walter Peacock; Betty Morrow and Hugh Gladwin;
Routledge publication, London and New York; 1997 (pg 116-140)

Key themes Gender, Age, Class and Race and Disaster response

Research Question

How gender, race, class, relations interact in disaster impacted communities and households.

Research Methodology

The authors use qualitative research methods such as focus group discussions and open ended interviews with disaster victims, service providers and through observations in tent cities, service provider organisation construct the stories of four fictional women – whose account is representative of many voices that they heard of. They state that the portraits are representative of the situations and experiences of women interviewed. They weave and merge their observations and feelings selectively to reflect the diversity of the sample and avoiding unrepresentative implications. All quotations in the article are transcribed in verbatim from the recorded interviews.

Finding(s)

- In general women without partners had less resources – money, transportation and labour – to complete disaster preparations.
- School children suffered from long term effects of Andrews as school system opened just three weeks after the hurricane. Children were in tears when the windows rattled. And the young people felt depressed, and showed symptoms of withdrawal, disruptive behaviour and violence.
- Women had to suffer with the 'double day' a the work and at home with expanded demands after hurricane.
- Women had spent countless number of hours in short term and long term community recovery – however they were severely underrepresented in important decision making
- The disaster response also needs to document the emotional responses of men to disaster – who after the hurricane Andrew showed signs of suicide, alcoholism and violence.
- The tension levels at the relief centres reflected cross cutting patterns of race, class, gender. The agencies – from federal to local were not prepared to deal with the multicultural diversity of South Florida.
- Direct Service providers also mentioned that low income single mothers were having the toughest time – as public housing where they stayed was destroyed and the pace at which it was built was very slow,. About 2 years after the storm, approx 20% of the public housing remained unrepaired. This delay was due to slow release of public funds as well as reliance on private funding for rebuilding.

- Whilst women focused on the children's needs, several of the women were ill; and complained of headaches, vision problems, sore throats due to living in damp apartments close to debris. Heavy responsibilities made them exceptionally overwork and emotionally stressed.
- Family conflict was seen as the by-product of frustration and uncertainty with overcrowding a contributing factor. This could have been dealt better with increased child care programme – however funds for this came in very late.
- Male desertions was reported frequently by the respondents as men could not take the 'pressure' following disasters.
- Service providers also confirmed that the first person in each address submitting an application – often the man with transportation received the check. There were many reports of FEMA benefits intended to replace the household possessions being misused by men for personal purposes like buying cars or supporting relatives in other countries
- Those with least resources after the storm – often single mothers, grandmothers – tend to get in to the limbo of 'temporary' housing.

The authors conclude that while the profiles document a range of commonalities of women's experiences, - showing that women are central to household and community recovery, and their needs gender specific, they are also impacted by their ethnicity and class. They suggest that gendered analysis of the disaster is important to mitigate the impact of the disasters. They suggest that further research on women's vulnerability to disasters, secondly on gendered impacts of disasters, and third on women's capacities and resources for responding to the disasters. From the policy perspective, the authors suggest that women absorb the social costs of being largely excluded from the disaster planning and recovery initiatives and that disaster planning need to account for impact of gender relations on social structures and interactions. Further they suggest that women being instrumental in preparing households for disasters, should be involved in community based disaster planning and mitigation initiatives as equal partners to build democratic disaster resilient communities. Women's needs need to be addressed in emergency response and long term recovery including economic recovery.

RRL - 020

Title Women's Disaster Vulnerability and Response to the Colima Earthquake

Author Vinas, Carolina Serrat
In 'The gendered Terrain of Disaster : Through Women's eyes' edited by Elaine Enarson and Betty Hearn Morrow; Praeger Publishers, USA 1998 (pg 161-172)

Key themes Gender and disaster

Research Question(s)

- a. How do the women describe what happened after the disaster?
How do the women feel about work, politics, authorities, nhbd, families and everyday
- b. life?

Research Methodology

Responses of the women in two district communities in Manzanillo municipality impacted by the Colima Earthquake in Mexico on Oct 1995. The methodology included direct observations after the earthquake immediately as well as one year and several months later. Interviews were conducted with injured families – mainly women. Further neighbourhood organisations, formal authority were also interviewed.

Concepts used :

Disaster as a social process: The research looks at disaster as a social process in the sense that not only impacts but also the social causes and responses by the civil society are used to develop the frame of analysis. 'Disaster vulnerability is looked upon a historically developed socio-policial condition that determines degree of damage, the capacity to confront the damage, and the ability to recover from the damage'.

Finding(s)

District of Burocrata : The people after by the disasters were highly educated – such as school teachers, retired public servants – and were capable of organising to demand for their rights, which potentially diminished their disaster vulnerability. Prior to disaster they had nhbd associations –which after the disaster was ratified as committee for reconstruction. They assessed the damage and developed plans for reconstruction. Months after the disaster around 30% of houses were declared to be on high risk soil and were to be demolished. Further, several households were declared as not poor and therefore not in need for help. The residents – were agitated and discontented leading to volatility of the situation.

Women interviewed after the earthquake – also members of neighbourhood association said that there struggle is not 'political' but for the family's well being. Interestingly men also said that there struggle and concern was for their families. City halls officials said that 'women are difficult to control, appear in groups without any organisation, speak at the same time, and do not leave without resolutions of their demands'. This showed the machismo attitudes amongs the authorities who did not want to negotiate with the women at all.

The study found that women were a fundamental positive force in the struggle and made up the majority of the neighbourhood associations. Women's traditional roles in the families continued even after the disaster and they thus worked outside and in the household. Women now involved in the organising after the earthquake said that their participation in non traditional labour, associating, organizing, struggling for their rights made them feel more useful, stronger and happier than before.

La Libertad District

Most of the inhabitants in this area – had different socio-economic conditions than those in Burocrata. This area was characterised by large families, overcrowding, and heterogenous populations. Before the disaster the neighbourhood lacked social organization. Here the residents struggle – after the disaster was also more disorganised.

Women from the district explained that their problems were directly related to women's situations as manager of the household resources and caretakers of childrens. Livelihoods were affected -Women running stores – suggested that even if the stores did not suffer physical damage – they could not sell much as people did not have resources – and do not make much profit. Food continued to be a problem for many – with prices for basic commodities very high. Women said that their poverty conditions were not generated by the disaster and the aid provisions did not reduce their vulnerability in any significant way. On the contrary social, economic and gender inequalities amplified during the disasters.

Overall comments on Gendered and Disaster Response from the two districts:

- According to women interviewed, Women organise more effectively than men.
- Women openly show their emotions – fears, anxiety, pain and frustration – while culture repressed the expressions of emotions in men.
- Women are in the central axis of family care. As principle providers they have an urgent need to locate resources.
- women leaders in La Libertad were different from Burocrata. However in both the cases, natural leaders emerged, elected by neighbours than imposed by authorities. Most of the aid was distributed by women in both communities.
- Not all women are equally vulnerable – some women had high wage jobs, others have their own houses; some did not suffer direct damage but were emotionally affected.
- Not all women show solidarity with others in need. Many women however show compassion for those who have suffered from the earthquake.

RRL - 021

Title Gender, Disaster and Development :The necessity for integration

Author(s) Fordham, Maureen
In 'Natural disasters and development in the globalizing world', pg 57-74; ed,
Mark Pelling, Routledge publication, London and New York 2003

Key themes Gender, Disaster and Development

Abstract

This paper interrogates the relationship between Gender, Disaster and development by a critical review of disaster research and practices in the Northern as well as Southern countries. It follows the trajectory of the three disciplines and the possibilities of their interconnections: The disasters research field has traditionally been dominated by the Hazards research which has been criticised for its lack of attention to social theory. However, there has been some incremental changes following critiques of the hazards approach by Hewitt (1983) followed by Blackie et al 1994, Varley 1994, Comfort 1999; Cannon 1994 who then pioneered the social vulnerability perspective whose focus was on underlying socio-political, root causes of disaster processes.

The idea of Development Studies is a contested terrain - however, the development studies – has made a useful addition of gendered development theory and practice. This work has highlighted the vulnerability and capacity of different social groups, especially women and more participatory approaches to decisionmaking and policy implementation. However, if as suggested by Anderson and Morrow 1998, the use of vulnerability and capacity analysis in disaster contexts constituted a important conceptual advance for the disaster studies.

The discourse on gender has evolved over time – from inclusion of women to focus on their empowerment. And even into the 1990s many books on hazards and disasters failed to recognise the analytical categories of gender, women and feminism. An area of interest in the development arena – violence against women emerged at a late and on a small scale in certain researches in disasters – (Larabee, 2000; Ralph 1999; Fothergill 1999; Wilson et al 1998; Enarson 1997).

The author concludes by suggesting that calls for integration are easy to make, but are difficult to achieve on the ground. Each of the above concepts are complex and its meanings context dependent. However the building of the sustainable, disaster resistant communities in both industrialized North and industrialising South, albeit complex needs to be undertaken. While institutional fragmentation, competition and misunderstanding are a major threat in both academic and practitioners field, the chief danger is that rhetoric of integration may ask the largely technocratic concern – the failure to grasp the root causes of vulnerability at social and political level. In that sense, the integration needs to happen at different levels – the academic, policy, practitioner as well as political levels.

RRL - 022

Title of article Women's Participation in Disaster Relief and Recovery

Author(s) Yonder, Ayse with Akcar, Sengul and Gopalan, Prema
Published by Population Council, One Dag Hammaraskjold Plaza, New York, USA, Nov 22, 2005
<http://www.popcouncil.org/publications/seeds/seeds.html>

Key themes Gender and Disasters

Summary

Treating Disasters as Opportunity Vs traditional topdown model:

Women suffer four types of indirect losses following disasters:

- Loss of productive employment outside the home (domestic, industrial, or commercial);
- Loss of household production and income (including that of the back-yard economy and of small businesses run by women from their homes)
- Increase in reproductive work; and
- Other economic damage resulting from outstanding debts or loans.

A typical disaster response phase consists of relief, reconstruction and recovery phases. Across these stages, serious problems arise over what, when, and how disaster aid is delivered. International agencies and national governments typically provide emergency assistance in a top-down manner that reduces affected people to victims and passive recipients of aid. This leads to dependency and cynicism within affected communities—problems that carry over to the recovery stage.

Emergency management rarely take their opinions into account. Although women commonly organize themselves to distribute supplies, establish shelter, and pool labor and resources to create community support services to meet basic family needs in the emergency period, their efforts are often invisible or go unacknowledged. In the reconstruction period, entitlement programs focus on individuals and their loss of property. This approach favors owners in affected communities and geographical regions and excludes or harms non-owners (the poor, women, and ethnic and other minorities). Conventional response programs fail to recognize women's participation in decision-making.

This paper suggests that disaster should also be looked upon as an opportunity to make groups less vulnerable, improve conditions of living for women and must favour equity. For eg, disasters push women out of their traditional roles and taking up new roles.

The three case studies discussed in this paper describe how groups of local women formed and organized to secure housing, livelihood activities, and basic services after earthquakes struck two states of India (Maharashtra and Gujarat) and the Marmara Region of Turkey. In both countries, women-focused, nongovernmental organizations from outside the devastated areas (Swayam Shikshan Prayog, or SSP, in India and Kadin Emegini Degerlendirme Vakfi, or KEDV, in Turkey) reached out to and organized local women's groups to enable women to participate in relief and recovery processes and to build the skills and capacities necessary to sustain their

involvement.

The innovative programmes taken up in India - included women being involved in non traditional activities such as managing large scale home repair programmes. This was done by nurturing leadership and skill training – of house construction to the women so that the houses could be earthquake safe. Techniques such as participatory mapping was done to design new settlements in Maharashtra. In Turkey, women were organised to manage relief in the tent cities – parts of which they used as centres for women and children. At the centers, the women discussed the earthquake, the relief programs, and events around the region. They organized exchange or marketing visits to Istanbul and started making plans for the future – and negotiated with the Turkish Ministry for a income generation projects. The other innovative activities included developing service production cooperatives and housing cooperatives by women. Finally, the programmes included exchange visits between different project staff and community women leading to transfer of skills and adoption of the best practices developed in the respective projects to enable empowerment of women.

The case studies of the SSP and KEDV experience highlight how postdisaster situations can be opportunities to empower women at the grassroots level, build more resilient communities, and initiate long-term social change and development. They also illustrate how NGOs can focus on facilitating and partnering to leverage resources and thereby galvanize affected women's groups to scale up and sustain their energy and organization over the cycle of relief to reconstruction. Although the Indian and Turkish strategies were different, they jointly suggest key elements of effective practice. Women were placed them at the center of reconstruction processes and enabled through capacitating processes.

Lessons Learned

Not only do the case studies pinpoint postdisaster opportunities for women's participation and contributions, they also underscore the conventional attitudinal and operational approaches to postdisaster programming and resource allocation that must be overcome to support women's grassroots organizations so that they can be fully effective in re-storing their communities in the relief and subsequent recovery processes. The four barriers that needed to be overcome was – overcoming biases around gender roles and professional expertise; overcoming lipservice and enabling interventions that genuinely reflect principles of participation and sustainability; overcoming top down brick and mortar type of govt programmes and rebuilding lives and livelihoods; and overcoming misconceptions about grassroots women's groups being small scale and low tech despite evidence to contrary. The case studies indicate that grassroots efforts can, if supported, rapidly mobilize a critical mass of actors. Women can acquire non-traditional skills and take on information-giving roles often considered to be the male domain, overcome male opposition and skepticism, and take on active leadership to rebuild their communities. Reducing the economic vulnerability of women and of their families is a key mitigation measure that reduces potential losses from future disasters. A longterm development perspective is critical, starting at the relief stage, in the allocation and use of resources in order to foster self-reliance, build local capacity, and avoid dependency.

RRL - 023

Title 'Men must work and women must weep' : Examining Gender stereotypes in Disasters'

Author(s) Fordham, Maureen and Ketteridge, Anne-Michelle
In 'The gendered Terrain of Disaster : Through Women's eyes' edited by Elaine Enarson and Betty Hearn Morrow; Praeger Publishers, USA 1998 (pg 81-94)

Key themes Gender and Disaster

Abstract

This paper emphasis on the ways in which - by and large women in particular are made more vulnerable in a disaster process through the use of traditional gender model and roles. Instead they suggest a reconceptualising of the frames of analysis leading to a more sensitive and gender enabling action in disaster contexts.

Research Methodology

Case studies of flood impacted Strathclyde Scotland; Perth Scotland and Towyn, North Wales. Semistructured qualitative Interviews were held with 23 people in two locations in Scotland supported by observational techniques and secondary data analysis with discussions with professionals working on the third location in Wales. All the areas selected had areas of social deprivation and exclusive selection of gender as a determining variable is problematic. Instead there is a complex intersection between gender, social class, race, culture and ethnicity.

Concepts used:

Private-public model

The private-public model is a useful simplification of the spatial manifestation of economic relations in capitalism. However this does not fully represent women's reality as women who are closely associated with private sphere also do wage labour which goes undervalued or unrecognised in public domain. The authors suggest that instead of using this dichotomy, it is important to include the third sphere of community work and the involvement in the community work in disaster process. This reconceptualising is a useful way forward as it retains the use of public private dichotomy as they illuminate the economic and social relations of patriarchy in capitalist societies.

Gendering of roles and behaviour in disasters:

Disaster management tends to be a topdown, male dominated, command and control model which not only reinforce existing masculine gender dominated relationships but also male domination in traditional female spheres of authority. For eg, in disaster situations the female authority in preparing food is diminished by the emergency managers who are typically men – who manage these operations.

Women as vulnerable group:

Women form a vulnerable group as they bear the increased burden after the event of flooding due to their low economic and social status as well as home and child care responsibilities. Further women also provide care to the elderly neighbours. In current contexts, it is expected that women will manage working outside without interference with her domestic responsibilities.

Finding(s)

Following are some of the typical outcomes seen in the disaster situations:

1) Stereotypical expectations of a return to 'normality':

As one of the main aims of the disaster management is to get the families to normalcy – once the families are in 'temporary accommodation' it is assumed that urgency is over. Yet the conditions of the temporary accommodations increase the stress levels for women who have to care for the young children and pregnancy. However since these situations fall outside the 'economically productive sphere' they do not imply similar urgency for emergency managers

2) Normality redefined :

The return to normality defined by the emergency planners is an oversimplified picture. However, the complexity and difficulty involved in creating a home and the symbolic nature of home – in such oversimplification are underestimated. By their very nature, the loss of home – intangible as it is – is impossible to replace or compensate.

3) Women were stronger:

Interviewees showed resilience although stressed by poverty and range of discriminatory behaviours before, during and after disaster. They not only survived but came out stronger.

4) Men's emotions and extreme events

Men appeared to have coped well with the extreme events but did not express the anxieties they felt as the loss of their traditional roles of protectors or providers for the family.

5) Gendered care and support systems

Women are associated with care giving in both private and public spheres. However it is necessary to have gendered representation in care and support organisations to support men as well as women.

Conclusions and policy implications

This research has given examples of stereotypical attitudes and behaviour in emergency response context. The private sphere was considered uncomplicated and its complexities ignored. Thus women's potential to participate in the emergency planning and management

went ignored. Men are also stereotyped as hiding their emotions and alienated from seeking care which is feminized. However what is needed is a better understanding of the differences in the women and men's needs and responses in disasters. The case studies also show that without such appreciation, women are made more vulnerable in disasters. The inclusion of women in emergency management could help address the lack of understanding. Disasters provide an opportunity to make the ideological shift to break down the public –private dichotomy and its inherent hierarchy that makes feminized private sphere subservient to the masculinized public sphere.

RRL - 024

Title The neglect of Gender in Disaster Work : An Overview of the Literature

Author Fothergill, Alice
In 'The gendered Terrain of Disaster : Through Women's eyes' edited by Elaine Enarson and Betty Hearn Morrow; Praeger Publishers, USA 1998 (pg 11-25)

Key themes Gender and Disasters

Research Question(s)

What we can learn, build upon and challenge from the current literature on gender and disaster?

Research Methodology

Review of around 100 studies on disasters which have some gender dimensions.

Summary

Whilst disasters have now been recognised as social phenomenon, and are rooted in social structure; the larger social context of which gender is a crucial dimension continues to be underdeveloped in disaster scholarship. The author has used a review of 100 studies which have addressed gender issues to some extent in the disasters. The findings are as follows:

Exposure to Risk: Gender influences vulnerability in disasters and exposure to risks. The researchers argue that women's heightened exposure results from their social class, their care-giving roles and their relative lack of power and status.

Risk Perception : The literature suggests that women perceive disaster events or threats as more serious and risky than men, especially if it threatens their family members.

Preparedness behaviour : This behaviour pertains to preparedness activities prior to disaster to mitigate its effects. The literature on this issue is minimal however the available data shows that women and men have or perform different and distinct prepared ness activities and women are often kept out from the formal disaster preparedness activities taken up by the organisations.

Warning communication and response:

This stage refers to the response of the people after the warnings are issued – for eg radio or other broadcasts or sirens. Gender is again found to be an important variable in this stage – it seems that women are more likely to receive risk communication, due to their social networks and respond with protective actions like evacuation.

Physical impacts:

This refers to losses immediately after the disaster – such as morbidity, injury and mortality rates. The data in US shows limited mortality rates, and therefore are not conclusive on this issue. However there seems to be an increase in domestic violence after the disaster and that women could die more due to discrimination or the location at the time of the disaster. It appears that gender variation by mortality and morbidity rates vary by the disaster types and location in the disaster. In developing world too, women are disproportionately impacted that is more women have died or injured after the events such as earthquake in India or Cairo, Egypt or cyclone in Bangladesh.

Psychological impacts:

Disasters produce trauma and distress. The work is extensive in this area, the available literature shows that findings are mixed. However majority of the studies show that women and female children have more emotional problems, while men show more alcohol drinking. Women also show more PTSD – posttraumatic stress disorder and show symptoms such as anxiety, depression.

Emergency Response:

Gender is found to be an important variable in emergency response depending upon the event particularly in terms of the division of labour in response work and their inclusion in the emergency response work – which continues immediately after the disaster for some days. Tasks such as looking after the children, food preparation are continued to be done by the women, while the leadership positions and volunteering is often done by men. Women work in private spheres while men work in public spheres in the response stage. Studies in developing world suggests that women's skill are underutilised in the disaster response and that they face discrimination in the relief due to their social status.

Recovery:

This is the long term – or about one year after the disaster – a time frame during which life will return to normal or to improved level to some extent. The literature looks into issues of relief assistance, family relocation and relationships. Here too gender is a variable, with women seeking assistance for their families, while men looking at the assistance as a stigma. Also poor women face most difficulties in recovery. In developing world, women also face more discrimination, abuse and hardship and less medical attention.

Reconstruction

This is the final stage of disaster cycle – the literature points out that poor women have most difficulty in returning their lives to normal and that females may have more difficulty in procuring loans than the male counterpart. Those who are already vulnerable before the disaster have less resilience after the disaster. Thus women from the low income group fare poorly in the reconstruction phase. Working class women already burdened with work outside experience increased burden now after the disaster in this phase. Reconstruction in developing world suggests that women are more adversely affected in the long term – with losses of livestock which are under women's control and their loss have a direct impact on the women's economic wellbeing.

The author concludes that gender is significant variable in nine above stated stages in disasters.

RRL - 025

Title Domestic Violence after Disaster
Author(s) Wilson, Jennifer, Philips, Brenda and Neal, David
In 'The gendered Terrain of Disaster : Through Women's eyes' edited by Elaine Enarson and Betty Hearn Morrow; Praeger Publishers, USA 1998 (pg 115-124)

Key themes Gender and Disaster

Research Question(s)

To what extent community organisations have responded to domestic violence after disaster?

Research Methodology

Three case studies used namely : Earthquake in Santa cruz, California in 1989; Lancaster, Texas affected by Tornado in 1994; Dade County, Florida after Hurricane Andrew in 1992.

Data was collected through semistructured open-ended interviews using both organization – such as Red Cross, Shelters for domestic violence and the community as units of analysis. Further secondary data such as reports of the organisations, media accounts, census data was also used.

Concepts used:

Women and Violence in Disasters

Social problems increase after disasters, and studies have suggested that domestic violence increases after the stress of disasters. However other conditions also need to exist – such as gender stratification including social, economic, familial and psychological oppression. Stress

such as disaster event itself is not a sufficient condition to initiate violence. Rather, an individual's place in the social structure creates the likelihood of the person experiencing violence – or furthering of vulnerability. In other words it is the inequitable systems of patriarchal systems that lead to violence – a form of male domination over women.

Finding(s)

-Three out of four representatives of domestic violence centres in Santa Cruz County perceived domestic violence to be a problem after the disaster. Some felt that the domestic violence had increased after the disaster. Lancaster representatives of the different organisations as also police department – on the other hand – felt that there was not much rise in the domestic violence and that reported incidents remained the same. However, most accounts in Dade country after hurricane Andrew suggested that incidences of violence had increased – that Miami's help line reported a 50% increase in the spousal abuse calls. Further, a random survey done of 1400 homes by state agency two months after the hurricane, reported that 35% reported that some one in the home was on the verge of losing verbal and physical control . Enarson and Morrow (1997) also reported evidence of increased violence in the qualitative study after the hurricane Andrew.

-The most common action taken after the disasters was providing counselling and shelter services to victims of abuse. In particular a key factor was the pre-disaster awareness of domestic violence as a problem amongst the organisations. Those who provided such services were aware of the problem and they defined the problem of domestic violence after the disaster and had some prior experience of extending these services. Action was however not taken where pre-disaster concern or awareness on domestic violence was low . Defining social problems as unmet community needs – established priorities for action. This could be one reason as to why Lancaster agency could not detect the problem of domestic violence after tornados.

-How organisational personnel perceived domestic violence issues before the disaster also influenced their perceptions and handling of domestic violence after a disaster. There is a need to know more about community contexts and see what linkages exist between pre and post disaster conditions. Agencies and Response organisations and communities need to develop relevant plans for post disaster response – without which women's vulnerability will be exacerbated .

- Other policy suggestions are about inclusion of domestic violence as a key issue to be included in the emergency response plans developed by the communities and agencies. Further training needs to be given to emergency workers in order to equip them respond to potential disasters.

RRL - 026

Title A comparative Perspective on Household, Gender and Kinship in Relation to Disaster

Author(s) Weist, Raymond
In 'The gendered Terrain of Disaster : Through Women's eyes' edited by Elaine Enarson and Betty Hearn Morrow; Praeger Publishers, USA 1998 (pg 63-79)

Key themes Gender, and Disasters

Abstract / Summary

Societies are organised in terms of kinship ties – however the global capitalism is now undermining the kinship and reducing the ability of the individuals and families to cope with the disaster.

Whilst kinship has oppressed women, they also play an important function in the lives of the communities and women – in poorer countries, disaster assistance is often provided by the domestic groups or kinship groups as against the developed countries which may rely more on the institutionalized responses. The domestic social structure gives meanings for the response in emergency context, but they are also a source of vulnerability. The pre-disaster conditions and the economic, social and political contexts shape these conditions – thus capacities as well as vulnerabilities produced by them are examined by the author. Gender and kinship ideologies, normative constraints and variability in class and gender based entitlements and the changes in the domestic structures and disaster capabilities are reviewed. The Bangladesh case study highlight the differences in the pressures felt by the families living with riverbank erosion and its relation with the types of extended domestic units. The female headed households come out as vulnerable households.

Research Question(s)

How does domestic structural arrangements affect vulnerability and coping capacity?

Research Methodology

Literature review and case study of Bangladesh and examination of kinship ties in disaster context

Concepts used:

Household kinship and gender:

Not all members in the household or families are equal as culture differentiates them on the basis of age, gender, social class leading to power differentiation and entitlements. Thus the structural reproduction of inequalities in distribution are not only class based but also gender based. A key marker of this is the gender division of labour existing in the society. After Sen (1982); Kabeer (1991) argues for a broader concept of entitlement that accommodates the intra-household distribution based on normative kinship and family structures. This means

women can become poorer due to deterioration of collective entitlements of family based households or alternatively by the breakdown of the family units and their claims arising out of it.

Changes in Domestic structure in a developmental cycle:

Domestic groups are transformed over time – with the aging of the members, birth of the new members and rules of marriage and residence in the given culture. These natural transformations of the units over time result in varying capacity of the households to meet their needs – they increase and decrease the vulnerability of individuals and these social units – for eg widows and widowers living alone represent a change in domestic group structure. The size and composition of the domestic groups, inheritance patterns, resource availability and control – all have a bearing on the continuity or fragmentation of the given domestic group.

Flight of men and Female headed households in disaster contexts

Abandonment, Separation, Divorce, death, or marital discord produce structural effects on the domestic groups ability to meet their needs – and women and children are worst affected in these changes. In a patriarchal context, an abandoned women may be tied to destitution and dependency. Women experience food malnourishment – and in disasters- women and girls are the primary victims of food insufficiency. Women face marginalisation – in terms of ownership of land and livestock and this affects the female headed households. In Kabeers terms, Existence of female headed households are a signal of both household and female pauperisation as a result of the breakdown of family entitlements. Women's interests continue to be tied to the fortunes of their family unit as long as family based entitlements are respected. In a disaster contexts, women when abandoned by men or separated due to conflict induced by disaster, are more likely to remain behind in reconstruction efforts .

Finding(s)

Findings from the Bangladesh case study:

Regular flooding in Bangladesh and loss of land through riverbank erosion is endemic affecting millions of people. Bangladesh has patriarchal bias in resource control and –resources are also controlled by power brokers.

-The Char and embankment zones have nearly three times as many women headed households as the non eroded zones. Most of these households are headed by women of men who are temporarily absent – that is gone for labour work elsewhere. In kazipur area studied, the women headship is a product of temporary male migration – where migration is also an important household survival strategy. The embankment zones show a sizeable women headed units – which may not signify destitution – but depends upon resources, and the domestic group arrangements and mature sons to carry out male dominated tasks. By and large Women headed households usually lacked land resources in Kazipur area and due to their younger age had more dependent children than men headed households.

It was found in Kazipur that extended households arise in the light of the disaster as some

households offer sanctuary to elders and orphans. During disasters, larger families also offer greater flexibility for caring for dependent children – potentially freeing some women in the domestic group to concentrate on hazard preparedness and emergency food distribution. Land distribution patterns in Kazipur also shows that almost all the female headed households are landless and land is concentrated in the hands of handful few men. A high proportion of landless rely upon the kin for a homestead under conditions of patronage. These conditions means subsidized labour for large landowners – in peak seasons - however as these conditions also marginalise poor men who lose respect and status and – they in turn abandon their families or resort to more violence to women. This family fragmentation is aided by riverbank erosion and displacement which in turn facilitates consolidation of control of land by few powerful families (Zaman 1989).

The data from Bangladesh thus suggests that riverbank erosion as a form of disaster can serve to aggravate existing imbalances in the society – by facilitating concentration of resource control in the hands of few men and a small percentage of the population. The natural disaster strengthens the hands of the male brokers and displace persons become a captive labour. Women with kinship or patronage to the land lords are granted access to homestead land in exchange for labour (Zaman 1989); Since men migrate in search of work or simply abandon their families, this captive labour is disproportionately women.

The case study has policy implications of different view of family. The view of male as benevolent despot suggests of interventions to improve the capacity of head to fulfil his role – it also ignores womens role in production processes. However this view does not address inherent and gendered inequality within a domestic group. The cooperative –conflict view acknowledges inequality within domestic group and implies a strengthened bargaining power among women within a family – through sustained development interventions to that effect.

RRL - 027

Title Challenging Boundaries : A gender perspective on early warning in disaster and environmental management

Author(s) Fordham, Maureen
United Nations Division of Advance or Women and ISDR, Expert Group meeting on 'Environmental Management and the mitigation of natural disasters : A gender perspective, 6-9 November 2001 Ankara, Turkey

Key themes Gender and Disaster

Summary

A gender perspective on early warning in disaster and environmental management requires that many boundaries are challenges – including those set by gender relations themselves and the different academic domains such as environment management, natural resource management and disaster management. Whilst both are now being linked through the notion of 'sustainable development', significant divisions persists.

Early warning refers to mitigation or risk reduction as well as disaster preparedness frameworks. This paper suggests that a neat categorisation of the disaster cycles – relief, recovery and reconstruction, as used by emergency managers and researchers alike is problematic as warning issues are linked up with response issues too. However an hazard perspective to risk reduction – leads to the domination of the use of technology to forecast extreme events over other forms of early warning system. This technology driven approach is typically male centred and its dissemination also make centric (Anderson 2001).

The disaster research is only asking questions as to what extent are the disaster 'natural' that is influenced by the human activity leading to ecological destruction. And whilst development research tried to connect disasters and development through environment, in practice the divide has remained. With vulnerability paradigm used as a lens to understand and analyse disasters, there now appears some crossover between development and mainstream disaster research.

Now research on warning systems has shown that the formal or official warning systems are often top down and failures have arised due to lack of social/cultural knowledge about the recipient groups – for eg, transmissions made in language not understood by an ethnic group etc. The weakest link has been in the reaching to the at-risk communities themselves and working with the local people themselves to develop a flexible system which is context as well as user driven than what experts might prefer.

Research has also shown conflicting evidence about women and early warning systems. Some show that women are more likely to be in receipt of, and act upon warnings making them less vulnerable and more likely to be active in emergent community disaster; other research studies – largely drawn from the South shows women are disadvantaged in terms of access to warning/prevention information and decisionmaking power. In Bangladesh, for eg in 1991, cyclone and flood, warnings were passed from men to men in public places and did not reach women. Even when they received warnings, they were constrained by cultural norms that

restrict their movement in public spaces. However in terms of capacities, research also shows that women are making significant contributions to disaster mitigation/prevention and environmental management. There are positive examples for eg also from Brazil where women have used radio to mobilise and organise at local level and increased their participation in sustainable development initiatives. Further, dissemination preferences have been found to be different between men and women in South Africa.

The paper concludes by suggesting that gender perspective on environmental management and natural disaster mitigation represents a newly expanded field of enquiry and action and a need for such connection is urgent when seen in the context of sustainable management and development. It also suggests that gendered warning and mitigation strategy need to be locationally and context specific – that there is no single type of ideal preventive structure or warning system appropriate to every locale or impending disaster situation. Planning must start with specific needs of diverse social groups. Thus early warning dissemination methods must serve diverse needs and situations. Further warning information need to ensure women's needs and circumstances are recognised. Ultimately the warning system must deliver what users and women want rather than what experts think should be disseminated.

RRL - 028

Title Gender Based Violence in Sri Lanka in the after- math of the 2004 Tsunami Crisis: The Role of International Organisations and International NGOs in Prevention and Response to Gender Based Violence

Author(s) Fisher, Sarah
A dissertation submitted to the University of Leeds Institute of Politics and International Studies, in partial fulfilment of the requirements for the degree of Master of Arts in International Studies. 6th October 2005

Key themes Gender and Disaster

Research Question(s)

- a. Is gender based violence an issue of concern for tsunami-affected women and has the incidence of gender based violence appeared to have increased since the tsunami?
- b. What role are NGOs playing in preventing and responding to GBV in terms of organisations that have specific GBV programmes in place in tsunami-affected areas?

Research Methodology

Fieldwork was carried out in Sri Lanka over a period of eleven weeks from May to July 2005. The research is qualitative with a primary emphasis upon the work that organisations in post tsunami phase are carrying out. In-depth, semi-structured interviews with key staff of NGOs – both national and international known to be working on gendered violence related initiatives. The incidence of GBV was also investigated in these interviews, with interviewees asked for their opinions and knowledge concerning gender based violence in tsunami affected areas.

Finding(s)

In reference to the 2004 tsunami crisis in Sri Lanka this Masters dissertation examines the role that International Organisations (IOs) and International Non-Governmental Organisations (I/NGOs) can play in preventing and responding to Gender Based Violence (GBV) in natural disaster situations. Whilst women are commonly acknowledged to suffer increased vulnerability to the effects of natural disasters, their particular vulnerability to GBV in a natural disaster context is less recognised and remains a neglected area within both disaster management and international attention to GBV.

Within hours of the tsunami having devastated entire coastal regions of Sri Lanka tsunami-affected women were subjected to rape and physical and sexual abuse. Women's increased vulnerability to GBV, and in particular domestic violence, remained somewhat hidden but persisted well beyond the initial emergency phase of the disaster.

A small number of UN agencies and INGOs undertook specific initiatives to prevent and respond to GBV, adopting a variety of approaches. These organisations were those working on GBV previously, and many of the issues contributing to post-tsunami GBV and limiting its management were the same as in the pre-tsunami context. For these reasons it was not always possible to distinguish pre- and post-tsunami GBV interventions as such.

Whether or not an organisation sought or had the capacity to address GBV in a particular location was dependent on previous GBV work, such as whether prevention and response mechanisms, services and actors were available. Other influences included how well established an organisation was in the area, the existence of capable local partners, the presence of staff with knowledge or interest in GBV work, and the role of local activism in drawing attention to women's needs. GBV activities in the first few months of the disaster were relatively few, and related to pre-tsunami GBV initiatives. New programmes were in the initial stages of implementation or being planned around six months after the tsunami.

RRL - 029

Title Gender and Earthquake Preparedness

Author(s) Mulilis, John-Paul
in Australian Journal of Emergency Management(Autumn 1998-99) pg 41-50

Key themes Gender and Disaster

Abstract

Despite the fact that males and females appear to differ in their hazard preparedness and mitigation attitudes and behaviours, emergency managers typically have not focused their efforts on this area. Psychological explanations of differences in gender preparations have traditionally revolved around gender stereotyping. PrE theory suggests that differing attitudes and behaviours result from differences in appraisal of resources relative to threat. The present study was conducted to investigate masculine and feminine differences in earthquake preparedness and to explore reasons for these differences. Results suggest that males and females may engage in different types of earthquake preparedness and mitigation activities, and that these differences may be the result of the way that males and females cognitively appraise the threat of an earthquake, an explanation that would be consistent with PrE theory. Disaster preparedness and mitigation is a topic of much concern, especially in earthquake-prone areas such as California (e.g. Bourque, Shoaf, & Russell, 1995; Mulilis & Duval, 1995). Furthermore, this same body of literature reveals that males and females appear to differ in their efforts along these lines. Examples of such differences include (1) that due to the structure of many societies, females may be more at risk in a general way to the consequences of hazards and disasters than males (e.g. Morrow, 1995; Valdes, 1995), (2) both formal and informal personal post-disaster community response services are more likely to be performed by females than males (e.g. Morrow, 1995; Neal & Phillips, 1990; Reskin & Padavic, 1994; Valdes, 1995), (3) males tend to be more active in early post-disaster recovery efforts, while females tend to be more active in later postdisaster recovery efforts (Morrow, 1995a), and (4) the family unit which has specific gender-related functions in the preparedness, mitigation, response, and recovery aspects of the disaster cycle (e.g. Abel & Nelson, 1990; Drabek, 1986; Fitzpatrick & Mileti, 1991; Hill & Hanson, 1962; Nigg & Perry, 1988; Perry, 1987; Quarantelli, 1960; Shelton, 1992). The above behavioral differences between males and females seem to point to the existence of a gendered dimension in disaster-related activities. Such a dimension would be consistent with the findings of Morrow (1995b) who notes that women are generally involved in more mitigation and preparedness activities than men, particularly for activities centered inside the house. Furthermore, mitigation and preparedness activities that men do perform, usually revolve around behaviors related to the outside of the residence (e.g. structural reinforcement of walls).

RRL - 030

Title The Relevance of Considering a Gender Perspective in Damage Assessment and Recovery Strategies. A Case Study in El Salvador, Central America

Author(s) Ferriz, Angeles Arenas
Presented at United Nations Division for the Advancement of Women (DAW) International Strategy for Disaster Reduction (ISDR) Expert Group Meeting on "Environmental management and the mitigation of natural disasters: a gender perspective" 6-9 November 2001- Ankara, Turkey

Key themes Gender and Disaster

Research Methodology

A combination of primary and secondary information was used in the research for this paper. The primary information was obtained through participant observation, semi-structured interviews with affected people, Key informant interviews and a survey. The secondary information was obtained through the revision of databases and literature.

Summary

This paper's effort is to make gender aspects visible in the framework of the socio-economic damage assessment of the January and February 2001 earthquakes in El Salvador.

Disasters affect all the groups in different ways. The impact on each group depends on its risk conditions. In recovery and in emergency periods, many women suffer from direct loss of property and income. In an emergency situation, women have to dedicate many hours to satisfy necessities and extend their reproductive roles from the family to the community. They assume most of the basic social activities implemented by the government if the normal course of those activities were not to be interrupted by the disaster. On the other hand, new remunerated employment generated after the disaster (cleaning of rubbles, recovery work, rehabilitation of housings, and so on.) are, in their majority, carried out by men, while non remunerated tasks are in their majority carried out by women.

Damage assessment and financial recovery plans are gender blind. This absence has a negative impact on women's recovery capacity and favours the increase of gender inequality. Although women are directly affected, gender inequality affects indirectly the whole community. To reduce the gender inequality it is indispensable to reduce the social vulnerability against disasters.

The purpose of the paper is simply to make a quantification of damages related to the informal economy of women who lost their houses. Direct damages have been taken into consideration, but also other elements that have impact on the recovery capacity and could increase gender inequality:

- a) Loss of household goods directly linked to women income generation.
- b) Loss of household goods considered women's property.
- c) Loss of women's regular income during the emergency and relief period.
- d) Women's loans contracted to finance small scale business or house property

- e) Women's time dedicated to emergency and recovery tasks in detriment of the income generation..
- f) Women's participation in decision-making

In order to quantify loss in the household, it is necessary to understand that the household is not only a place for living but also a productive area for women, and plays a key role in the social and economy relations in the community. Although the report emphasizes quantitative aspects, it also considers the qualitative dimension. The micro character highlights the assessment of the socio-economic impact of the disasters.

The results of the investigation emphasize the necessity to bring out gender aspects in damage evaluations. The average damage (valorisation of building not included) for each Salvadorian women that has lost her household during the earthquakes is around 73% of the GDP per capita; if the non-remunerated work in the emergency and rehabilitation is also considered, the estimation is more than the GDP per capita.

In assessment evaluation it is necessary to consider the following aspects:

- Women's income generation (not only married women)
- Subsistence activities (home gardening and animal husbandry) and informal sector
- Household goods and time dedicated to relief and recovery tasks
- Decision-making
- Daily survival strategies

In a recovery proposal, it is necessary to have projects focused on especially vulnerable groups, in order to make the economic recuperation and the social recovery easier. Recovery is not a simple process of relocation; it is an opportunity to build a better society. In this way, actions to reduce vulnerability of social groups and increase gender equality must be included in the recovery proposals.

RRL - 031

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in Australian Journal of Emergency Management(Autumn 1998-99) pg 41-50

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RRL - 032

Title The Relevance of Considering a Gender Perspective in Damage Assessment and Recovery Strategies. A Case Study in El Salvador, Central America

Author(s) Arenas Ferriz, Angeles

Presented at United Nations Division for the Advancement of Women (DAW) International Strategy for Disaster Reduction (ISDR) Expert Group Meeting on "Environmental management and the mitigation of natural disasters: a gender perspective" 6-9 November 2001- Ankara, Turkey

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In a recovery proposal, it is necessary to have projects focused on especially vulnerable groups, in order to make the economic recuperation and the social recovery easier. Recovery is not a simple process of relocation; it is an opportunity to build a better society. In this way, actions to reduce vulnerability of social groups and increase gender equality must be included in the recovery proposals.

RRL - 033

Title Battered women in disaster: A case study of gendered vulnerability

Author(s) Enarson, Elaine
Disaster preparedness resource centre, University of British Columbia

Key themes Gender and Disasters

Summary

This paper highlights mainly the issue of violence against women and gender aspect. It focuses on domestic violence against women with an explanation that this is part of a larger complex of family violence including the abuse of elders and children. Author in this paper pointed towards the ignorance of the extent or nature of violence in the aftermath of disaster. She has addressed that there is a need for sustained national research initiative to investigate the incidence of violence of all kinds in wake of disaster.

RRL - 034

Title of article Addressing domestic violence in south Africa : Reflections on strategy and practice

Author(s) Vetten, Lisa
U N Division for the advancement of women

Key theme Gender and Disasters

Summary

This report is based on the gender specific issue , that is violence against women. The report draws conclusions on strategies and good practices in relation to reforming legislation addressing violence against women. The paper describes some of the key innovations of the domestic violence act(DVA), and examines which women have been most likely to benefit from the DVA. It concludes by using these reflections as a basis for recommendations around good practice in the area of law reform.

RRL - 035

Title Women Domestic Violence and post Traumatic stress disorder(PTSD)

Author(s) Hughes, Margaret J. ; Jones, Loring
Department of health and human services, School of social work, San Deigo

Key themes Gender and Disasters

Summary

This project report aims at highlighting in detail the main objectives of the project undertaken by center for California Studies, California State University. The reports deals in detail the aim of the project and provides with the summary of empirical generalization from the literature available on domestic violence and PTSD and action guideline for intervention

RRL - 036

Title The needs of women in disasters and emergencies

Author(s) Wiest, Raymond; Jane Mocellin and Thandiwe Motsisi
Prepared for the disaster management training program

Key themes Gender and Disasters

Summary

The present work has been conducted for the disaster management training program of the UNDP and office of the UN disaster relief coordinator, with an aim to provide a general overview of the problems experienced by women in disasters and emergencies. Other objectives are to address gender bias in disaster related research and the integration of the report findings with disaster related research in general. The report also offers a framework for the integration of findings into the larger research program on disaster and emergencies.

RRL - 037

Title Waves of violence- women in post tsunami Sri Lanka

Author(s) Rees , Susan, Pittaway, Eileen and Bartolomei, Linda
The Australasian Journal of Disaster and Trauma Studies. Vol.2005-2

Key theme Gender and Disasters

Summary

This paper describes a community based and developed program intended to support women and to reduce the incidence of sexual and gender based violence in post tsunami Srilanka. Preliminary data from the project is used to highlight some of the needs of women as well as the challenges in handling gender based violence and marginalization.

RRL - 038

Title Voicing Silence: Experience of women with disaster in Orissa

Author(s) Orrisa State Disaster Mitigation Authority, Booklet, Booklet, 2002. Published by OSDMA, Rajib Bhavan Orissa

Key themes Gender and Disasters

Summary

This booklet is an attempt by the OSDMA to highlight women situation in disasters and to promote their role in prevention and mitigation at community and state levels. It explores women's particular vulnerabilities to disaster at community and family level, as well as their marginalization in political power and governance systems. Case studies discuss women's role in floods and droughts, during and after disaster. It also explores the possibilities for change, providing specific examples of how mobilization and organization of women in disaster scenarios can bring positive results. The booklet has wide relevance to state and nongovernmental agencies, researchers and other concerned with disaster mitigation, development, gender mainstreaming.

RRL - 039

Title Just Die Quietly: Domestic Violence and Women's Vulnerability to HIV in Uganda

Human Rights Watch. Vol. 15, No. 15(A): 2000, Source: Online Human Rights Publications

Key themes Gender and Disasters

Abstract

This report explores what the author consider to be the shortcoming of Uganda's government to protect women from domestic violence and discrimination thereby increasing women's risk of contracting HIV. This report documents widespread rape and brutal attacks on women by their husbands in Uganda. It is stated that in Uganda domestic violence laws have not been enacted and spousal rape is not criminalized which further aggravate the situation.

RRL - 040

Title Droughts in Tharparkar

Author(s) Waheed, Arshad and Sheikh, Rehana
Case study paper, Colombo 5, Srilanka

Key themes Gender and Disasters

Summary

Conducted as part of gender research under the livelihood options for disaster risk reduction (LODRR) project, this case study focuses on the district of Tharparkar, and arid zone in Sindh province, Pakistan. The aim of the case study was to establish link between drought and socio-economic conditions from a gendered perspective and to identify options available to women to improve livelihoods. The specific case study information examines gendered impact of floods in relation to health and nutrition, literacy and education and economic and political participation.

RRL - 041

Title A methodological Approach to Gender analysis in natural disaster assessment: A Guide for the Caribbean

Author(s) Deare, Fredericka
Women and Development Unit, Santiago, Chile, 2000

Key themes Gender and Disasters

Abstract

This document was prepared by Fredericka Deare, consultant for the economic commission for Latin America and the Caribbean (ECLAC), Under the supervision of the women and development unit, which mainly focuses on the issue of gender in response to natural disaster in the Caribbean region. The document present tools and methodologies to conduct gender analysis including; analysis of the socio- economic affects of natural disasters and a methodological framework for gender analysis such as gender analysis of the impacts on health and social network response, gender aspects underlying the division of labor and allocation of resources and evaluation of pre-disaster gender relations.

RRL - 042

Title The impact of disaster on women

Handbook for estimating the socio- economic and environmental affect of disasters, 2001. (ECLAC).

Key theme Gender and Disasters

Summary

The handbook deals mainly with the differential impact of disasters on women. It reflects an understanding that men and women reveal vulnerabilities peculiar to their sex when confronted by disaster situations. In the face of this reality, the handbook points that it is essential to keep a clear gender focus to be able to support women facing a disaster and to reinforce their capacity to overcome these situations. Such awareness can reshape reconstructions tasks and projects.

RRL - 043

Title Gender and Natural Disasters

Author(s) Fact Sheet, Women, Health and Development Program. Pan- American Health Organization, U.S., 2007

Key theme Gender and Disasters

Summary

The fact sheet developed by Pan American Health organization has highlighted the gender focus to the analysis of disaster mitigation and response. The issue like women's vulnerabilities during and after the disaster process and the reason behind that has been the main focus. It has correlated the aspect of natural disaster and gender perspective and highlights some of the common reason why gender issue takes a backseat in natural disaster event.

RRL - 044

Title Addressing Gender in Conflict and Post-Conflict Situations in the Philippines

Author(s) Margallo, Sonia
In Social development papers :Conflict Prevention & Reconstruction Paper No. 20 / January 2005. Can be dowloaded from
[http://lnweb18.worldbank.org/ESSD/sdvext.nsf/67ByDocName/AddressingGenderinConflictandPost-ConflictSituationsinthePhilippines/\\$FILE/WP+20_Web.pdf](http://lnweb18.worldbank.org/ESSD/sdvext.nsf/67ByDocName/AddressingGenderinConflictandPost-ConflictSituationsinthePhilippines/$FILE/WP+20_Web.pdf)

Key theme Gender and Disasters

Summary

The paper is a review of how gender is addressed in various post-conflict situations in the Philippines with primary focus in Mindanao. The review identified three major categories of issues in post conflict Mindanao namely: (i) access to basic services and livelihoods, (ii) protection and security for internally displaced populations, and (iii) disarmament, demobilization and reintegration. The recommendations of the review revolve around these three categories of post conflict issues taking into consideration the unique needs and the roles of men and women.

RRL - 045

Title Gender, Disaster and Development :The necessity for integration

Author(s) Maureen Fordham

In 'Natural disasters and development in the globalizing world', pg 57-74; ed, Mark Pelling, Routledge publication, London and New York 200

Key themes Gender, Disaster and Development

Abstract

This paper interrogates the relationship between Gender, Disaster and development by a critical review of disaster research and practices in the Northern as well as Southern countries. It follows the trajectory of the three disciplines and the possibilities of their interconnections:

The disasters research field has traditionally been dominated by the Hazards research which has been criticised for its lack of attention to social theory. However, there has been some incremental changes following critiques of the hazards approach by Hewitt (1983) followed by Blackie et al 1994, Varley 1994, Comfort 1999; Cannon 1994 who then pioneered the social vulnerability perspective whose focus was on underlying socio-political, root causes of disaster processes.

The idea of Development Studies is a contested terrain - however, the development studies – has made a useful addition of gendered development theory and practice. This work has highlighted the vulnerability and capacity of different social groups, especially women and more participatory approaches to decisionmaking and policy implementation. However, if as suggested by Anderson and Morrow 1998, the use of vulnerability and capacity analysis in disaster contexts constituted a important conceptual advance for the disaster studies.

The discourse on gender has evolved over time – from inclusion of women to focus on their empowerment. And even into the 1990s many books on hazards and disasters failed to recognise the analytical categories of gender, women and feminism. An area of interest in the development arena – violence against women emerged at a late and on a small scale in certain researches in disasters – (Larabee, 2000; Ralph 1999; Fothergill 1999; Wilson et al 1998; Enarson 1997).

The author concludes by suggesting that calls for integration are easy to make, but are difficult to achieve on the ground. Each of the above concepts are complex and its meanings context dependent. However the building of the sustainable, disaster resistant communities in both industrialized North and industrialising South, albeit complex needs to be undertaken. While institutional fragmentation, competition and misunderstanding are a major threat in both academic and practitioners field, the chief danger is that rhetoric of integration may ask the largely technocratic concern – the failure to grasp the root causes of vulnerability at social and political level. In that sense, the integration needs to happen at different levels – the academic, policy, practitioner as well as political levels.

Age and Disasters

RRL - 046

Title Placing age differences in the context of the Orissa supercyclone : Who experiences psychological distress?

Author(s) Suar, Damodar, Mishra, Sasmita and Khuntia, Rooplekha
Blackwell Publishing Ltd, with the Asian Association of social Psychology and the Japanese Group Dynamics Association 2007 in Asian Journal of Social Psychology (2007), 10, 117-122

Key themes Age and Disasters
NB: Also filed under Key theme Mental Health and Disaster

Abstract

The present study examines the influence of age on anxiety, depression, and post-traumatic stress of the supercyclone-affected people in Orissa. When the effects of exposure, caste, and gender were controlled, linear effects of age on psychological distress were found to be significant, whereas quadratic effects of age on psychological distress were non-significant. With increasing age, survivors experienced more anxiety, depression and post-traumatic stress. The elderly people were the most vulnerable.

Research Methodology

The data were collected in structured interview sessions 3 months after the disaster struck. Of the 130 interviewees, 65 persons were severely exposed and the rest were mildly exposed to the supercyclone.

The study hypothesized that if psychological distress increases with age and elderly people are the worst sufferers, the relationship between age and distress will be directly linear. If younger people experience distress, middle-aged people experience more than them, and the older people experience less distress than the middle-aged, the relationship between age and distress will resemble an inverted 'U' shape curve.

Exposure and resource perspective

This perspective explains more vulnerability of older people to trauma than younger ones. The coping capacity of older people decreases because of declining health and lower socioeconomic resources. (Friedsam, 1961; Phifer, 1990). They have lesser likelihood of receiving warning, greater reluctance to evacuate, higher resistance to alter accustomed patterns of life, and a severe sense of deprivation resulting from losses. They are more likely to experience disaster-related injuries (Bolin & Klenow, 1982–1983), substantial economic losses (Bell, Kara, & Batterson, 1978), and evaluate their situation as worse compared to those around them (Bolin & Klenow, 1982–1983). They are also less likely to use post-disaster services of counselling and social support

Measures used

With the collection of demographic and socioeconomic information on location, age, sex, education, caste, and loss of life and property, three inventories/scales measured anxiety, depression (Depression Inventory; Beck, 1967), and PTSD (DSM-IV, 1994). Except for the diagnostic criteria involved in PTSD, items in the anxiety and depression inventories were reduced. To lessen the interview time, items that were found common in the judgment of three psychologists were retained.

Finding(s)

The mean score from the aggregate data indicated that the younger adults experienced less, middle-aged people experienced more, and the older people experienced still more anxiety, depression, and PTSD (Table 1). In the table, the cluster B denotes intrusion, the cluster C denotes avoidance/numbing and cluster D includes arousal symptoms – all which continued or persisted for more than one month.

Table 1 Descriptive statistics on psychological distress in different age groups

Age group	N	M and SD	Anxiety	Depression	PTSD cluster			PTSD (B + C + D)
					B	C	D	
18–35	71	M	18.65	19.07	1.08	1.86	1.76	4.70
		SD	4.72	3.40	0.82	1.50	1.15	3.25
36–55	46	M	19.78	19.67	1.11	2.12	1.92	5.17
		SD	4.51	2.97	0.82	1.56	1.16	3.29
56–80	12	M	20.28	20.28	1.31	2.66	2.22	6.22
		SD	4.89	3.40	0.75	1.38	0.93	2.68
Total	130	M	19.22	19.42	1.12	2.04	1.87	5.02
		SD	4.67	3.26	0.81	1.52	1.14	3.23

PTSD, post-traumatic stress disorder.

The first step of regression analysis revealed that severe exposure to the supercyclone consistently increased anxiety, depression, and PTSD. Only females experienced more anxiety than males. When the confounding effects of exposure, caste status, and gender were controlled in the second step of regression analysis, elderly people were found to be more vulnerable to anxiety, depression, and PTSD (Table 2). All beta coefficients were positive and significant for linear effects of age on distress. In the third step, none of the beta coefficients were significant for quadratic effects of age on distress. Both approaches specifying an inverted 'U' shape curve were refuted. Hence, the older the age of disaster victims, the greater was their psychological distress.

A closer inspection of the results showed that excluding the effects of control variables, the linear term of age explained an additional 3% variance each of anxiety and depression, and 2% variance of PTSD. All the explained additional variances were found to be significant. Contrarily, the quadratic terms for age did not explain any additional variance of distress.

Table 2 Regression analysis predicting the effects of age on psychological distress

Dependent variable	Step	Independent variable	B	SEB	β	R ²	F ^a	R ² change	ΔF
Anxiety	Step 1	Exposure	2.32	0.84	0.25**	0.11	5.07**		
		Caste	-0.95	0.85	-0.10				
		Gender	1.91	0.82	0.20 ⁺				
	Step 2	Age	0.06	0.03	0.19 ⁺	0.14	5.14***	0.03	4.87 ⁺
	Step 3	Age ²	0.00	0.00	0.09	0.14	4.09***	0.00	0.05
Depression	Step 1	Exposure	1.22	0.60	0.19 ⁺	0.08	3.41 ⁺		
		Caste	-1.00	0.61	-0.15				
		Gender	0.36	0.58	0.08				
	Step 2	Age	0.04	0.02	0.18 ⁺	0.11	3.65**	0.03	4.10 ⁺
	Step 3	Age ²	0.01	0.01	0.07	0.11	2.50 ⁺	0.00	0.03
Total no. PTSD symptoms	Step 1	Exposure	4.87	0.39	0.76***	0.60	62.86***		
		Caste	-0.30	0.39	-0.04				
		Gender	0.06	0.38	0.01				
	Step 2	Age	0.03	0.01	0.13 ⁺	0.62	49.91***	0.02	5.03 ⁺
	Step 3	Age ²	-0.01	0.00	-0.41	0.62	40.68***	0.00	2.06
	Step 3	Midage ²	0.01	0.00	0.10	0.62	40.68***	0.00	2.06

^ap < 0.05; **p < 0.01; ***p < 0.001.

⁺F in step 1 is against 3, 126 d.f., in step 2 against 4, 125 d.f., and in step 3 against 5, 124 d.f.

B, beta; β , standardized beta; PTSD, post-traumatic stress disorder; SEB, standard error of beta.

Implications of the findings for intervention :

Age plays a role in recovery. Older the age of the victims, greater is their psychological distress. In the culture of India, collectivistic values of interdependence, social support, cooperation and interpersonal sensitivity coexist with power distance. Senior members are respected and they informally represent the family, take care of others and provide advice for the family and community prosperity.

The Supercyclone however depleted the personal (self esteem, mastery, well being), social, economic and work resources that survivors had built and conserved over time. These resources sustained the living.

Elderly people being custodian of family and community had a greater sense of resource loss with little hope to regain the resources at the end of their lives inducing more distress. Further, elderly in this culture live with a high uncertainty avoidance and low tolerance for ambiguity – and the sudden crisis was cognitively painful.

Interventions such as preserving resources such as “sense of mastery” and self esteem would help the old people regain their status.

RRL - 047

Title Protecting Children in Post-Disaster Planning

Author(s) Toms, Carol and MacLeod, Heather
Published by World Vision International; 2005

Key themes Age and Disasters

Summary

The paper examines why children are vulnerable in disaster and how we can protect them from aftermaths of disaster. It examines programmes started in the wake of disaster to protect children. It suggests ways for allocating safe and child friendly spaces for children, explaining disaster to them and their participation in planning of site and its design.

Race, Class and Disasters

RRL - 048

Title Race, Class, and the Katrina Crisis

Author(s) Marable, Manning
Published in WorkingUSA: The Journal of Labor and Society , Volume 9 , June 2006 pp. 155–160, Immanuel Ness and Blackwell publishing Inc.

Key themes Race and Class

Abstract

The recent human tragedy in New Orleans created by Hurricane Katrina has generated an interesting and important debate about the underlying causes of black suffering and oppression. In its most simple form, the question being debated is whether race and racism were most responsible for the Katrina crisis that disrupted the lives of hundreds of thousands of African Americans, or whether class and poverty were relatively more significant in explaining this human catastrophe.

Research Methodology

Paper based on Media and other reports

Key Issues Raised

1) Corporate Media and Racism

The conservative media such as Fox news led the news – after the disaster with stereotypes of African Americans by tales of blacks being looters and rapists. Racist subtext was that New Orleans blacks were not worthy of saving.

2) Racial inequality and its impact on disaster

Most of the people affected in New Orleans were poor. years. In terms of poverty, New Orleans—a city that was nearly 70 percent African American—had 30 percent of its residents living below the federal poverty line. In the flood-devastated Ninth Ward, with a 98-percent black population, the poverty rate exceeded 40 percent. About 40 percent of working-age adults were unemployed. Thousands were living in dilapidated, substandard housing even before the hurricane struck. Data from the 2000 Census for New Orleans confirmed that roughly 30 percent of New Orleans households lacked automobiles. Logistically, it would have been impossible for most low-income, unemployed, and elderly African Americans to even leave the city before the disaster struck.

3) Debate on Race and Class and its impact on Disaster

The authors suggests that several examples point out that the poor Blacks in New Orleans had to face discrimination due to race rather than class factor. One example of this was the comprehensive study done by the National Fair Housing Alliance, a coalition of 220 civil rights and nonprofit fair housing organizations in 2005. The study suggested that there was unequal racial treatment of black Vs white Katrina victims in their attempt to secure temporary housing after the disaster. This study conducted telephone tests with black and white home seekers requesting information about unit availability, rents, and other conditions of housing leasing. In 66 percent of the tests, whites were distinctly favored over African Americans.

RRL - 049

Title Ethnic and Racial Inequalities in Hurricane Damage and Insurance Settlements

Author(s) Walter Gillis Peacock and Chris Girard
In 'Hurricane Andrew' ed by Walter Peacock; Betty Morrow and Hugh Gladwin;
Routledge publication, London and New York; 1997 (pg 171-190)

Key themes Race, Class, Ethnicity and Disaster Response

Abstract

Issues and Findings

The literature on disaster recovery in the United States indicates that insurance is one of the most important determinants of recovery in US (Bolin 1982; Drabek and Key 1983; Bolin and Bolton 1983, 1986). However the assumption that market will rebuild housing may be overlooking important failures in market mechanisms. This article looks into how racial and ethnic pockets of vulnerability to natural disasters are potentially more susceptible to damage as well as experience most recovery obstacles It looks into the recovery issues in the area impacted by Hurricane which has a good representation of Black, Hispanic and Anglo homeowners.

Research Methodology

Based on Hurricane Andrew Survey where respondents were asked if the homes were damaged and if so, whether the damage was slight, moderate or major. Respondents were further asked on the details of the damage – for parts of homes such as windows or full home etc. Such comparison would not have been possible had the researchers asked for dollar damage of amounts – which are a function of overall value of property.

The sample was divided into three racial/ethnic categories – Anglos, Hispanics and Blacks.

Finding(s)

The results show that while controlling for other influences, blacks and Hispanics suffered more damage than the Anglos. Further the levels of damage reported by Cuban-Hispanic households are higher. Thus the households location relative to the storm's path was among the most important factor determining damage. Further the type of residence was also critical – the residences located in apartments, duplexes reported lower levels of damage than single family dwellings; whereas mobile homes fared the worst. Thus these results were consistent with general expectations from the literature that the disadvantaged groups are more vulnerable to hurricane damage. However, in Dade, neither the Cubans nor the Hispanic are minorities – although in US as a whole they could be one. Thus further analysis also suggested that the residential segregation effect had an impact in the sense that black hh had more

damage compared to the Anglo households, whereas this factor was not operating with respect to the Cuban or other Hispanic households..

Insurance and Recovery Processes:

In US federal disaster policies implicitly assumes that private insurance will be a major mechanism for recovery because the govt prog such as low interest small business administration loans come into play only if the household is under or not insured.

Nhbds in South Dade after hurricane Andrew suggested that there was some sort of market segregation reflected in the choices of the insurance companies made by the blacks on one hand and Anglos, Cubans on the other – who were the dominant groups. Blacks had insured from smaller and lesser known firms who failed after the storm.

Further survey on insurance coverage and payouts suggested:

Few Anglo or Cuban homeowners (-2.7% and 4.1%) respectively were without home insurance compared to 9.3% of non Cuban Hispanics and 8.7% of black home owners. Blacks were four times likely to say that they were without an insurance as against Anglos.

Among those who had filed a claim and received settlements in Dade county – 16% of Anglos said that the insurance company was not offering enough to cover their rebuilding expenses as compared to the more than double that percentage for the non Cuban Hispanics (41%) and Blacks (38%). In comparison, the Cuban % is in line with the Anglos (24.7%).

Further investigations showed that income and damage levels did not really account for the substantial or ethnic differentials. Rather analysis showed that percentage of homeowners indicating that their insurance settlement was not enough were three times greater (25.2% versus 8.5%) when their insurers were not among the top three companies. Second among those home owners insured not insured by the top three companies, slightly more than half of Black home owners said that they did not receive sufficient settlement; as compared to about one-quarter of Hispanic and one-eighth of the Anglo homeowners. On the other hand there was no statistically significant difference among racial and ethnic groups for homeowners insured by top three companies even though black owners were twice as likely to indicate that they had received an inadequate insurance settlement. In this case, there was not much statistical significance because the pay out was quite high for the top three companies regardless of the race and 90% of all homeowners and 85% of black homeowners said that they received enough money to cover all the repairs.

The other statistically significant relations found were:

Over 60% of the Hispanics and Anglos were insured by a top three company; whereas only 49% of the blacks were. These findings are suggestive that the insurance companies could be refusing policies to the residents of black neighbourhood.

Conclusions:

The research shows that social urban landscape has pockets of vulnerability to disaster – and

are less resilient in recovery process. Vulnerability is created by racial segregation with possible effects of access to insurance policies.

This research also challenges that housing will take care of itself in the recovery process. The mechanism of market based rebuilding process through insurance failed to provide sufficient funds for recovery of 15% of insured respondents in the survey. Inequities stem from the access issues to blacks in the segregated areas. Black households were three times more likely not to have homeowners insurance as white households. Thus existing inequalities exacerbated further inequalities inherent in the market recovery process itself. Further, the Hispanics and in particular Cuban Hispanics whilst a minority at the national level did not experience difficulties with insurance or settlements when compared with Anglos. One of the most important determinants of getting a sufficient settlement was whether they were insured by the top insuring firms.

There were also convergence of obstacles in the lack of adequate protection against – natural as well as social disasters. Thus black neighbourhoods were more vulnerable – with heavy damage and insufficient insurance settlement. The research suggests that a series of obstacles built into the urban social structures leads to further marginalisation of the marginalised

The Research therefore calls for policy recommendations which include: public awareness and information about insurance policies and programmes; minority agent development programmes to encourage placement of insurance agencies in minority communities; community insurance act legislation; and Anti red lining policies which provide an objective evaluation of the risk assumptions to enable access for minorities to insurance; and disclosure reports on the ethnic and racial characteristics of the agents.

RRL - 050

Title Ethnicity and Segregation : Post hurricane relocation

Author(s) Chris Girard and Walter Peacock

In 'Hurricane Andrew' ed by Walter Peacock; Betty Morrow and Hugh Gladwin;
Routledge publication, London and New York; 1997 (pg 191-205)

Key themes Race, Ethnicity and Disaster Response

Research Question(s)

Why did people relocate or stay? What factors led to the household relocation – temporary or permanent? What were the barriers to leaving after Hurricane Andrew?

Research Methodology

Surveys made at different intervals after hurricane Andrew that include respondents from South Dade to understand better the ethnic relocation patterns. At each interval, respondents were asked about relocation after the hurricane.

Summary of Issues and findings

Anglo households in general were most likely to leave their homes. Blacks were the least to leave and Hispanics showed a intermediate tendency. The findings also suggests that blacks were less likely to relocate after hurricane not only because of economic constraints, but because of barriers created by residential segregation.

Implications of this results:

The findings reinforce the view that residential segregation may be considered a cause and not simply a consequence of racial disparities in opportunity. Several proponents of this view suggests that racial segregation multiplies the effects of economic deprivation –poverty, crime, family dissolution, welfare dependency and so on focusing on the black, under neighbourhood. In parallel to this effect of segregation, in disasters, it appear to limit the movement out of disaster areas and stifle recovery for the blacks.

Racial inequality must be considered when assessing the urban landscape's vulnerability to natural disaster. There also needs to be more focus on urban ethnic ecology and residential segregation. Segregated nhbd are a part of urban landscapes that are not well integrated with the mainstream institutions critical for jobs, political power, financing and insurance. Disasters simply reinforce the effects of segregation and marginalisation and hence Blacks face more barriers to recovery.

The policy implications for this is that issues related to maintenance and creation of segregation must be examined and addressed long before disaster strikes because they have an impact on the recovery of the impacted communities. Further vulnerability mapping which takes physical risks further by overlying them with social factors that produce vulnerability would be a important step in ensuring disaster mitigation.

RRL- 051

Title Hurricane Katrina: prior trauma, poverty and health among Vietnamese-American survivors

Author(s) A.C.-C. Chen, V.M. Keith, K.J. Leong, C. Airriess

International Nursing Review, 2007 ISN 57

NJ 07030-5774, USA

Key theme(s) Ethnicity and disaster, poverty

NB: Also filed under Key theme: Mental Health and Disaster

Abstract

Background: The flooding of New Orleans after Hurricane Katrina revealed the disproportionate vulnerability of ethnic minority communities for emergency preparedness, disaster relief and health. Nurses need to analyse Katrina's health consequences for the most vulnerable segments of our society.

Aim: To examine factors contributing to differential health outcomes among the New Orleans Vietnamese community in response to Katrina.

Methods: A sample of 113 adult Vietnamese Katrina survivors from New Orleans was recruited. A mixed-method approach, including survey and focus groups, was used to collect data. Survey questions were modified from standardized instruments to evaluate survivors' health status and factors contributing to health outcomes. Multivariate and content analysis were used to investigate effects of prior trauma, financial strain, social support and acculturation level in predicting survivors' health outcomes.

Results: Findings suggested financial strain was the strongest risk factor for Vietnamese survivors' post-traumatic stress disorder (PTSD) symptoms, and physical and mental health post-disaster; while social support was a strong protective factor for health. Survivors who perceived higher impact from previous traumatic experiences had poorer physical health, but not PTSD symptoms or poor mental health after controlling for financial strain and social support, suggesting complex relationships among these measures in predicting PTSD symptoms and health. Less-acculturated individuals also reported higher levels of PTSD symptoms and poorer physical health.

Conclusions: Catastrophic events like Katrina can result in disproportionate risk of negative health outcomes among vulnerable populations. Nurses should take into account prior trauma, financial strain, social support network and acculturation level, to adequately address survivors' needs.

RRL - 052

Title And the Poor get Poorer : A neglected Black Community

Author(s) Nicole Dash, Walter Gillis Peacock, and Betty Hearn Morrow
In 'Hurricane Andrew' ed by Walter Peacock; Betty Morrow and Hugh Gladwin;
Routledge publication, London and New York; 1997 (pg 206-225)

Key themes Ethnicity and Class in Disaster Response

Context

The focus of this paper is on small predominantly black incorporated community – in Florida city which is embedded peripherally within the complex metropolitan Miami. The Florida city was one of the places where the impacts of the hurricane was felt very strongly. The documentation in this paper suggests that in comparison to its immediate neighbour of Homestead, Florida city was unequally impacted by the hurricane, its recovery progress sluggish and its future more tenuous.

Florida city is in Dade county and is also one of the smallest with around 6000 persons in 2.5 sq miles. It is bordered by city of homestead to the north. As per the 1990 census, florida city as 61% black and another 37% are Hispanics, mostly Mexicans and central Americans drawn to the area for agricultural work. Further florida's economy remain predominantly agriculture– and accounted for 60% of the city's sales volume.

Homestead has five times the population of florida city with 9317 households and averaged 2.83 persons as against florida city's 3.17. The median income of the homesteads was approx 20% higher than the florida city. (pg 209) Homestead is one of the most Anglo communities in Dade county – over 42% of population classified as non Hispanic, non black Hispanics made up 35% - including many Cubans and Mexicans. This study compares the impact on housing, economic and populations.

Finding(s)

Impact on housing:

A dramatic decrease of 78% reduction of residential property value was found after the storm in Florida city, and whilst the total loss of homestead was twice that of Florida city, this decrease was smaller – 60% of its earlier aggregate value.

Impact on population:

Florida city lost 33 percent of its population, while homestead – 31%. In both cases, Anglos relocated out of the area then did Blacks. The black population in Florida increased by more than 10% whilst its Anglo population declined by 5%. In homestead, 'blacks gained 6.5% while Anglos lost 8.6%. The net impact was that Florida city became an almost exclusively black community, while homestead was left with relatively equal population of each group – with Anglos losing their numerical majority

Economic effects:

In terms of jobs, Florida city lost about 87% of its employees, whilst homestead gained 10% of its employee base.

The analysis of these disproportionate losses show that hurricane Andrew destroyed Florida's social infrastructure – and the city's leadership was decimated and there was no clear plan for recovery. Cities with pre-existing plans were able to recover more. The other key factor was Florida's high dependency upon larger socio-political contexts – and when plans were finally approved – the wait for funds was long. Thus without adequate administrative overhead, hiring, training etc, the retention of personnel and recovery became difficult. Also what increased this was the lack of experience of the community leadership in disasters as well as the decimation of the leadership as one of the fallouts of the disasters.

In terms of household assistance – in access of 59% of Florida city's hh lacked insurance, as compared to 47% of the Homesteads. Further only 5.5% of Florida's homeowners qualified for SBA loans meant for restarting of small businesses, as against 20% from Homesteads. Qualitative interviews also showed that lesser number of people from Florida actually applied – as they may have believed that system does not work for them – that is they had no expectation from the system.

Thus 'Florida after disaster suffered high levels of damage, had limited access to insurance and received lower levels of public aid making recovery much slower both at the community and the household level).

The policy suggestion from this paper is that whilst as argued by Klintberg (1979), Rubin (1985) structure of the govt is a critical factor in recovery, we need to look beyond the internal factors to the larger ecological network in which the recovery occurs. Within the larger political and social context of Dade county, this community yielded miniscule power and therefore was not able to compete successfully for the resources necessary for recovery

RRL - 053

Title Coping in a Temporary way : The tent cities

Author(s) K A Yelvington

In 'Hurricane Andrew' ed by Walter Peacock; Betty Morrow and Hugh Gladwin;
Routledge publication, London and New York; 1997 (pg 92-115)

Key themes Class and Ethnicity in disaster response

Abstract

This is an ethnographic account of the life in tent cities built after the hurricane Andrew which had hit South Florida on August 1992. The tent cities were built immediately after the hurricane had struck to house people affected by Disaster. Initially the tent cities were looked after by American Red Cross which were in charge of checking the victims. They had adopted a flexible policy – so people were taken in without having to prove fully that they were living in a dwelling destroyed by the hurricane. The feeling was that all those who wanted to stay in tent – which had harsh conditions are in dire need for a housing. The affected populations was a mixed ethnic groups – belonging to latinos (50-60%) – mainly Mexicans and Mexican Americans; Central Americans and Puerto Ricans and a few Cuban or Cuban-Americans. Blacks (30% comprising of African Americans, Haitians, Haitian Americans and other Afro- West Indian. The remaining 20% were non Hispanic whites called Anglos.

The account suggests that initially there was an ethos of cooperation and sharing across different ethnic groups – however the divisions started when the days of staying turned from days to weeks to months. The considerable ethnic diversity in the tent cities – led general instances of frustration and conflict into issue of ethnicity.

While Red Cross seemed to allocate the indiv and families multifamily tents without regard to ethnicity, a pattern of segregation was found in the Campbell drive tent city residents.

Later on when FEMA took over from Red Cross, it (FEMA) became strict with the proof of identification in entry to the tent cities. Further, the people admitted to the city needed to prove that they were entitled for FEMA aid. And under FEMA regulations, reimbursement checks were made out to the head of the household and a household meant a physical unit or dwelling. When two or more families shared a single house or apartment – and yet owned furniture individually, as was case with Homestead's migrant workers, only one check was made. Giving aid to the household head was the biggest obstacle – as suggested by the advocacy groups Households which shared three to four families - FEMA either denied the entire household money or awarded assistance to only one family. Thus given the complex ethnic, cultural, and class make up of South Dade – the affected county, the policies did not match the realities of victims.

When FEMA closed the tent cities, while media suggested all who stayed in tent cities, received trailers from FEMA – this was not found to be true. It was estimated that 2000 people were still living in their cars or in makeshift camps in South Dade after the tent cities were closed and several people after the closure had to live in damaged units without electricity and

telephone services, some became homeless.

The study finally suggests that what the research brings out is not just cultural plurality but also serious inequality of the affected region. Further the role of the State, disaster relief agencies and their policies also impacted the outcome. The policies of FEMA and their officials were reflective of the 'misguided' notion of community. Further they also idealised the 'North American Middle class model of household and family –which did not reflect the reality of those people who were on cultural and economic periphery of American society. While the tent cities provided temporary relief to the poor and the powerless, their policies of admitting those to the tent cities often increased inequality.

In their recommendations, author suggests that disaster response need to be more aware about the ethnic, and special needs of specific populations – and should not model their household recovery on the middle class model of nuclear family.

RRL - 054

Title Moving Beyond "Special Needs" : A function-based framework for Emergency Management and Planning

Author(s) June Isaacson Kailes and Alexandra Enders
Journal of Disability policy studies Vol 17/ No 4/2007, pp 230-237

Key themes Disability/Diversity and Disaster

Abstract

Disaster preparation and emergency response processes, procedures, and systems can be made more effective for people with disabilities, as well as for the population as a whole. An essential element of building appropriate levels of capacity, specific planning, and response success is to move beyond use of the "special needs" category, to better identify and address the diverse needs of those included under this label. This article provides disability demographics and describes special needs populations to lay the foundation for this change. It suggests the development of a more accurate and flexible planning and response framework based on essential, sometimes overlapping, functional needs: communication, medical needs, maintaining functional independence, supervision, and transportation. It also proposes new approaches to functional support, leadership, service delivery, and training.

Concepts used : Notions of Social groups and its usefulness in disaster preparation and response.

Use of the People with special needs and its limitations

Combining groups too broadly leads to problems in planning and response. The label special needs incorporates people whose functional needs include assistance with communication,

medical needs, maintaining functional independence, supervision and transportation.

Used widely in emergency management literature, the special needs groups include people with disabilities, those with serious mental illness, minority groups, non English speakers, children, elderly persons. Other lists can add single working parents, people with special dietary needs, pregnant women, prisoners, homeless and others. These groups represent a large and variety of concerns and challenges in disaster response and planning.

As per the US demographic trends, if we use the above categories, more than 50% of the population are those with special needs rendering the category meaningless. This greatly weakens the chances for specific needs and providing effective comprehensive response.

Special also implies difference and isolation. Among disability advocates, special is the label often used for segregated programmes.

Use of category People with disabilities and its limitations

As a group, this is a very heterogenous group – and it is important to understand a range of function-based needs within the population.. There are several -67 places where disability is defined in federal US laws – each identifying criterias for eligibility – for eg social security or disability insurance. Some are used to protect civil rights and others are narrow – as they are to do with eligibility criteria and not always useful for immediate disaster response. This criteria may be useful for the long term rehabilitation support, but immediately, after the event, there is a need for function based needs and functional support to address these needs.

Key Finding(s) and Suggestions

1) Identifying functional limitations than impairments

Identifying impairments (Impairments as “ problem of body function or structure such as significant deviation or loss” , WHO 2001) or diagnosis does not tell a person how to operationalise the need for functional support – for eg, skin impairment may not have functional limitations. Instead a focus on functional support needs may help individuals survive in a better way in emergency situations. By adopting a broad function based approach, no one is left behind.

2) Functional based framework for emergency management and planning:

It is proposed that a flexible framework built on five essential function based needs – communication, medical, maintaining functional independence, supervision, and transportation be used – this would reduce negative consequences and improve planning, preparedness, recovery activities at all levels.

3) Disaster preparedness and people with functional dependence:

Typically disaster preparedness and emergency response system are designed for people for whom escape or rescue involves running, walking driving, and quickly responding to directions. Emergency management – even well intentioned ones do not address complex functional

dependence. A US National wide review of govt response showed that govt agencies do not adequately involve civic organizations, faith based organizations, special needs advocacy groups, private sector, nhbd associations, and educational institutions in planning proceses. The report recommended such involvement.

4) Going beyond special needs to issues of Diversity

A better and appropriate level of capacity, special planning and response can be done if the planning framework moves beyond the use of "special needs" to address the "diverse needs" of those included in this category.

RRL - 055

Title Health, Disability and Donor Response

Author(s) Presented by Santosh Rath, Shanta Memorial Rehabilitation Centre, India, 30th Oct 2006; presentation made at forum 10, Cairo Egypt 29th Oct – 2nd Nov 2006

Key themes Disability and Disasters

Summary

Following the Draft Convention and of the Rights of persons with disabilities by UN ad hoc committee on Disability on 25th August 2006, article 11 proposes – State parties shall take, in accordance with their obligations under international law, including international humanitarian law and international human rights necessary measures to ensure protection and safety of persons with disabilities in situations of risk, including situations of armed conflict, humanitarian emergencies and the occurrences of natural disasters'. Now Disabled persons are being included along with other vulnerable groups in disaster contexts as persons whose specific vulnerabilities affect their ability to cope and survive in a disaster.

This paper aims to identify the degree to which disability was included in the disaster response, the finances available and whether these policies were implemented. Donor funding, highlighted equity and pro-poor, but left many vulnerable groups outside their work.

The data for this paper is mostly from secondary sources and with some visits to the donor organisations. The main difficulty faced was that inspite of letters to donor organisations in India requesting data on disability response in disaster, there was no response.

Disasters, Disabled, health and Response:

Studies following recent disasters – tsunami, Katrina and Kashmir earthquake suggest that disability was not taken into account in disaster response. Further mortality during disaster was high in Tsunami of disabled people , from Andaman and Nicobar, Indonesia and Thailand. The root cause was lack of access to shelters for the disabled and any absence of plan for them.

Disasters also lead to injuries – however very little was done during recovery to enable medical care for the disabled in tsunami.

INGOs, NGOs, Disability and inclusion:

The response of the door agencies has been very limited and inclusion as an agenda has not been taken up by most in practice. Disabled people are lumped as vulnerable people and not as right holders by most. Latrines and Shelters in India and Srilanka constructed after the Tsunami were without ramps. Working with disability means mostly working with specialist agencies such as 'Handicap international'.

While Novib-Oxfam is a large donor, it was communicated that no finances were earmarked for disabled. Concern had the same answer, and the only donor which had kept funds earmarked was Dan Church Aid of Denmark working in India.

The authors suggests that although high amounts of funds were availability in Tsunami, it was a missed opportunity to put inclusion in practices of reconstruction.

The author gives following suggestions for policy and programme implementation:

One of the problems is that few donors go to disabled peoples's organisation after disaster. Second problem is that policies and programmes fail to recognise differences – and their different needs. The third problem is that of double standards – of inclusion and exclusion of some groups of people. Therefore the need is to :

- Promote inclusive policies and programmes by involving people with disability.
- create collaboration between stakeholders to actively consider disability issues
- promote standards to ensure inclusion
- ensure that disability organisations are actively involved in the disaster relief organisations and overall governance response.

Further structural change are needed by engaging States in devising laws to transform practices and traditions which discriminate against the people with disability – that match international standards.

Donors also need to to ensure funding and give importance to disability inclusive response with good monitoring practices of implementation.

RRL - 056

Title Traditional Societies in the face of natural hazards: The 1991 Mt Pinatubo Eruption and the Aetas of the Philippines

Author(s) Jean-Christophe Gaillard
In International Journal of Mass Emergencies and Disasters, March 2006, Vol 24, No 1, pp 5-43

Key themes Ethnicity and Resilience

Research Question

Understanding the capacity of the response of traditional societies in the face of natural hazard through the lens of concept of resilience.

Research Methodology

Field work conducted amongst the Aetas, affected by the 1991 eruption of Mt Pinatubo. The field work included interviews with key informants covering community leaders and other women and men members. Other interviews included govt officials and different agencies.

Abstract / Summary

This article looks in how traditional groups have responded to the disaster through the lenses of resilience. From the case study of the 1991 Mt Pinatubo eruption in Philippines, and its impact on the Aeta communities it suggests that capacity of resilience of traditional societies and the concurrent degree of cultural change is due to four factors in main : the nature of the hazard, pre-disaster sociocultural context, geographical setting and the rehabilitation policy of the govt authorities.

Concepts/conceptual framework implicit in the study

The dominant framework regards traditional environment dependent societies as fragile and unable to cope on their own with the large-scale fast-onset natural hazards. Such arguments emanate from the top down technocratic and western logic. The second theoretical framework sees traditional societies as capable of recovering on their own from the impact of the natural phenomenon. The third approach is regarding responses of the traditional societies in the face of natural hazards and defends an intermediate viewpoint. It argues that the occurrences of natural hazards rather act as catalysts for ongoing cultural changes among traditional societies pressured by the industrial world. The author suggests that all the above approaches are inadequate as they do not address cultural change as a way of coping with the havoc wrought by the disaster. This paper, aims to tackle the capacities of the response of traditional society such as Aetas in the face of natural hazard through the lens of concept of resilience.

Finding(s)

While the 1991 Mt Pinatubo eruption brought undeniable differentiated changes in the Aeta society the fundamentals of the Aeta social system has survived the consequences of the

disasters. While Aetas, have changed their foodhabits, clothing, religious beliefs, the Aetas households still co-exploit the swiddens, share food, and journey together to public markets for economic transactions. Thus Aeta social system has not disappeared due to disaster but has adapted to new environmental, social, economic and political environment while maintaining the stable core. It is this factor of maintaining their social fabric or accepting marginal or larger changes in order to survive that makes the Aetas resilient.

RRL - 057

Title The Hakka Spirit as a predictor of Resilience

Author(s) Li-Ju Jang and Walter Lamendola

In Disaster Resilience : An integrated Approach (ed) by Douglas Paton and David Johnston, pp 174-189; Charles Thomas Publisher, 2006; Illinois USA

Key themes Ethnicity and Resilience

Research Methodology

Qualitative study using participant observation of 18 years or older survivors and service providers as well as volunteers in the relief and reconstruction projects in Tung Shih. Further data was collected through indepth interviews, and observations. A total of 28 individuals which included 16 survivors, 6 service providers and 6 volunteers were interviewed. Most of them were female, hakka believers and married. Of the 28, 25 had experienced loss of loved ones and property damages.

Context and Finding(s)

The Taiwanese township of Tung Shih was exposed to an continuous natural disasters – include the major earthquake in 1999 which is refered by Taiwanese people as 921 earthquake – on the magnitude of 7.6 Richter scale. The earthquake flattened buildings on the road, ruptured water supplies and a loss of fishery, forest and livestock and several factories. Apart bridges, highways and schools were seriously damaged. The earthquake led to 2,423 deaths, 11305 injuries and made more than 100,000 people homeless. At the township level, Tung Shih suffered highest death toll with 358 (29.98%)

Most of the participants regardless of whether they were survivors or the service providers reported that ‘Hakka Spirit’ played a key role in the resilience of Tunh Shih residents. ‘Hakka’ were carpenters who had originally migrated from China several hundred years ago. The story goes that they were not welcomed by the natives – and that they were attacked then. However they continued with perseverance to stay and work in the place – and also prayed and built the temple for their god Lu Ban. Slowly the attacks stopped and Hakka were able to live peacefully in Tunh Shih. The Hakka spirit refers to the memory of the perseverant and hardworking, frugal living ancestors by those who were affected by the earthquake and other disasters – and therefore had made some of the values of the Hakka people as a part of their

life – such as frugality, savings. For eg, savings were done by most Hakka people – whilst working which came in handy in the recovery after the earthquake. Further, the Hakka believed that they will recover against all adversity and therefore had a positive attitude even after the earthquake. This led to a faster recovery by the Hakka people – who did not wait for the assistance from outside – but started their reconstruction immediately after the earthquake.

The participants in the study suggested that Hakka Spirit is a major cultural set of beliefs and behaviours that influenced resilience.

The authors suggests that Hakka Spirit can be understood as an example of set of social practices that a)were performed in a manner that encouraged resilience and growth and b)increased the capacity of the human agents to thrive in adversarial situations.

RRL - 058

Title Disaster stress following a Hurricane: The role of religious differences in Fijian Islands.

Author(s) Gillard M. and Paton D.
Published in *The Australian Journal of Disaster and Trauma Studies*. Vol. 1999-2 ; 1997

Key themes Ethnicity, Religion and Resilience

Summary

The paper explores the influence of religion on disaster stress in Fijian Islanders. Interview data revealed the religious groups could be segregated in regard to the assistance afforded them and the demands made upon them by religious organizations. The results revealed that religious denominations exercised a differential impact on vulnerability, although differences were partially dependent on the measures of vulnerability used.

Research Objectives

- a. An exploratory study undertaken to assess the influence of religion on stress reactions to natural disasters in the Fijian Islands
- b. To examine its impact on indigenous Fijians who follow the Christian religion, Indians who follow Islam, and Indians who practice Hinduism

Research Methodology

The first stage of the research involved conducting open-ended interviews with twenty members of each of the three religious denominations. Interviews were conducted on the hurricane belt down the west coast of the island of Viti Levu in Fiji. The setting was the town of Lautoka, a garment-manufacturing town that had been hit by most of the major hurricanes in previous years. The levels of education and literacy differed, although it was generally of a low/medium standard. Participants were selected at random on a door-to-door basis and interviews were conducted in the interviewee's private home. Interviewees were asked to describe how their religion affected their personal experience of hurricanes.

Finding(s)

Some 94% of Fijian Christians expected their church to render assistance to them. There was a confident anticipation that the church would "get them back on their feet" no matter how severe the damage. Reports of the last hurricane included stories of the church building new houses for members whose homes were destroyed. The church often supplied members with food and provisions over and above standard government aid. There was a strong belief that relief money was no obstacle for the church and that a high level of competent support could be expected. With the availability of foreign aid (from overseas Christian Churches) the Christian organizations of Fiji are able to provide good support on all levels, including reconstruction of housing, relocation, limited financial aid, and household food and supplies. Members of the Christian Church do not have any demands placed upon them apart from attending church and their usual church duties. The Christian Church can be classified as providing an "assistance" environment.

While still anticipating some assistance, the expectations of members of Islamic Mosques and Hindu Temples were lower than those of their Christian counterparts. After a disaster, some 75% of Hindus and 63% of Muslims expected assistance to be forthcoming from their Temple or Mosque. Stress reactions could be exacerbated or compounded if this support fails to materialize or falls short of expectations.

Another difference between Christians, Hindus and Muslims was evident in regard to the expectations on the part of their respective religious centres to require and request assistance from its members. Hindus and Muslims are expected to provide manual labour (particularly by trades persons), food supplies (for the Mosque staff and Temple committees as well as the poorer of their members), building provisions (for the Mosques, Temples and their poorer members), and financial aid. Due to limited resources Muslim Mosques and Hindu Temples come under the "demand" category of post disaster interaction. That is, the members of these organisations are expected to make contributions toward the repair and continuation of their Mosques and Temples, as well as providing support and assistance to their poorer fellow members. Operating within a "demand" environment may increase the psychological vulnerability of members of these religious denominations.

On the basis of these observations, membership of the Hindu and Muslim religions could constitute a response generated demand. We could thus anticipate higher levels of post disaster stress amongst members of "demand" religions compared with "assistance" religions. The occurrence of Hurricane Nigel provided an opportunity to test this hypothesis. This was accomplished by the second stage of the research.

The second stage involved the content analysis of interview data to compile a demand/assistance questionnaire (Gillard, 1998). This questionnaire was designed to assess differences between the three religious groups with respect to the a) the post-disaster demands (e.g., physical, financial) made upon them and, b) the assistance offered (e.g., spiritual, physical, financial) by their respective Church, Mosque or Temple. The questionnaire included a general stress symptom measure, the "HSCL-21", (Green, Walkey, McCormick, & Taylor, 1988), and a traumatic stress symptom measure, the "Impact of Events Scale" (IES - Horowitz, Wilner, & Alvarez, 1979) to assess differences in psychological vulnerability between religious groups. Because of concerns about the cultural validity of traumatic stress measures (Marsella, Friedman, Gerrity, & Scurfield, 1996), two measures of psychological vulnerability were used.

Although a third world nation, Fiji has 87% literacy. To minimize the risk of language problems affecting data collection the questionnaire was administered door-to-door to thirty members of each religious denomination. This ensured that the researcher was available to deal with language problems prior to respondents completing the questionnaire. Data was collected 3 - 4 weeks after hurricane Nigel. The sample population was representative of the population at large. Respondents ranged in age from sixteen to seventy two, included an equal proportion of men and women, and comprised individuals of high, middle, and low socioeconomic status.

Resilience to Disasters

RRL - 059

Title Natural Hazard Resilience : The role of individual and household preparedness

Author(s) Douglas Paton; John Mc Clure; and Petra Burgelt

In disaster resilience: An integrated approach by (ed) by Douglas Paton and David Johnston, Charles Thomas Publisher, 2006; Illinois USA, (pg 105-127)

Key themes Resilience

Summary

Blumer (1969) in this theorisation around 'constructing reality' suggests that people actively and constantly interpret stimuli from the environment while interacting with the elements in that environment and integrate their interpretations through the mental models constructed by them. People construct differential meanings – by interpreting their worlds depending upon their social contexts. And since individuals are open to new and different experiences, their interpretations changes with time – and with this the process of adaptation to new conditions (Denzin 1992). Thus according to authors, the ultimate function of interpretations is to adapt as well as possible to the changes in the environment'.

For blumer(1969) the social structure 'supplies a fixed set of symbols which people use to interpret their situation'. Similarly in disaster situations, people interpret information based on their situated experience.

As impacted communities are becoming more diverse, a failure to accommodate the differences or the diversity can diminish the capacity of the mass media information dissemination to facilitate protective actions (Paton et al 2005; Johnson et al 2005; Paton & Burgelt 2005). There can also be communication problems if information does not consider the existing interpretive frameworks.

If interpretive mechanisms are identified then the knowledge can be used to develop design risk reduction strategies which are context specific. This could involve conceptualizing how people interpret their relationship with hazards and actions required to protect them as social cognitive processes (Duval and Mulilis 1999; Mc Clure et al 1999, 2001; Paton 2003).

This paper looks at following issues – how people make decisions about whether or not to adopt protective measures.

Precursors	Development of intentions	Convert intention to action
Motivating factors a. critical awareness b. risk perception	Personal competencies for implementation : Self efficacy, coping capacity, personal	Adoption of protective action factors affecting which will be the outcome of the precursor and development on intentions as well as trust.

	responsibility.	
Factors constraining motivation to prepare:		
a. Perceived irrelevance of risk information.		
b. Existing beliefs about preparedness and anxiety.		

RRL - 060

Title Links between Community and Individual Resilience : Evidence from Cyclone affected communities in North-West Australia

Author(s) Julie Ann Pooley; Lynne Cohen; and Moira O'Conner
In disaster resilience: An integrated approach by (ed) by Douglas Paton and David Johnston, Charles Thomas Publisher, 2006; Illinois USA, (pg 161-173)

Key themes Resilience –Individual and Community

Summary

The term Community resilience has been defined as ' the ability of a community to not only deal with adversity but in doing so reach a higher level of functioning (Kulig 1999:2). The term community resilience has been referred to as widely as risk management (Paton et al 2001) and hazard planning (Tobin and Whiteford 2002). Further, Brown and Kulig (1996-1997) have suggested that community resilience 'is grounded in the notion of human agency' that is the community engages in intentional meaningful action – that the community does not just bounce back but actively chooses change. Factors contributing to resilience include human capacity – such as assets and skills, community sustainability (meet indiv need in a culture harmonizing with nature); and community competence – (eg the processes by which community members identify and decide the ways to meet those needs).

The individual's sense of being or belonging to a community is also influenced by several factors such as a) membership – shared history, emotional safety, common symbols; b) Influence – which accounts for indiv influence on community and vice versa c)Integration and fulfillment where individual and community needs also satisfy collective needs d)Emotional connection that is the bond between members of the collective. (Mc Millan and Chavis 1986).

This concept of 'sense of community' is the key link to the indiv and community connectedness – how indiv and community become a resource for each other. One more variable – namely competence is brought in to understand peoples capacity for action – namely community

competence- a concept used to understand community resilience too.

Cottrell (1976) suggested that a competent community is :

- collaborate effectively to identify needs and issues
- achieve working consensus
- agree to implement agreed upon goals
- carry these out in collaboration.

Thus a competent community is able to articulate their views on the matters and can accommodate difference and has a willingness to be involved and manages community relations. The presence of Competant community enhances their capacities to manage or cope with the adverse. Buckland and Rahman (1999) argued that high social capital – which is similar to the sense of community is able to respond to the disasters more effectively.

Kulig (2000) in recent refining his model of community resilience has suggested three components: a) interactions that are experienced as a collective b) the expression of sense of community c) community action. In other words, Kulig has given a central importance to the concept of community competence while measuring resilience.

Other conceptual frameworks includes that of Tobin (1999) combining three theoretical models – a) mitigation model resting on reducing risk b) recovery model resting on govt policies to relief and recovery – capital reaccumulation c) structural-cognitive model which incorporates issues of structural (societal) changes, and situational factors such as demographic and community characteristics as well as cognitive – attitudinal variables.

Title Natural disasters, adaptive capacity and development in the twenty-first century

Author(s) Mohammed H I Dore and David Etkin
In ' Natural disasters and development in a globalizing world' ed Mark Pelling, Routledge publication, London and New York, 2003

Key themes Resilience, Adaptive capacity and development

Abstract

The climate change is affecting and leading to hydrometeorological disasters across the world. In order to counter the effect of climate change, countries will have to increase their adaptive capacities – as a part of conscious development policy.

Concepts used

Adaptation : This refers to the question of what are the sufficient and necessary conditions for adaptation? When is adaptation complete?

How can we suggest that the developed countries have adapted themselves to climate change? The authors suggests that developed countries could be taken as the baseline or necessary conditions – but by no means sufficient to come to an understanding of baseline adaptation. This is because the developed countries have – 1) the technical knowhow to understand climate, 2) have resources to research the climate, 3) have necessary technology to cope with climate; 4) share risk through govt disaster assistance programmes and insurance markets; 5) and the insurance markets through mechanism such as deductible minimum or rebates for minimizing disasters or no claims; and lastly speaking the 6)investment of resources by the govt in all levels of emergency response. All these six indicators are could be called as necessary conditions that define adaptive capacity at the institutional level.

The definition of adaptive capacity by reference to developed countries is used just the same way, that gap in per capita incomes are used to differentiate between developed and developing countries. The authors suggest that the above six conditions are necessary but by no means sufficient to enable successful adaptation.

So what are the sufficient conditions for complete adaptation?

The authors suggests that no country including developed is full adapted so long as their continue damage to the infrastructure and life during a hazard. And therefore there exists no 'sufficient adaptive capacity' for complete adaptation.

The authors conclude that there is no way of stipulating the necessary and sufficient conditions for adequate or optimal adaptation to climate change.

Two levels of adaptive capacities:

The authors therefore differentiate between two levels of adaptive capacity – namely baseline

adaptive capacity and the socially optimal adaptation.

Baseline adaptive capacity suggests the countries ability or inability to deal with a variety of climate changes – for eg in forms of country's building codes or in relation to other social variables.

Socially optimal adaptation : The authors suggest that socially optimal adaptation are the prudent or 'the feasible level of expenditure that a country might want to carry out given its baseline adaptive capacity at a particular time'.

The authors conclude by suggesting that all development policies must attempt to increase the adaptive capacities in order to deal with the climate change.

RRL - 062

Title The Concept of Resilience Revisited

Author Bernard Manyena

In Disasters 2006, 30 (4) : 433 -450, Overseas Development Institute 2006; Blackwell Publishing Oxford, UK and MA USA.

Key themes Resilience

Summary

This paper focuses on following aspects of resilience – namely the definitional issue of resilience; how resilience is applied to people and structures and implications of the deconstructions of the term for the way in which we view disasters and disaster risk reduction.

The theoretical base for the term resilience has come from different studies – which have defined it in two broad ways – as a desired outcome or as a process leading to desired outcomes. A viewing of different definitions of 'resilience' used in different studies shows a nuances shift from the outcome to a more complex process oriented resilience concept. The outcome oriented disaster programmes are inclined to use command and control methods of responding to risk – with the idea of returning to the original or the normal state- thus not addressing the entitlement loss issues which may have led to the disasters in the first place. Viewing disaster resilience as a deliberate process leading to desired outcomes suggests emphasizes human agency and its role in disasters. Disaster resilience is seen as a characteristic nurtured by a process that foster it.

The concept of 'adaptation' – has been included in the definitions related to 'resilience' and in particular those related to ecological systems and are more process oriented in its approach. It also has a 'futuristic' dimension that is adaptation as a strategy to mitigate future disasters. In this conception, the communities have maintained their core values or assets but have addressed the non essential attributes or elements – for eg, growing up different kind of crops

than say, giving up farming and resorting to different livelihood altogether.

Vulnerability and Resilience too have been seen as related concepts. The key question is however about the relationship between them – is resilience opposite of vulnerability or is resilience a factor of vulnerability? The literature also distinguishes between social and physical vulnerability. Here the Vulnerability could be viewed as reflection of the intrinsic physical, economic or social and political predisposition or susceptibility of a community to suffer adverse effects by a natural or human made shock. On the other hand – it also shows low disaster resilience and a limited capacity to recover. Disaster resilience here is viewed as the intrinsic capacity of the system, community, or a society pre-disposed to a shock or stress to adapt and survive by changing its non essential attributes and rebuilding itself.

There is also some discussion on whether resilience refers to humans or also structures. However the, authors suggests that discourse that separates 'humans' from 'structures, that is people can engage in adaptive behaviour but the structures only can be adapted sounds simplistic, as human beings do not live in a vacuum but are a part of systems that impact on losses.

The author finally suggests that the concept of disaster resilience requires delineation of vulnerability and resilience, which otherwise contributes to the blurring of the two concepts. The author delineates the constituent elements of the two concepts – with elements of vulnerability being mainly derived from the engineering or environmental sciences, and the elements of resilience derived from medical and social sciences. The author thus suggests that human resilience is about the 'processes of enhancing capacity to recover from a disaster within a shortest possible time with minimal or no outside assistance. This approach recognises that communities have certain levels of resilience built over centuries. Local adaptation strategies, culture, heritage, knowledge and experiences are the building blocks for boosting disaster resilience'.

RRL - 063

Title Disaster Resilience : Integrating Individual, Community, Institutional, and Environmental Perspectives

Author Douglas Paton
In disaster resilience: An integrated approach by (ed) by Douglas Paton and David Johnston, Charles Thomas Publisher, 2006; Illinois USA, pg (305-318)

Key themes Resilience

Summary

The paper or chapter summarises the insights from the earlier chapter and suggests that communities can adapt and even benefit from disasters. But that communities can adapt and even grow does not mean that they should be left to fend for themselves. A corollary is that in many places the adaptive capacities are lacking. However if the predictors for the community, ecological and social level adaptive strategies or outcomes are known then they can be included in emergency planning.

Also deficit and loss outcomes co-exist with capacity to confront characterised by adaptation and growth. A corollary is that how risk is conceptualised, assessed and managed needs to be thought through.

Contemporary use of 'risk' focuses on potential losses as it focuses on vulnerability. This does not represent risk paradigm in a way that encapsulates the evidence of adaptive and growth outcomes from disasters. A return to the original concept of risk – as a probability of event accounting for gains and losses that the event could represent could deal with this problem.

This would mean conceptualising 'Risk' as how hazard characteristics interact with those individual, community and societal elements that facilitate capacity to adapt (increased resilience) and those that increase susceptibility to experiencing loss (i.e increased vulnerability). Thus in this framework, risk management is considered as consisting of two co-existing elements of vulnerability and resilience.

Risk = Likelihood * Consequences

Risk= likelihood * (resilience (gains) + vulnerability (losses))

The authors suggest that while vulnerability factors increase the susceptibility – it does not mean that their presence means automatic increased risk. Rather vulnerability factors may co-exist with factors that facilitate resilience to adapt to adverse circumstances. It is the relative balance between vulnerability and resilience factors when mobilised when confronting hazard effects that determine risk.

Modelling comprehensive Adaptive capacities and Resilience:

Drawing from the earlier chapters, Resilience is also now conceptualised as resources that members can draw upon to develop adaptive capacities to sustain societal functions during disaster. The intrinsic aspects of culture, personal dispositions, formal and informal organisations, and societal and institutional characteristics are all resources. Cultural aspects

also need to be accommodated in the risk reduction and recovery plans.

Thus the model of adaptive capacity would include a) individual – eg self efficacy; sense of community; sense of place b)community e.g reciprocal social support, collective efficacy) and c) societal/institutional eg business planning, resources for adaptation; mechanisms facilitating different/ and between levels – social justice, community competence, trust, empowerment) that promote cohesive action to enhance adaptive capacity, minimize disruption, and facilitate growth.

Further cooperation cannot be taken for granted – with diversity in the communities would mean differences in the needs, perceptions, goals and therefore capacity to resolve conflicts and reconcile needs in fair and just ways. The fact that costs and benefits of hazard mitigation may not be distributed equally needs to be taken in to account – thus risk management strategies based on social justice principles and community involvement in decisionmaking influence risk acceptance and collective commitment to for responsibility for safety. Further the degree to which civic agencies sustain community participation by distributing power, resource and expertise that empower members are important to the outcomes.

It is useful to break adaptive capacity in the form of individual, collective or community and societal levels to offer insights in to vulnerability as well as resilience at each of these levels. Adaptation – immediately after the disaster could be mostly individual base – a few days after the disaster would be community based or dependent – that the degree to which the community is able to work together and develop plans etc, and in the long term – based on the society – that is the larger structures – such as workplace, schools – thus preparedness need to act at these larger levels too.... Since adaptive capacity – as its name signifies is finite, planning must consider how adaptive pressures change over time Till what time would the community and societies be able to function and what time will the available resources exhaust?

In conclusion, the authors suggest that 'Resilience is about nurturing and sustaining capacities of the people, communities and societal institutions to adapt and experience benefits from the disaster'.

RRL - 064

Title Disaster Resilience: Building Capacity to co-exist with natural hazards and their consequences

Author Douglas Paton
In disaster resilience: An integrated approach by (ed) by Douglas Paton and David Johnston, Charles Thomas Publisher, 2006; Illinois USA, pp3-10

Key themes Resilience and Adaptive capacities

Summary

This book deals with identifying the values, beliefs, competencies, resources and procedures that societies and their members can call upon to facilitate their capacity to adapt to these circumstances and sustain societal functions in the face of high disruptions in everyday life. This book is about identifying factors which makes societies and members resilient.

Defining resilience:

The term resilience is synonymous with notion of 'bouncing back'. It is derived from the latin word 'reiliere' which means 'to jump back' or a capability to return to the previous state. However disasters changes the reality of the people – and it is to the changed reality that people must adapt to. Also new reality in disaster context could also be a catalyst for change. In this book, 'resilience is a measure of how well people and societies can adapt to a changed reality and capitalize on the new possibilities offered'. Thus definition of resilience includes the notion of adaptive capacity. Further the adaptive capacity cannot be left to chance – but needs to be consciously nurtured by individuals, societies, and emergency planers and management drawing on collective and institutional resources.

Adaptive Capacity:

Resilience can be considered to be comprising of following:

- Resources (household emergency plan, business continuity plan) to ensure their safety and the continuity of their core functions due to hazard consequences.
- Competencies (self –efficacy, trained staff disaster management procedures) required to mobilise, organise and use the resources
- Planning and development strategies to integrated resources available to ensure existence of coherent societal capacity, and opportunities for growth
- Flexibility and sustainability that is resources are used as per the changing needs of the community.

Understanding the interdependence of people, communities, institutions influence adaptive capacities – that is resilience and adaptive capacity needs to be described at several interdependent levels.

Resilience is also looked upon as continuing economic, business, administrative activities in face of disasters and promoting heritage and environmental sustainability.

RRL - 065

Title Exploring the Complexity of social and ecological resilience to hazards

Author(s) Douglas Paton; Gail Kelly; and Michael Doherty
In disaster resilience: An integrated approach by (ed) by Douglas Paton and David Johnston, Charles Thomas Publisher, 2006; Illinois USA, (pg 190-212)

Key themes Resilience

Summary

This paper analyses the factors influencing sustainability of relationship between human and natural systems. It presents three perspectives on social –ecological resilience that have implication for hazard reduction, preparedness and recovery planning. This conceptualisation of the relationship has three issues – one concerns how human settlement and behaviour constitutes an adaptive for the environment and second – how people cope or adapt with the environmental hazard consequences. The third possible relation is how socio-ecological interaction can constitute the source of adaptive capacity for people and communities.

The reciprocal relationship between ecological resilience and social resilience is important at several interdependent levels. Ecological sustainability is vital. Thus it is important to encourage socio-ecological interaction in ways that reconcile the sustainability, the promotion of wellbeing and adaptive capacity and social goals. The factors leading to this win win situation could provide a framework for intervention to facilitate community resilience to natural hazards. This paper looks into some of these factors – namely the following:

- nature of the hazard – slow onset or otherwise
- uneven distribution impact of the hazard leading to conflicts and eroding the adaptive capacity
- notions of equity and justice – the costs and benefits attached to actions
- economic factors including the environmental protective actions vis a vis job loss or loss to the economy
- People's attachment to the place and their willingness to invest time and maintenance to the environment they inhabit.

This also means that planning in disaster responses need to include environmental and socio-ecological strategies to deal with the above factors to mitigate hazard effects and to increase human adaptive capacity. Thus Emergency managers and environmental managers needs to work together and develop strategies that reconcile environment protection with the reduction of risk to people and society and increasing resilience through socio-ecological mechanisms.

RRL - 066

Title Planning for Hazard Resilient Communities

Author(s) David King

In disaster resilience: An integrated approach by (ed) by Douglas Paton and David Johnston, Charles Thomas Publisher, 2006; Illinois USA (pg 289-304)

Key themes Resilience and communities

Summary

While the terminology of mitigation has been driving the planners, this paper focuses on enhancing hazard resilience of the communities. This paper has incorporated structured planning, and hazard resilient communities within the emergency management framework of mitigation, response and recovery. While Planning is about land use changes, hazard zones etc are new developments . Planners and development officials use legislation to set up minimum standards to achieve hazard mitigation. Community resilience is enhanced indirectly through services and structures – that is by strategies that reduce vulnerability. The corollary is that resilience of civil society and communities is undermined by in appropriate infrastructure.

Diverse communities respond and recover according to their local priorities and capacities. Neither formal leadership structures nor communities provide primary leadership in recovery and response. Community resilience and strengths may be positive in some hazard situations but not enough in others. Resilience is hazard, community and temporally specific. These realms of resilience do not exist as absolute characteristic – which can be reached as some sort of final goal. Resilience needs constant capacity building from within the community and outside from the agencies. Planners can enable develop positive community resilience characteristics. Hazard resilience is thus a responsibility of planners, emergency managers, working with communities to build mitigation capacity.

Title Assessing Social Resilience

Author(s) Philip Buckle

In disaster resilience: An integrated approach by (ed) by Douglas Paton and David Johnston, Charles Thomas Publisher, 2006; Illinois USA, (pg 88-104)

Key themes Resilience

Summary

People do not exist solely as individuals but also as social beings – they belong to : Families, tribe, or clan, locality and neighbourhood, community, social associations – for clubs, faith associations; Organisation (private firm or bureaucracy) and systems (economic and environmental systems).

All these different levels indicate a level of autonomous capacity at each level that can be used to act upon and therefore exists and semi-independent of their constituents of individual members. That is they are quasi independent entities – who possess assets such as networks and values that facilitate daily life.

A functional assessment of resilience at individual level could include :

This would be made on the basis of how well they 'own' or 'manage' following attributes:

1. Information and Advice on Preparedness and Assistance measures to enable them to deal with the reactions of self and others in disasters.
2. Resources – financial resources to prevent, prepare or recover from disasters.
3. management capacity – having time and opportunity to manage appropriate resilience generating activities.
4. Personal and community support – such as outreach services, community support officers
5. Involvement involves linkages with others.

These five resources are important not just to individuals but also the families and community groups.

The authors also suggest that the traditional characterisation of particular groups of people – such as aged, etc as being vulnerable does not tell us which people in a particular situation may be vulnerable – this is because the people or groups of people have a specific mix of vulnerabilities and coping strategies that depend upon their circumstances and context of the hazard and interaction with the personal and group. The traditional lists therefore have only an indicative value at the best. Instead the functional approach defines resilience and vulnerability as characteristics that can be reduced or enhanced with observable and measurable effects. The elements that support resilience at community level are:

Knowledge of hazards

Shared community values : commitment to community goals

Established social infrastructure: information channels, social networks, and community

organizations (eg churches, clubs)

Positive social and economic trends – viable economy contributing to sustainability

Partnerships : between agencies, community groups and pvt enterprise

Resources and skills : can be generic attributes (management or financial skills, human resources potential).

In general principles of community capacity building or building nurturance can be summarised as:

- local communities managed through principles of good governance – transparency, accountability, inclusiveness and agreed priorities).
- extent to which programmes and policies are governed by contemporary standards and community needs.
- Adequate resourcing for resilience building progs
- capacity to build integrated development of social, economic livelihoods, environmental and cultural dimensions to community.

Further Resilience is context – specific and also against the states of the individual and to balance vulnerability against capacity. For eg a rich person is less vulnerable to loss of home but could be equally vulnerable to psychological trauma.

Thus what is suggested is therefore ‘a functional approach where vulnerability is assessed on the basis of the ability of a person or a group or community to work towards and to attain certain basic goals, such as capacity to manage their own affairs, to have access to appropriate and appropriate levels of resources, including food, water, shelter, health care, education and cultural activity, social inclusion and information and access to other necessary and desirable services’. However a situational/contextual assessment is needed so that local circumstances are taken into account to assess capacity and vulnerability. This in turn can provide framework for developing appropriate mitigation, remedial and support mechanisms.

RRL - 068

Title Sustainability and community resilience : the holy grail of hazards planning

Author Graham A Tobin

In Environmental Hazards(1999), Elsevier Science Ltd; pg 13-25

Key themes Resilience
Summary

Sustainability and resilience are considered as the guiding principles for hazard planning. However, in practice a comprehensive planning incorporating these elements is much more complex as relations between community sustainability/resilience and hazards are complex involving social, economic, physical and political factors. This paper develops a conceptual framework for analysis of sustainability and resilience, based on three theoretical models, a mitigation model, a recovery model, and a structural-cognitive model. This framework is examined using data from Florida, USA, where local context, social and political activities, and economic concerns present difficulties in application. The question remains, therefore, to what extent can communities truly develop sustainable and resilient characteristics?

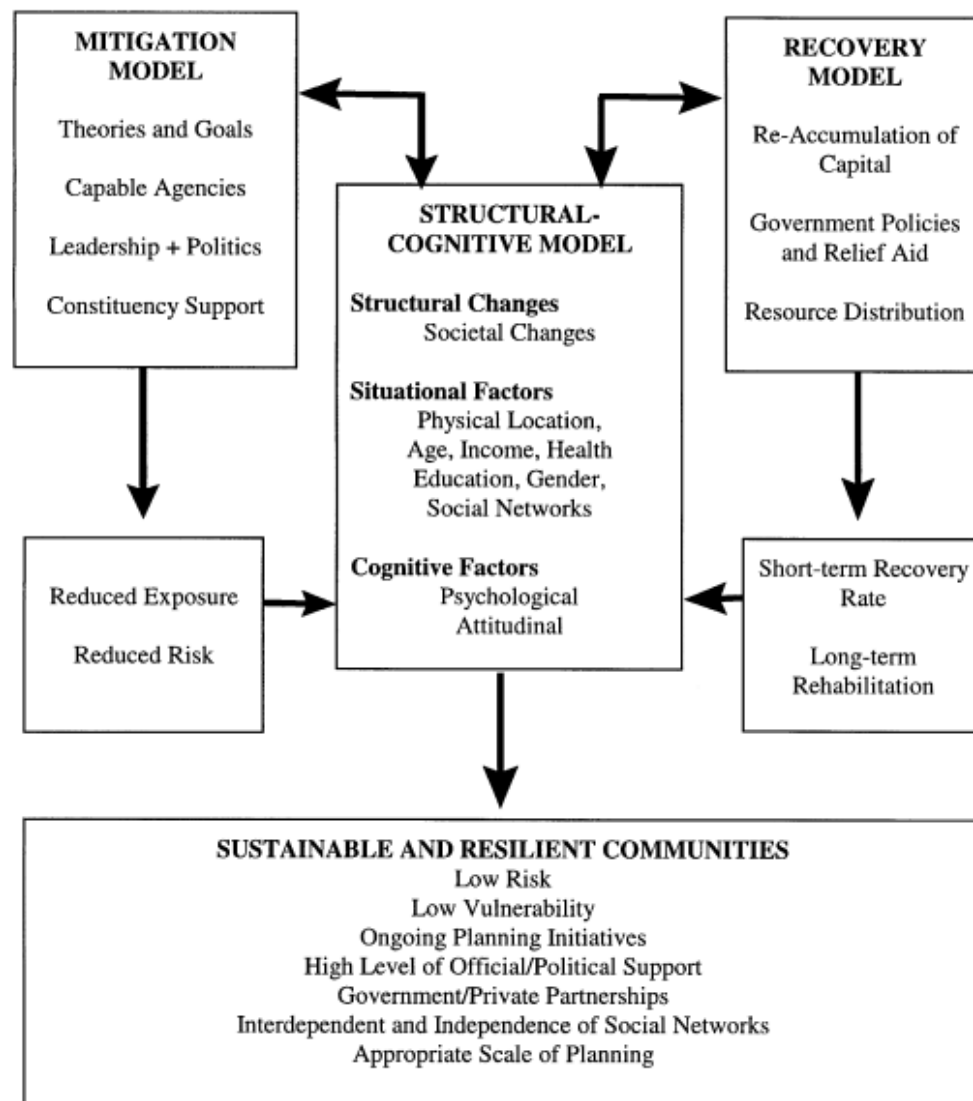
Key concepts/conceptual frameworks used:

Sustainable and resilient communities

In this paper sustainable and resilient communities are defined as societies which are structurally organized to minimize the effects of disasters, and, at the same time, have the ability to recover quickly by restoring the socio-economic vitality of the community

Theoretical frameworks to understand community resilience

The structural functional views, conflict theory, competition for resources, and other geo-sociological and anthropological principles are raised here as possible frameworks in understanding community resilience (for eg Kreps and Bosworth, 1994). The following flowchart provides the framework for this analysis:



See text for details; feedback loops not shown.

Adapted from Peacock and Ragsdale (1997); Tobin and Montz (1997) and Waugh (1996).

Fig. 1. Sustainable and resilient communities in hazardous environments: a framework for analysis

Mitigation Model

Mitigation programs aim to reduce exposure and risks. For example, the flood embankments protect communities and reduce risks for the hazard prone people. Further, causal linkages between the elements need to be attended if the mitigation programs are to be successful. Further goals must be clearly articulated, sufficient resources made available, and commitments made in the long term.

Recovery Model

It would not be possible to eliminate all disasters due to their spatial location – some locations will always remain hazard prone. Therefore focus on recovery is pertinent. This requires long term rehab processes that are affected by the prevailing socio- economic processes and structural constraints. Local participation is also important. In this respect, Peacock and Ragsdale suggested that to understand recovery, we need to focus on a) re-accumulation of capital and physical infrastructure b) policies and programmes of govt agencies, private organizations and businesses c) resource distribution. They suggested that recovery of indiv household is an indication of recovery at the societal level and capital re-accumulation processes and networks which enable this process.

Relief policies and programmes affect rate and patterns of recovery – many relief prog strive to return the status quo – or return to the normal – so they never really address the equity issue and developments and root causes of hazards are never addressed. Hence cycle of disaster – damage repair – disaster is continued. Social inequalities, community heterogeneity and competition for scarce resources impose constraints on recovery processes.

Structural-Cognitive model

Sustainability requires a third filter – “one that incorporates changes in the structure and thinking of society to accommodate hazards within the framework of day to day affairs”. Otherwise many factors will constrain mitigation policies. These constraints may be structural, which deter development by preserving old systems and attitudes, perceptions which create unfavourable environments. Age, family structure, wealth, gender, ethnicity, education, and nhbd characteristics, among other situational traits may lead to varied outcomes (Ollenburger and Tobin 1998).

Sustainable/resilient communities

In theory such communities should be able to withstand extreme geophysical process and recover rapidly from disasters whenever they occur. Sustainability and resilience are then contingent upon careful planning and organization of society – both to ameliorate the impacts of disasters and to facilitate the recovery processes.

The three models given above are inter-related and will have significant bearing on sustainability goals.

Borrowing from all the three models, the characteristics of sustainable and resilient communities must include:

- Lowered levels of risk to all members through reduced exposure to the geophysical event. – that is less hazard prone communities
- Reduced levels of vulnerability for all members of the society. Reduced vulnerabilities must include strategies to help politically and economically marginalized people.
- Planning for sustainability and resilience must be ongoing. – that is planning must be long term – and these goals at forefront of all planning.
- High levels of support from agencies and political leaders- that is without political will –

sustainability will not be achieved.

- Incorporation of partnerships and cooperation at different govt levels to provide appropriate leadership, skills, resources, local knowledge for implementation of mitigation projects.
- Strengthened networks for independent and interdependent segments of society. Social networks must be resilient to withstand changes in vertical and horizontal relations – through which decisions are made.
- Planning at the appropriate scale – due to globalizing of the economy- decisions are often divorced from local level. Recovery processes may not be in the hands of local business persons but subject to absentee employers (multinational corporations).

These factors need to be addressed in planning for sustainable communities.

Finding(s)

While these models are conceptually sound, in practice, obstacles need to be overcome as shown by some concerns as identified by the hazard managers in the State of Florida, US (which also experience Hurricane Andrew):

- a) New comers in the florida – whose population has been increasing –due to net in migration do not have or have little knowledge about the hazard potential and limited experience with such disasters
- b) Global warming leads to warming of Atlantic ocean leading to tropical storms. Hence Mitigation models that seek to reduce exposure, and risk are facing new challenges.
- c) demographic structure – as there is rapid growth of population – so a larger number of people are now hazard prone and will inevitable increase disaster losses.
- d) Immigrants are located in the coastal areas – and all these dwellings are at a risk from hurricanes and floods.
- e) The concurrency act, requires developers to anticipate water and sewage needs in planning development – and the law could be used to facilitate and enhance hazard mitigation planning
- f) A considerable that is 20% of population is older that is above 65 years, and another 24% is below 18 years – and in terms of developing sustainable communities present different problems. Morrow (1997a) has shown that elderly were disproportionately impacted by Hurricane Andrew with 73% solely reliant on social security.
- g) Evacuation, response planning thus must take into account these demographic traits with special needs of elderly taken into account.
- h) Gender relations and issues of domestic violence also need to be taken into account.

Need for all the three models to work in tandem:

The Florida case study points out to the several problems that will be encountered at every step if sustainability and resilience becomes an accepted planning goals. Characteristics shown in fig 1 do not exists in Florida. The risk from hazards – and hurricanes remain very high. Two features however stand out – if we are to use the fig 1 – to achieve the goal of sustainable and resilient communities 1) Mitigation and recovery models must work in cooperation and 2) roles of structural and cognitive factors must be fully understood. There is a need to understand how each element as presented in fig 1 can play a role in terms of pre-disaster planning, and post disaster studies.

Title Social Vulnerability to Climate change and the architecture of Entitlements

Authors W Neil Adger and P Mick Kelly
In *Mitigation and Adaptation strategies for global change 4*: 253-266; 1999
Kluwer Academic Publishers, Netherlands

Key themes Resilience, Adaptation and Entitlements

Summary

The paper suggests that the first step towards conceptual model of vulnerability to climate change must include appraising the social and economic processes that hinder or facilitate adaptation. Vulnerability is defined as an individual or a collective condition of social groups and communities. Adaptation would put a stress on these individual and collective groups – however vulnerability as well as adaptation is determined by the ‘architecture of entitlements’ available to the individual or social groups which would allow them to cope up with the adversity. Thus concept of ‘entitlement’ developed within neoliberal and institutional economics is extended to this perspective. In this conceptual framework, vulnerability is then defined as a socially constructed phenomenon in turn influenced by social and institutional factors and relations.

This framework is used to study a district in coastal lowland Vietnam. It asks the question in the context of this case study:

Whether a social vulnerability can be empirically observed in a fashion that captures the complexity of the state of vulnerability, its causes and its potential points of mitigation; and
Whether this social vulnerability concept facilitates comparison over time and across different populations?

The authors suggests from this case study that vulnerability framework can be operationalized, and that the nature of vulnerability of these coastal populations is intertwined with the wider political economy and structures of entitlements.

The lessons for the global assessment from this case study, the authors suggests – are that given the complexity of the factors exhibited in the shaping of the vulnerability, it is not appropriate to use this framework to aggregate from one geo-political scale to another – from local to regional levels in the measure of vulnerability. This is also because the analysis of vulnerability is presented in terms of individual or groups – that is economic, social and political circumstances specific to those groups. To attempt to aggregate would mean losing out on this precise richness and diversity of entitlement architecture and the range of adaptive responses.

However, the authors conclude that there is a type of global vulnerability assessment that is meaningful through which global vulnerability is assessed – for eg questions such as what role do elements of globalisation of world economy play in facilitating or hindering the responses of the international community to climate change?

However, such responses, still would face the problem of masking, regional, national and local details – which could otherwise yield valuable lessons.

RRL - 070

Title Cultures of Disaster : Society and Natural Hazards in the Philippines

Author(s) Greg Bankoff

Routledge, 2002

Key themes Resilience, coping, adaptation and Disasters

Summary

In this fascinating and comprehensive study, Greg Bankoff traces the history of natural hazards in the Philippines from the records kept by the Spanish colonizers to the "Calamitous Nineties," and assesses the effectiveness of the relief mechanisms that have evolved to cope with these occurrences. He also examines the correlation between this history of natural disasters and the social hierarchy within Filipino society. The constant threat of disaster has been integrated into the schema of daily life to such an extent that a 'culture of disaster' has been formed.

RRL - 071

Title Modelling Regional Economic Resilience To Disasters: A Computable General Equilibrium Analysis Of Water Service Disruptions

Author(s) Adam Rose, Shu-Yi Liao

Journal of Regional Science, 2005 Vol 45 ISN 1

Key theme(s) Resilience, Adaptive responses

Abstract

Recent natural and manmade disasters have had significant regional economic impacts. These effects have been muted, however, by the resilience of individual businesses and of regional markets, which refers to the inherent ability and adaptive responses that enable firms and regions to avoid potential losses. Computable general equilibrium (CGE) analysis is a promising approach to disaster impact analysis because it is able to model the behavioural response to input shortages and changing market conditions. However, without further refinement, CGE models, as well as nearly all other economic models, reflect only "business-as-usual" conditions, when they are based on historical data. This paper advances the CGE analysis of major supply disruptions of critical inputs by: specifying operational definitions of individual business and regional macroeconomic resilience, linking production function parameters to various types of producer adaptations in emergencies, developing algorithms for recalibrating production functions to empirical or simulation data, and decomposing partial and general equilibrium responses. We illustrate some of these contributions in a case study of the sectoral and regional economic impacts of a disruption to the Portland Metropolitan Water System in the aftermath of a major earthquake.

Research Question(s)

- a. A conceptual definition of resilience in terms of two components, inherent and adaptive, as an advance over prior formulations
- b. Operational definitions including linking production function parameters to various types of inherent and adaptive producer behaviour in disaster situations
- c. Mathematical optimization approaches to recalibrate production function parameters to reflect resilience and improve their accuracy
- d. A method for decomposing partial and general equilibrium results in a CGE context

Research Methodology

The production side of the CGE model used in this paper is composed of a standard, multilayered, or multitiered, constant elasticity of substitution (CES) production function for each sector. The constant elasticity of substitution (CES) production function has the nested form for five aggregate inputs capital, labour, energy, materials, and water. The production function represents a type of hierarchical, or sequential, decision-making process. For a given level of output, the firm's manager first chooses the optimal combination of capital and energy. He or she next juxtaposes that combination of labor to determine the optimal choice of inputs in the third tier, and so on. The model assumes homothetic weak separability, meaning that the substitution elasticities, and hence input choices, in one tier are invariant to those of another.

Computable general equilibrium models used here for hazard analysis are likely to yield estimates of business disruptions for some if not all sectors of an economy that differ significantly from the direct loss estimates provided by empirical studies. This is because production function parameters are not typically based on solid data, or, even where they are, the data stem from ordinary operating experience (inherent resilience only) rather than from emergency situations. Hence, it is necessary to explicitly incorporate the adaptive resilience responses below into the analysis. This is accomplished here by altering the parameters in the sectoral production functions of the CGE model. Inherent resilience is embodied in the basic production function for individual businesses. Adaptive resilience is captured by changes in the parameters.

Finding(s)

This paper has presented major methodological advances in computable general equilibrium modeling for application to estimating the regional economic impacts of earthquakes and other disasters. We provided an operational definition of resilience and couched it in terms of production theory. Then a methodology has been developed for recalibrating CGE model parameters in the light of empirical estimates of production losses due to a lifeline supply disruption. The methodology also enabled to decompose loss estimates into direct and indirect components. The application of the methodology to a disruption of water services in the Portland Metro economy showed how indirect (pure general equilibrium) economic losses vary according to the overall level and sectoral mix of water shortages, the extent of pre-event mitigation, and post-event inherent and adaptive resilience.

The simulation analysis results are sensitive to the following major assumptions:

- (1) Adjustment to equilibrium in a costless manner. Dis-equilibrium considerations and transition costs would add to the negative impacts, though likely to a small extent.
- (2) Optimizing behavior, which was rationalized as being more likely in an emergency situation, when decision-makers must be especially vigilant. If these were not the case, the impacts would be even larger, a situation that becomes increasingly more likely as the size of the disaster becomes larger and the economy moves increasingly toward disarray.
- (3) Omitting explicit considerations of uncertainty. Uncertainty is likely to decrease resilience somewhat and thus lead to an underestimation of losses.
- (4) Not explicitly including inventories. These are likely to be relatively minimal for water inputs in most sectors, especially in relation to water service disruptions in the context of large earthquakes.
- (5) Basic parameters of the CGE model, aside from those relating to water inputs. In the absence of solid data on these parameters, it cannot venture a guess as to whether the study has overestimated or underestimated the impacts of the water service disruption on this score.
- (6) The mix of adaptive resilience responses. The overall level for the combination of these responses for the Portland case, the exact mix of the two in each sector also affect indirect losses, though in a manner it cannot be ascertained.

Thus, overall, the disaster loss estimates are likely to be on the low side. The greatest improvements in accuracy can be attained through conceptual improvements in the CGE approach in general with respect to non-equilibrium/optimization contexts, as well as more empirical work on specifying general model parameters. More empirical work on the extent of inherent and adaptive resilience is needed as well.

The methodology can be adapted to other applications of CGE models for response to other types of disasters, including terrorist attacks. Empirical data on input and output changes can be used to recalibrate key production function parameters to reflect real-world conditions and improve the accuracy of loss estimation.

RRL - 072

Title Economic Crises and Natural Disasters: Coping Strategies and Policy

Author Emmanuel Skoufias

World Development, 2003 Vol 31 ISN 7

Key theme(s) Resilience and coping, ex-ante and ex-post strategies; aggregate shocks

Summary

This paper reviews 12 studies presented at a conference examining two broad themes: (a) the interplay between household coping strategies and the impact of crises and natural disasters on various dimensions of well-being (e.g., consumption and child nutrition); and (b) some of the *ex-ante* and *ex-post* strategies that public agencies can adopt so they can be more effective in protecting households and their members from the potentially adverse impacts of aggregate shocks.

Research Question(s)

- a. Economic crisis and natural disasters in developing world and frequency and severity of these events
- b. How household welfare is affected by these adverse economic events
- c. Consequence of coping strategies

Research Methodology

The paper included in the special issue of *World Development* is directly related to the above issues. A number of the papers analyze rigorously the effects of recent macroeconomic shocks such as the peso crisis in Mexico, natural disasters such as El Niño in Philippines, the recent adjustment process in Jamaica, and the effects of AIDS in Africa, among others. The list of the main questions addressed by different conference papers is both diverse and long. A list of the questions that may be of interest and can be examined. Do community characteristics play a role in how a shock affects households? Does a rapid increase in the inflation rate affect the nutritional status of children? Do households have a more difficult time coping with covariant as opposed to idiosyncratic shocks? What are some of the strategies that households use in the case of aggregate shock? Does social capital make a difference in coping with shocks? Do macroeconomic shocks, even if short-lived, have adverse effects in the long run? What types of programs and government actions are required to prevent or mitigate the adverse long-term effects of some household coping strategies? Is a shift of government interventions to an *ex-ante* risk-reduction strategy to be preferred over *ex-post* mitigation and coping programs? Is it possible to design a targeting system that serves the dual roles of alleviating poverty and insurance simultaneously? Are cash transfer programs likely to be less effective at maintaining caloric availability during periods of higher inflation than in normal times? Are cash transfer programs also effective at maintaining micronutrient availability?

Finding(s)

The aggregate nature of economic crises and natural disasters implies that many of the

informal mechanisms for mitigating and coping with risk, and in particular those that are community-based, may become less effective. Under such circumstances households may be forced to rely on self-insurance strategies that are particularly costly in terms of current as well as future welfare.

Knowledge and better understanding of the main coping strategies of households is very useful for setting the priorities for public programs and safety nets. Many of the papers in this special conference issue contribute in this effort by describing the variety of coping strategies used by households in different countries and by examining how successful they were at protecting household welfare. Mexican households, for example, decreased their fertility in response to the tequila crisis (McKenzie). Rural households in Bangladesh borrowed more soon after the 1998 floods (del Ninno, Dorosh and Smith); Ugandan households resorted to fostering orphan children of relatives dying from AIDS (Deininger, Garcia and Subbarao), while South African households were found to cope with the crisis by relying on local support networks (Carter and Maluccio). Yet most of these coping strategies do not appear to be completely effective at protecting households. Poorer households in the Philippines, for example, were found to be less able to protect their consumption as a result of the recent economic crisis and El Niño shock (Datt and Hoogeveen). At least two of the papers in the conference (Handa and King; Carter and Maluccio) provide strong empirical evidence that the self-insurance strategies used at times of crises are associated with lower child nutrition in the short-term (measured by weight for height) and in the long-term (measured by height for age). Households fostering orphan children in Uganda are found to consume, save and invest less while orphan children were at a disadvantage in terms of health outcomes and immunizations. Yet surprisingly little evidence was found regarding the potentially adverse effects of aggregate shocks on the schooling of children in Brazil (Duryea and Arends-Kuenning). Even in Uganda where the AIDS epidemic has increased dramatically the number of orphans and the incidence of fostering, foster children do not appear to experience a serious disadvantage in education (Deininger, Garcia and Subbarao).

In combination these findings suggest that aggregate shocks, even if short-lived, are also likely to have irreversible consequences on the prospects of future generations. Public actions that prevent deteriorations in the nutritional status of children and maintain access to health services for poor and vulnerable households deserve top priority. Should such interventions also include incentives for families to keep children in school? While there is scattered evidence pointing to the affirmative, the absence of any solid evidence from the papers presented at the conference can only suggest that this issue deserves further investigation. Having shed some light on the priorities of interventions at time of crises and natural disasters the conference papers also addressed the deeper issues related to the timing and the guiding principles that can increase the effectiveness of public interventions in protecting households welfare. A number of important findings stand out. First, *ex-ante* risk reduction programs offer “a bigger bang for the dollar” relative to *ex-post* mitigation and coping programs since they appear to be welfare enhancing as well a poverty reducing (Owens, Hoddinott and Kinsey). Second, government led reforms such as an earlier trade liberalization combined with well functioning private markets, public and nongovernmental organizations (NGOs) interventions have the potential of being successful at preventing major crises as was the case in Bangladesh after the 1998 floods (del Ninno). Insofar as governments have the foresight and the discipline to adopt such strategies there are serious opportunities for reducing the adverse effects of crises.

Third, programs that target the structurally poor do not necessarily reach households that can be affected by economic crises and disasters. If poverty alleviation programs are to also serve the role of providing insurance, it is necessary to adopt appropriate targeting mechanisms. Targeting based on administrative criteria, proxy means tests, or categorical variables do a relatively better job at identifying the households that are “permanently” poor than those who are actually hurt by the crises. In contrast, self-targeting systems typically associated with employment generation and infrastructure maintenance and creation programs appear to be possess the advantage of providing both insurance and transfer (Sumarto, Suryahadi and Pritchett).

Fourth, the nature of the aid that a program provides may also constrain the extent to which a program can help poorer or more needy households. Emergency aid, for example, consists mainly of in-kind transfers such as food, clothing and medicine. To the extent that the needs for these goods are the same across households, there is only limited scope for providing “more” relief to those who suffered greater losses or who are poorer following a disaster (Morris and Wodon). Targeted cash transfers, on the other hand, seem to offer a quick and flexible alternative that could be distributed at a lower administrative cost than in-kind transfers, and may be easier to tailor according to the losses of the affected households. At least for the instances where the objective is to prevent a deterioration of the caloric availability at the household level, the higher calorie income elasticity among poorer households and the insensitivity of the elasticity to changes in relative prices ensure that a well-targeted cash transfer program will have a greater effect on the caloric availability of poorer households (Skoufias). To the extent that the availability of micronutrients is also of primary consideration then cash transfer program may need to be complemented by programs that protect micronutrient intake.

Finally, the design of crisis relief and social safety net programs directed to specific members of households, such as children or pregnant women, must also take into consideration the intermediary role of families (Quisumbing). Person-specific transfer programs run the risk of having a lower effect on the intended individuals due to reallocations of resources within families over which policy makers have no direct control.

In recent years a number of countries, including Bangladesh, Brazil, Colombia, Mexico, Honduras, Jamaica, and Nicaragua, have shifted their national poverty alleviation strategies toward cash transfer programs targeted to poor households and conditioned on households investing in the nutrition, health and education of their children. Moreover, the transfers associated with these programs are deliberately targeted to women on the grounds that resources controlled by women are associated with better educational and nutritional outcomes of children. The preceding findings suggest that programs of this type provide a good foundation toward the creation of social safety net systems that could be quite effective at times of crises. Governments, for example, can ensure that child nutrition, child health and child schooling of the already poor households are minimally affected by the crisis, by changing the amount of the cash transfer to the poor households already in the program. However, these programs do not have the built-in flexibility to expand coverage to households falling below the poverty line during times of crises. It is hoped that the papers in this special issue make a useful contribution toward the effort to combine long-run poverty alleviation with effective relief during periods of crises.

RRL - 073

Title Socioeconomic Vulnerability and Adaptation to Environmental Risk: A Case Study of Climate Change and Flooding in Bangladesh

Authors Roy Brouwer Sonia Akter Luke Brander and Enamul Haque
Risk Analysis, Vol. 27, No. 2, 2007

Key theme(s) Resilience

Abstract

In this article we investigate the complex relationship between environmental risk, poverty, and vulnerability in a case study carried out in one of the poorest and most flood-prone countries in the world, focusing on household and community vulnerability and adaptive coping mechanisms. Based upon the steadily growing amount of literature in this field we develop and test our own analytical model. In a large-scale household survey carried out in southeast Bangladesh, we ask almost 700 floodplain residents living without any flood protection along the River Meghna about their flood risk exposure, flood problems, flood damage, and coping mechanisms. Novel in our study is the explicit testing of the effectiveness of adaptive coping strategies to reduce flood damage costs. We show that, households with lower income and less access to productive natural assets face higher exposure to risk of flooding. Disparity in income and asset distribution at community level furthermore tends to be higher at higher risk exposure levels, implying that individually vulnerable households are also collectively more vulnerable. Regarding the identification of coping mechanisms to deal with flood events, we look at both the *ex ante* household level preparedness for flood events and the *ex post* availability of community-level support and disaster relief. We find somewhat paradoxically that the people that face the highest risk of flooding are the least well prepared, both in terms of household-level *ex ante* preparedness and community-level *ex post* flood relief.

RRL - 074

Title Flood Risk Management in Central Vietnam: Challenges and Potentials

Authors Phong Tran, Fausto Marincioni, Rajib Shaw, Massimo Sarti, Le Van An
Natural Hazards Volume 46, Number 1, 119-138, DOI: 10.1007/s11069-007-9186-2

Key theme(s) Coping and Resilience

Abstract

This paper explores the impacts of floods on the economy, environment, and society and tries to clarify the rural community's coping mechanism to flood disasters in central Viet Nam. It focuses on the social aspects of flood risk perception that shapes the responses to floods. The research findings revealed that flooding is an essential element for a coastal population whose livelihood depends on productive functions of cyclical floods. The findings also revealed that floods, causing losses and damages, often inhibited economic development. The surveyed communities appeared to have evolved coping mechanisms to reduce the negative impacts of the floods, yet these coping mechanisms are under pressure due to environmental degradation. Integrated flood risk management is considered as a suitable paradigm for coping with flood disasters.

Social Capital and Disasters

RRL - 075

Title Stretching the Bonds : The Families of Andrew

Author(s) Betty Hearn Morrow

In 'Hurricane Andrew' ed by Walter Peacock; Betty Morrow and Hugh Gladwin;
Routledge publication, London and New York; 1997 (pg 141-170)

Key themes Social Capital and Resilience

Research Methodology

Survey of the households in South Dade affected by Hurricane Andrews

Abstract / Summary

Issues and findings:

In the competitive post disaster recovery period, each family's social and economic position as well as connections with the larger community can be influencing the outcome of the household (Drabek et al 1975; Drabek and Key 1982; Bolin 192).

Disaster Studies have shown that recovery of families are contingent upon – the use of personal resources – for eg savings, insurance etc; support from informal kinship systems and thirdly institutional such as govt support. While survivors may use all the three – the dominant use of systems – is dependent upon the larger political and economic settings (Dynes 1975; Bolin and Trainer 1978; Bates and Peacock 1989b). Research has suggested that in industrialised countries, kinship ties, for eg are important but not primary (Drabek and key 1976; Bolin 1982; Erickson et al 1976).

According to Metro Dade Planning department, Hurricane Andrew affected 130,000 households in South Dade and three fourth of the families were a unit of two or more related persons, and an average household size was around three – but non nuclear kin often lived together. The 1990 census of Dade also showed that 10% of hh included grand children, 15% were headed by women – and were largely poor.

Kinship support:

Before the Storm:

-For one third households in survey relatives were very important source of information about the impending storm.

-14% HH in the survey received assistance from the households in preparing their homes – among those who had kins in the area – reported only 16%.

-In terms of receiving aid the logistics regression models used suggested that minority families are more apt to have been helped by relatives. Also, black and Hispanic households receiving the support from relatives are nearly twice as high as Anglos (or English). While elder and

single-mother households display not much differences; the odds for widows are 2.4 times higher. Homeowners had twice as much assistance than the renters.

-In terms of giving aid, the examining households suggested that 18% of them played a major role in preparing the relatives home for the hurricane. For those who had relatives closeby the figure changes to 22%.

The researchers conclude that overall the kin networks were underutilised during hurricane preparations.

During the Storm:

-About 54% of all hh located in evacuation zones evacuated completely with only 5 % leaving at least one member of the household behind. 4% reported staying back as they had no place to go and & 7% of the households reported staying back as they were too poor and had not place to. While most south florida people stayed at their homes, relatives and friends congregated at homes and houses that they perceived were safest.

After the Storm:

-Assistance from relatives was somewhat higher after the storm. 24% of the relatives reported receiving major kin assistance with things such as debris removals, repairs and supplies. 30% of the relatives reported assisting relatives after the storm. The logistics regression model suggested that black families are about 1.5 times more likely than Anglo families in providing help. Income differences were found to be significant – and chances of being a helper were related with income levels. Under severe conditions, family networks became a significant sources of help in aftermath of a disaster. Further sharing losses and hardship with kin is an important source of solace for the Andrew's victims

Homeless families

As per the Governor disaster planning and response review committee 1993; 180,000 people were homeless for some period of time after Andrew. Families split up sending young or elderly away from the terrible conditions in South Dade. Temporary housing was grossly insufficient and displaced people could not find a place to rent after the Andrew in South Dade. Thus due to lack of other decent house, thousands continued to stay in badly damaged houses and apartments or their cars – sometimes doubling there with their friends and relatives after the Andrew. In absence of rental placement, the preferred choice was that of staying with relatives. In all 12% of the total sample reported taking to relatives. And while the poorer relatives are less apt to have kin move in, those who do are likely to stay longer.

Agency Assistance:

There were several impediments in getting assistance:

- filing an application was a problem
- no public transport available – so mobility for those without cars was a problem in the first few weeks.
- Agencies themselves had difficult time finding suitable place to work in
- Women who had to look after children and were without cars were at a distinct disadvantage.
- The application procedures were very complicated and applications were rarely

integrated which meant several trips to FEMA.

- Negotiating the aid process – qualifying households took a great deal of time, energy and skills with the bureaucracy.
- While around 3000 were given FEMA house trailers to stay, thousands were also denied them – as households did not fit the favoured small nuclear family units.

Recovery:

-The wealth and upper middle class communities were first to regain some normalcy. And random survey from minority working class home owners of 200 households suggested that 70% of the families had their homes severely damaged and destroyed – but yet were neglected by the authorities as their attention was on well to do nhbd. Almost all the community's emergency and relief assistance came in the first weeks due to efforts of local catholic church and not authorities. Less than 18% reported assistance from FEMA. As the houses were badly damaged, 56% stayed with relatives, 21% stayed on the trailers; 18% stayed with friends; and 9% rented a place. Average time of displacement was almost the year after the disaster and 38% had not returned entirely even after one year. Household stress was high amongst them.

Impact on nhbd or kin:

- One third reported less stress with their neighbours than before the hurricane. 90% had felt a sense of sharing in the nhbd after the storm and most said it was still high a year later. This supports the idea of 'therapeutic community' in the after math and also indicates more lasting effects than usually reported.
- On the other hand, the unevenness of recovery led to some strain among neighbours – stories of how people next doors got more money and resentments over handouts by FEMA or larger insurance payouts. Post disaster frustrations sometimes brought the class and ethnic friction – already existing in the community to the surface.
- Some conclusions:

-for families who are disadvantaged, in a competitive socio-political recovery process – informal kinship ties are important. The case of hurricane Andrew shows that urban families regardless of their ethnicity are embedded in kinship networks and are an important resource when disaster strikes. An explanation for many people not receiving help from the local kin could be that they themselves had problems as they too were impacted. Other studies have shown that local kin are important if they too are not impacted by the disasters (Quarantelli 1960; Fogelman and Parenton 1956. This research also shows that families tend to be less source of assistance in large scale societies. However while dependence on kin diminishes it nevertheless remains important.

The authors also suggests policy recommendations such as qualification criteria for assistance should not penalise multi-family households. As recovery moved from cleanup activities to reconstruction activities, families relied less on kinship and more on institutional supports. Thus more effort need to be put on enabling coordination of assistance programmes to make them more successful.

RRL - 076

Title Participation, Social Capital and Vulnerability to Urban Flooding in Guyana

Author Mark Pelling

In Journal of International Development 10; 469-486; 1998

Key themes Social Capital and Disasters

Research Question(s)

Do contemporary participatory models of management enable building of social capital and enhance hazard or risk management strategy?

Research Methodology

Household Survey Interviews were conducted in two areas of high flood risk – namely Georgetown, Guyana’s capital city and Plaisance of peri-urban village – 12 km east of Georgetown. They identified household asset profiles, and comparative risk of flooding based on past experiences and impacts. These survey findings were then supported by indepth interviews with 10% subsample for which residential histories were constructed.

Theoretical Framework

Access Mechanisms : institutions, Markets and Social Capital

Newer approaches have acknowledged the role of social capital in shaping mechanisms of resource distribution and means of access. The idea is that it promotes Participatory methodologies through which decision making and responsibility are re-distributed to overcoming market based inefficiencies in redistributing of resources.

Vulnerability and Access to Assets:

Vulnerability and Coping capacities are linked with form and availability of assets – which include information as an asset amongst the resources.

Ideologies of Participatory development

Participatory development has been approached from the empowerment perspective – bottom up and inclusive and representative leadership – which leads to enhancing of social capital of communities. The other perspective is the utilitarian perspective where participation is a means for efficient planning. However participation as a social change has also been cautioned – as in some cases some groups better placed are able to articulate their private interests as public interests.

Finding(s)

-The maps of the settlements showed that those neighbourhoods with better representation in community leadership were those neighbourhoods that had lower levels of vulnerability to flood hazard. Thus the same socio-economic processes which created social and economic differentiation within the settlements had underlied the creation of vulnerability to flood hazard – and were alongside shaping the access to local political decisionmaking.

-Vulnerable households relied primarily on individual mitigation strategies or adaptation during flood events due to underdeveloped civil society, weak local and government and failure of the participatory methods to be inclusive or representative of the most marginalised.

-Instead of promoting social capital, participatory decisionmaking was taken away from the local communities and recentralised authority with the local and national elite. Participation was unsuccessful in redistributing decisionmaking power and strengthening of local social capital and community decisionmaking capacity.

-The opportunity to build local social capital into hazard reduction strategy was lost due to top down approach of community targeting which failed to develop horizontal social ties but instead strengthened vertical linkages of dependency and control.

- There was thus a failure in both empowerment through social capital building and utilitarian agendas of participation which were identified in the constructions of participation utilised by the executing agencies and govt of Guyana

RRL - 077

Title Social Capital: A Missing Link to Disaster Recovery

Author(s) Yuko Nakagawa and Rajib Shaw

In International Journal of Mass Emergencies and Disasters March 2004, Vol. 22, No. 1, pp. 5-34

Key themes Social Capital and Disasters

Abstract

Post-disaster recovery processes should be considered as opportunities for development, by revitalizing the local economy and upgrading livelihoods and living conditions. Social capital, which is defined as a function of trust, social norms, participation, and network, can play an important role in recovery. This paper examines the role of social capital in the post earthquake rehabilitation and reconstruction programs in two cases: Kobe, Japan and Gujarat, India. The Kobe case study shows that the community with social capital and with a tradition of community activities can pro-actively participate in the reconstruction program, and thereby can make a successful and speedy recovery. A model for bonding, bridging and linking social capital was developed from the Kobe experience, and was applied to Gujarat in four different communities. It was observed that the community with social capital records the highest satisfaction rate for the new town planning and has the speediest recovery rate. The role of community leaders has been prominent in utilizing social capital in the recovery process, and facilitating collective decision-making. Thus, although the two case studies differ in socio-economic and cultural contexts, the community's social capital and leadership are found to be the most effective elements in both cases in enhancing collective actions and disaster recovery.

Research Question(s)

Even though lots of effort is put into disaster recovery programs, why have some communities carried out faster (in terms of time frame) and more satisfying (in terms of holistic and participatory) recovery programs while others have not? Where do such differences come from? While there is possibly no straightforward answer, since it is a complex mixture of social, economic, religious, political and other issues; in this paper, an attempt has been made by using social capital as a measure to find an answer to this question.

Research Methodology

A comparative study was undertaken in Kobe in Japan and Gujarat in India to analyze the post-earthquake recovery process, and to find the common elements to ensure sustainability.

In this study, the first step was data collection and analysis in Kobe, Japan on the rehabilitation program following the Kobe Earthquake. Multiple methods were used for data collection—from primary as well as secondary sources. Primary data was collected through questionnaire survey and interviews with key stakeholders. Secondary data was collected and based on the data analysis, a model was developed focusing on the role of social capital in the recovery program. This model was then applied to the earthquake-affected area of Gujarat, India, and its applicability was studied in

order to reach a conclusion. Two neighborhoods were selected, one from Kobe and the other from the city of Bhuj in Gujarat. Criteria for selection of the neighborhoods were: 1) similar type of hazard, 2) urban scenario, 3) representation from developed and developing countries, 4) relatively higher effects of damage, and 5) categorization as a special zoning area in the reconstruction plan. Accordingly, Mano neighborhood from Kobe, and the Old Town of Bhuj were selected as case study areas. For the Kobe case study, mainly secondary data sources were used. In addition, interviews were conducted with academicians, NGOs, private consulting firms, and residents in the local communities. For the Gujarat case study, both primary and secondary data were used equally.

Concepts Used

Social Capital: Social capital, in general, refers to the trust, social norms, and networks which affect social and economic activities. A higher accumulation of such capital contributes significantly to social, political and even economic performance, for better or worse. While different authors have referred to it in different way, in our analysis, we define social capital as the function of mutual trust, social networks of both individuals and groups, and social norms such as obligation and willingness toward mutually beneficial collective action, which is, in this paper, the post-disaster recovery process. This social capital will be facilitated and/or enforced by trust for community leaders and also by the political maturity of the community. Political maturity means that the community is accustomed to consensus building by having meetings and discussions among community members.

Finding(s)

Two case studies of Kobe and Gujarat Earthquakes show that although the local socioeconomic and cultural backgrounds are different in these two areas, the recovery process of urban areas is quite similar. At every stage of the disaster cycle (rescue, relief and rehabilitation), the communities played the most important roles among other concerned stakeholders. In both cases, the communities with social capital are found to be efficient in rescue and relief. In Bhuj, the cases of local Mano and Soni affected community cases show, even in the challenging situation of rehabilitation, communities with social capital can perform well. But social capital is not the sole factor determining speedy and satisfying recovery. As the Mano case indicated, strong leadership inside the community is also essential for any collective action. Also, from various interviews conducted during the field survey in Gujarat, many NGO members commented that community leadership was the most essential aspect of the successful rehabilitation in both urban and rural areas. The results of the questionnaires conducted in Bhuj also show that the Soni community has the highest trust in its community leader. It is the trust of the community in their leaders which helped Soni to take collective decisions in the time of emergency.

The author suggests that the three actions for social capital : recognize, preserve/conserve and invest will lead to “mutually beneficial collective actions” and “shared thinking” in the communities. Shaw and Sinha (2003) proposed a policy framework for a four-tier system of community, local government, state government and central government for effective decision-making under the Risk Management Framework. It is the responsibility of the community and its leaders to increase their social capital and use it effectively for the post disaster recovery process. However, at the policy level, it is required to recognize the social

capital of the communities as an asset. This will help in policy formulation from a grass-roots perspective, and will enhance the recovery program.

RRL - 078

Title The Importance of Social Capital in Disaster Response

Author(s) Dynes R.R. 2002
University of Delaware. Newark. De

Key themes Disasters and Social Capital

Summary

Article describes social capital as aspects of social structure and as a resource to achieve goals. It also describes about disaster- its definition and research base and how social capital can be helpful in disaster response.

Disaster Response

RRL - 079

Title Disasters and Social order

Author(s) Gary A Kreps

Sociological Theory, Vol 3, No 1 (Spring 1985) pp 49-64

Key themes Disaster Response; structures and Human Agency

Abstract

The paper suggests some answers/guidelines to the above question and emphasizes the need for taxonomies to link properties of disasters and properties of social structure. There is much debate on what is disaster. The paper proposes, following from several other authors such as Fritz, Dynes on four core properties of disasters: Disasters are *events* that can be designated in time and space. These events have *impacts* on the *social units*. These units enact *responses* related to these impacts. The paper suggests a 64 – cell taxonomy of the responses of social units to the threat or occurrences of disasters are suggested as a solution to enable the linkages after disasters. The taxonomy highlights the dialectical relation between social action and social order. This dialectical relation is expressed by a metric which merges qualitative descriptions of the content of the social structure with quantitative depictions of its forms.

Research Question(s)

How are disasters and social structure related? How does disasters affect social structures and social orders?

Research Methodology

Review of existing literatures and studies

Concepts used/Conceptual Framework

Social Structures and disasters

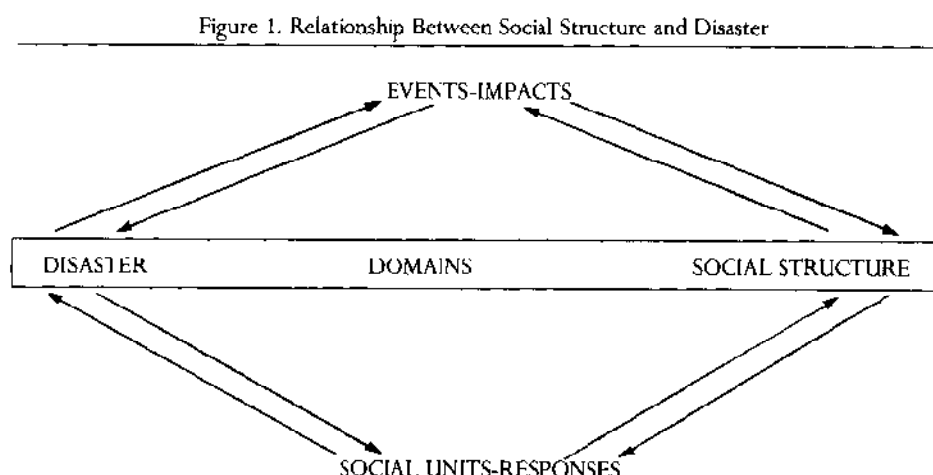
In early literature social structures are considered as forms of human association– and a study of social structure is a study of social units and responses. In this paper, problems of defining and classifying social units is identified and solutions suggested.

Social Structure and social order :

The paper asks the question, assuming that structure exists, : how is social structure created and how is it maintained – namely the question of social order. The authors suggests that human responses to disaster highlight that social structure and social order are dialectically related. That is both are autonomous but both can be reduced to one another. They suggests that that people are making choices and creating social structures when routines are disrupted.

However the importance of already existing social structures – for eg police, hospital personnel, etc cannot be denied. They are in the disaster context ritualizing their already existing roles. In other words, social action is both the cause and effect of social order. Interpreted as social order, what is evidenced are the social units of various types. Some exist prior to the event – others are new. And these units – while can be considered fixed are transformed by the action of human beings. That is social order is both the cause and effect of social action. This is the dialectic of social structure.

The paper also suggests a revision of Fritz (1961) definition which points to the relationship between disaster and social structure. The revised definition suggested is “disasters are events in which societies or their larger subunits (eg communities, regions) incur physical damages and losses and/or disruption of their routine functioning. Both the causes and effects of these events are related to the social structures and processes of societies or their subunits”. This is shown diagrammatically:



The paper uses the bridging concept of “Domains” to show this relationship between disasters and social structure. Domains represent actual or threatened impacts as legitimated spheres of collective action – and a building of an organization/association.

The continuous arrows show that disasters and social structures are at once antecedents and consequent of each other. Pre- and post impact domains capture the life history of disaster as historical happening or the temporal dimension of the disaster.

Responses to disasters as alternative forms of association:

Responses to disasters reflect alternative forms of association. These forms are enacted by different types of social units. The authors study of the disaster archives for 15 disaster events (earthquake, floods, hurricanes, tornadoes) show 423 instances of organization.

TABLE 4:
TYPE OF DISASTER DOMAINS OF ENACTING UNITS

Hazard-vulnerability analysis	3	.7
Standby human and material analysis	6	1.4
Disaster preparedness, planning and training	11	2.6
Public education	0	0.0
Hazard mitigation-structural	0	0.0
Hazard mitigation-nonstructural	0	0.0
Insurance	0	0.0
Issuance of predictions and warnings	11	2.6
Dissemination of predictions and warnings	15	3.5
Evacuation	24	5.7
Protective action	17	4.0
Mobilization of emergency personnel and resources	70	16.5
Search and rescue	29	6.9
Medical care	24	5.7
Care of fatalities	5	1.2
Providing victim basic needs	50	11.8
Damage needs and assessment	14	3.3
Damage control	33	7.8
Restoration of essential services	21	5.0
Public information	20	4.7
Traffic control	31	7.3
Law enforcement	3	.7
Local governance	1	.2
Coordination and control	21	5.0
Reconstruction of physical structures	6	1.4
Reestablishment of economic functioning	2	.5
Resumption of other social institutions	2	.5
Determining liability for the event	0	0.0
Reconstruction planning	5	1.2
Totals	423	100.0

The four basic elements found in these 423 instances of organization were:

- A – Activities
- R - human and material resources
- T – Tasks
- D – Domains

These four elements are individually necessary and collectively sufficient for organization to exist. Each of the four elements represents a unique expression of social structure, that their mutual co-presence points to the existence of an organization.

For example, an organization of search and rescue emerges after an earthquake.

Few individuals from neighbouring area join the search activities (A). These may include indiv with training or formal agencies such as municipality and voluntary groups (R). A task structure emerges from these groups within several hours of impact (T). A legitimacy of an integrated search and rescue operation is not officially recognized by govt officials until about 12 hours after the impact (D). The research gives different forms of permutation combinations of ARTD.

Domains (D) and Tasks (T) are the ends of the organization while Resource R and Activites A are its means.

Domains are external and in the durkheimian sense real and constraining. They are individually created and legitimated. Domain points to a form of association that is distinct from all others.

Its establishment may take place during any point of origin of the organization.

Following from the above, a use of 64 cell taxonomy of associations is proposed:

TABLE 1:
TAXONOMY OF FORMS OF ASSOCIATION

<i>Organizational Forms</i>	<i>Marginal</i>	<i>Three Element Forms</i>	<i>Two Element Forms</i>	<i>One Element Forms</i>
D-T-R-A	167	D-T-R	D-T	D
D-T-A-R	5	D-T-A	D-R	T
D-R-A-T	27	D-R-A	D-A	R
D-R-T-A	53	D-R-T	T-R	A
D-A-T-R	2	D-A-T	*T-A	
D-A-R-T	1	D-A-R	T-D	
T-R-A-D	21	T-R-A	R-A	
T-R-D-A	4	T-R-D	R-D	
T-A-D-R	*	*T-A-D	R-T	
T-A-R-D	*	*T-A-R	A-D	
T-D-R-A	1	T-D-R	A-T	
T-D-A-R	*	*T-D-A	A-R	
R-A-D-T	15	R-A-D		
R-A-T-D	13	R-A-T		
R-D-T-A	67	R-D-T		
R-D-A-T	12	R-D-A		
R-T-D-A	4	R-T-D		
R-T-A-D	13	R-T-A		
A-D-T-R	1	A-D-T		
A-D-R-T	1	A-D-R		
A-T-D-R	2	A-T-D		
A-T-R-D	4	A-T-R		
A-R-D-T	5	A-R-D		
A-R-T-D	5	A-R-T		
Total	423			

*Indicates forms not located with reference to origins of organization

Conclusion

Analysis of social structure and disasters shows that actual or threatened impacts translate as domains of collective action that are enacted as alternative forms of association. This translation is a part and parcel of social construction of a set of circumstances or events called as disasters.

RRL - 080

Title Governmental Response to Disasters : The conflict between Bureaucratic Procedures and Emergent Norms

Author Sandra K Schneider

Public Administration Review, Vol 52, No 2 (Mar- Apr 1992), pp 135-145

Key themes Disaster Response; structures and Human Agency

Summary

The article suggests that the key to a successful govt response rests on the extent to which post disaster human behaviour corresponds to prior govt expectations and planning. In the aftermath of every disaster – there is always a gap between emergent norms that guide social interactions and the bureaucratic norms that dominate the govt activity. Examining US's efforts in handling disasters in five contexts – which include both the successes as well as failures, shows that when the gap is large, the relief effort – is perceived as failure, when the gap is small – perceived as success.

Thus the gap is the primary determinant of public perceptions about the success and failure of govt efforts.

Research Question(s)

Why are some govt disaster relief efforts perceived to be successful while others are believed to be failures?

Research Methodology

Review of literature on five disaster contexts in US namely impact of Hurricane Hugo in a)Caribbean islands b)South Carolina c) North Carolina in 1989 and d) Loma Preita Earthquake in Carolina in 1989 e) Floods in South Carolina in 1990.

Analytical Framework

Bureaucratic norms, emergent norms and relation between the two:

Bureaucratic norms:

They include : explicit objectives, formal structure, division of labour, and set of policies and procedures guiding organizational activity

Emergent norms:

They include : a) collective behaviour (defined as non institutionalized interactions and behaviour patterns b) widespread search for meaning amongst the affected population – also called as the milling process.

Milling process:

The milling process represents situations where people do not know how to act because their usual sources of guidance are unavailable or are irrelevant. During the milling process, new

forms of interactions emerge among affected population

Keynoting process:

The selection of specific ideas and the concurrent elimination of others is called keynoting. This means that specific themes and symbols will eventually give meaning to the disruptive events. Keynoting provides potential direction for group activity, eventually enabling the affected population to end the milling activity.

The dominant symbols and ideas which emerge during the keynoting activity create a new set of norms to guide the behaviour.

Milling and keynoting in the five disaster contexts in US:

The govt response in Hurricane Hugo in Caribbean islands in 1989 – suggests that the govt could not deal with the situation and the institutionalized govt response broke down completely. There were instances of social unrest and disorder. The gap between bureaucratic and emergent norms was very wide.

South Carolina's experience with hurricane Hugo in 1989 suggests that milling process began immediately. While there were no instances of social unrest, many small towns or cut off areas received little outside assistance and relief. The sense of helplessness and anomie intensified among the victims as recovery efforts progressed. A nationwide perception developed that the govt disaster recovery efforts particularly that of FEMA were a failure.

Experience of Hugo in North Carolina represented a more optimal response pattern. The gap was virtually non existent. The emergent norms were supportive of existing policies and facilitated recovery activities. – this was a more conducive environment for the govt agencies and there was little need to deviate from the standard operating procedures.

The Loma Prieta Earthquake in California in 1989 suggests that although the authorities did deal with the immediate dangers of the earthquake, they were less successful with long term aspects of relief efforts. Some officials also disseminated inaccurate information. The milling process began during the recovery phase as the population realized that life would not immediately return to normal.. However there was also a popular belief that public institutions were not solving the problems. The keynoting behaviour in California was largely carried out by the mass media . The dominant message was that FEMA was incapable of providing assistance to survivors. The emergent norm in this context was an extreme sense of disillusionment.

Finding(s)

Conflict between Bureaucratic and Emergent norms is the key to success or failure of the responses.

Two distinct norms operate together – bureaucratic and emergent after disaster and the sources of the two are largely independent of each other. As a result some gaps exist. The article suggests that it is the extent of the gap between govt plans and needs of affected population that determines successes or failures of the relief efforts.

RRL - 081

Title Response to Social Crisis and Disaster

Author(s) E L Quarantelli; Russel R Dynes

Annual Review of Sociology, Vol 3 (1977) pg 23-49

Key themes Disaster Response; structures and Human Agency

Abstract

The authors in this paper selectively summarise and highlight the basic substantive and structural trends from the literature which assumes disaster primarily a social phenomenon. The authors through this review highlight what has been ignored so far in the disaster literature. Their review also refer mainly to post 1960 articles and studies, including several studies involved in the codification of the disasters. These codifications include works on general codification as well as series of codification attempts on more specific topics.

Trends/perspectives discussed in the paper:

1. Efforts at Codification:

The first codification of findings was done by Fritz in 1961. However almost no systematic work has been done to examine what Fritz indicated the positive outcomes of the disasters – the importance of the therapeutic community in softening the psychological impact for victims. A decade after Fritz's article, Barton (1970) wrote most sophisticated general codification effort. Barton singles out key problems of indiv behaviours in disasters, such as matter of role definition, role competence, and possibly role conflicts during emergencies. Other includes question of coordination of indiv and organizational behaviours in disasters. They highlight complex inter-relationships between factors such as organizational mobilization and rate of non adaptive behaviour of individuals in emergencies. It further explains the rise of therapeutic community and what factors affect individual behaviour with respect to community and comes out with different kinds of propositions such as : subjective deprivation makes for less sympathy and identification with the victims; conversely, the more people feel relatively better off than others, the more concerned are they with the deprived. He thus derived empirically testable hypothesis as well as the theoretical frameworks within which they were located.

Another recent codification effort was that by Dynes in 'organized behaviour in disaster : 1974; in American Society. Dynes suggests that organizational mobilization can be examined by separating out four different types of groups likely to respond to disasters – namely established, expanding, extending, and emergent organizations. It also shows how community disaster structure emerges from the creation and coordination of task subsystems. However little attention was given to indiv or families. In yet another effort, Mileti in 1975 in 'Human Systems in extreme environment : A sociological perspective' systematically extracts findings across a range of levels, from individual to groups, organizations, community, society and to international level. Mileti suggested that largest amounts of study were at the level of individual and then at the group. In another monograph on 'Organisational communications

and decision making in crisis by Dynes and Quarantelli 1976, using 35 sources generated 294 propositions. Of the total number 125 treated decision making as dependent variable and 21 treated it as the independent variable. Stallings in 1977 used fourfold typology of organized behaviour in disasters – established, expanding, extending and emergent groups and examined three empirical research to find out what kind of typology did they generate – which led to seventeen different propositions. Apart from the above the codification efforts included early warning systems (McLukie 1971), police/civil defence - civilian relations in disasters (Kennedy 1969; Anderson 1969), community conflict in disasters, communications in disasters (Stallings 1971), and panic behaviour (Quarantelli 1977).

The problems with these codification was that the studies treated all data sources as having equal validity and acceptability. For eg propositions based on solidly derived evidence were given no more weight than that derived on chance observations. However, the positive factor is that although the data sources do not overlap, they converge on roughly similar kinds of propositions.

2) Social organizational rather than social psychological emphasis

The reasons for behaviours were set in seeking explanations in the social setting or structure, rather than the psychological make up of individuals. Fundamental questions about groups as groups, their composition, and behaviours and their inter-relationships were addressed in research efforts.

3) Groups rather than individual as basic units

There is a move from socio-psycho to socio-organizational studies that is explanation is sought in social setting or structure rather than psychological make up of the individual. The unit of analysis was group rather than individual.

The groups level study looked particularly into different kinds of organizations – for example response of police, utilities, hospitals – and suggested that the effectiveness and efficiency of disasters are dependent on viability of emergent organizations rather than psychological states or readiness of individual victims. (Dynes 1975)

Three problems on research on organizations include the fact that key groups operative do not have classic structural boundaries like that of bureaucracy – for eg Red Cross has amorphous boundaries, and few clear cut members, vague lines of authority – and methodologically it is not clear as to how they should be studied. Further many informal groups lack the assumptions held by sociological theories – division of labour, lack of communication systems. The stratification system – hallmark of formal organizations. Finally, disaster situations tend to be peopled by emergent groups which have no existence before and now have a transitory existence – but their existence is crucial to the response systems. They include temporary search and rescue teams; community-coordinating groups. Formal organizational theory is deficient on the analysis of such emergent groups.

4) Increasing use of Systems notions:

Disaster situations are often led by emergent groups who have transitory existence – but play

an important role in disaster situations. Formal organizational theory is deficient on the question of such emergent groups. Thus new conceptualizations such as collective behaviour theories or open-system theories had to be built.

The notion of system was used to accept existence of “emergent groups”. This means – given the assumption of a “system” you ask “ What services were delivered by the mental health system after X tornado?” How efficient was the system in this delivery? Was there a delivery system or none at all before the disasters?”

An interdisciplinary research – for eg by Mileti (1975) asserted that “ the concept of system stress appears to be a mechanism whereby research findings from studies of disaster might, first be integrated together and second, linked to other areas of inquiry in the social sciences”. It also suggests “system independence can be maintained, and the consequences of stress within any one systemic level, eg group, organization or community, can be investigated. In the same way, system interpenetration can be recognized and researched at several systemic levels, such as effects of psychological stress or biological functioning, or the effects of organizations stress on the power structure in the community”. This perspective is seen as allowing disaster to be viewed as events influenced by ongoing system process.

5) Combination of collective behaviour and complex organization approaches:

The area of collective behaviour or social organization is no more distinct. Research also shows that established and traditional organizations facilitate or creates conditions for emergent organizations – and therefore require both perspectives of collective behaviour and that of complex organization.

6) Pre-Impact period as a source of post impact changes

Disaster research have argued for the “principle of continuity” that is pre-disaster behaviour is probably the best indicator or trans – and post disaster behaviour (Quarantelli 1977). This principle of continuity applies to organizational behaviour as well as behaviour of individuals. For example, there is not much increase in mental health problems after disasters – if mental illness is examined. However, an exception is the destruction of community context in the Buffalo creek flood dam disaster which resulted in widespread and severe psychopathology – this is one of most disrupted community context and led severe mental illnesses.

7) Functional and dysfunctional long run consequences

Studies such as that by Rossi focused on “ How long it takes for communities to recover from disasters of different types, of varying intensities, and with communities with different characteristics”.

Some studies such as that by Drabek et al 1973 showed that communities were better off with respect to family solidarity. Other studies in Disaster Research Centre (DRC) , Colorado also showed that organizations and communities are better off than before in terms of power positions.

In other words disasters contribute to both stability and to change – they generate both

consensus and conflict (Quarantelli & Dynes 1976). This is a step away from the assumption that all disasters are bad – and sociologists have discovered that both good and bad can come out of disasters. Such a lead was given as early as by Prince in 1920 in his work on Halifax explosion – “Catastrophe and social change” .

8) Model building

Schatzman (1960) developed a sequence pattern model of disaster and its consequences for community that emphasized continuity between disaster and non disaster behaviour. Some models are very detailed – for eg, Mileti’s 1974 causal model of warning responses for individuals – it links three exogenous variables (incomes, severity of last experience and number of children) with three intermediate endogenous variables (degree of personalness of warning system mode, degree of warning confirmation behavior, and degree of specificity of warning sought) and a final outcome variable reflecting degree of adaptive response (from doing nothing to evacuation).

Other models includes one that combines open systems and collective behaviour theories, for eg those developed by the DRC.

9) Gaps and Challenges

Much of the research undertaken so far has undermined widespread public beliefs and perceptions. For eg, although sufficient evidence shows that there is rarely any looting after disaster in America, this still has to be tested in other countries too. Thus one of the gaps is that the dominant contexts of these studies have been US and therefore the conclusions still have to be tested in other social contexts. Thus more crosscultural studies are needed.

The authors – quarantelli and Dynes lament that the political nature of disaster phenomenon has not been sufficiently addressed to – although argued by Brown and Goldin as early as in 1973.

RRL - 082

Title The Human Being in Disasters : A Research Perspective

Author(s) Charles Fritz, and Harry Williams

in "Annals of American Academy of political and social science, Vol 309, Disasters and Disaster Relief (Jan 1957) pg 42-51

Key themes Disaster Response; structures and human agency

Abstract

Many groups and agencies have a vital need for accurate information on how people behave in disasters. This article questions the popular notions of the disasters as represented in the media and based on a number of research findings presents alternative information pertinent to disaster preparedness, control and amelioration. Basing itself on facts rather than popular conceptions, the article discusses how to make disaster warnings effective, behaviour during disasters and the subsequent emergency periods, the problem of people flocking to the area, the need and difficulties of coordination and control of relief activities and trauma of the victims and sources for conflicts between relief agencies and their clients.

Popular perception of disasters Vs real picture : How do people behave in disasters?

According to the popular perceptions, after disaster strikes, people panic, they trample each other, losing all concern for their fellow human beings. After the panic has subsided, they turn to looting and exploitation which the community is rent with conflict. Large number of people are left permanently deranged mentally. This picture is continually reinforced by television prog, journalistic accounts, novels, movies and radios. However those experienced in disasters reject this picture as a product of ignorance, inaccurate observation and fertile imagination. However, in more subtle forms, these stereotypes affect disaster officials and experts and affect their plans. It also affects both the general public and persons who are responsible for protecting and helping the public during disaster.

Since 1950s there have been a number of studies on behaviour of people during the disasters which have tested these popular conceptions. Since most of the popular conceptions focus on 'abnormal', this article focuses on correcting these perceptions by drawing upon the studies which represent the more 'general' and are 'typical' in disaster contexts – in order to influence and correct the perceptions and practices of those involved in disaster response work. Particularly those findings are presented that have a pertinence for disaster amelioration, preparedness and control.

1) Disaster Warnings

By and large official worry about giving disaster warnings as they fear that it will cause panic amongst the people. However extensive evidence now suggests that there is no need to fear about such reactions of panic. In fact, an effective message must be clear and specific. Warning messages must be transmitted accurately through channels that will reach entire public.

Research shows that people are reluctant to heed to the warning messages for several reasons - Lack of past experience with disasters the delusion of personal invulnerability (the feeling

that it won't get me), dependency upon protecting authorities, reluctance to abandon property and personal possessions was also a common factor weighing against acting on early warning. This does not mean that effective warning is impossible. It means that it is important to look into the human factors in planning of the early warning system.

2) Survival Behaviour

When danger is imminent, people take to flight or taking shelter by combating the hazard rather than freezing up or not acting at all. Flight or Fight is the normal behaviour in and during when hazard strikes. However, flight does not mean panic or uncontrolled flight. It is most often orderly with people continuing to think about others and making rational judgements. Further during the actual impact, people may try to stay alive and also protect their immediate loved ones – for eg Mothers protecting their children...

3) Behaviour during post disaster phase : Social disorganization as an impact

Most people may be stunned, confused, and somewhat disoriented after the impact, they gain sufficient self control to help their kin, family, neighbours and friends. The first one and one – half hours of the disaster is practically in the hands of the immediate neighbours the problem of moving bodies and saving lives was in their hands. This does not however mean that outside relief support is not needed. Much of the relief activity of the community is sporadic and along the lines of kins and intimacy and therefore general community needs remain unattended.

To an outsider, the initial behaviour of the persons may sound to be too chaotic as behaviours are very heterogeneous – some are standing around, others digging debris, helping the injured etc. Because the behaviour is too heterogeneous, it cannot be described in few categories. It is this lack of uniformity of actions that leads an outsider to erroneously conclude that people have panicked.

Fritz suggests:

“What the outsider observer is witnessing is not panic but social organization – uncoordinated activity on a general, community level. It is important to recognize that this social disorganization does not necessarily indicate individual irrationality or personal disorganization. Many individuals and small groups are working within the disaster area with purpose and some degree of organization. However they are likely to be focused on discrete, limited tasks and to appear oblivious to the more general needs for assistance. The central problem of disaster management is to broaden the focus of attention and reestablish general, coordinated action for this mass of individual and small group actions” (pg 45-46)

4) Convergence :

One of the problems of disaster coordination and control is not from the victims but from the influx of outside – informal and spontaneous actions of persons residing outside the disaster area. This mass assault sometimes seriously hampers the work of administration and organized rescue, medical , relief and rehab programmes.

Effective convergence and coordination requires recognition of the different motives of the convergers. The problem is narrowly conceived as that of restraining "sightseers", looters, and other unauthorized personnel. This is erroneous notion of people coming from exploitative motivations. The actual difference in incidence of looting and other forms of exploitation during peace time and disasters is relatively insignificant. Rather the actions are also motivated by wanting to assist, sympathy, anxiety. Satisfaction of these needs require guidance than indiscriminate restraint.

5) Coordination and Control : how to achieve this?

There are several factors which make coordination difficult amongst which are:

-Effects of Convergence behaviours

- Lack of workable pre-existing plans on a community wide basis. Sometimes, community wider disaster plans exists only on paper – if they are to be made effective then they must be understood and accepted by all those who have a part in them, including general public.

- Inadequate communication or an ambiguity concerning agencies or officials who have the authority to take decisions.

-Disputes between authorities on responsibilities

-Lack of central coordinating mechanism

6) Psychosomatic help

People suffer psychosomatic trauma after disasters. However, they do not drain the psychiatric medical units. Anxieties concerning future are common and effective treatment lies in alleviation of the situations which produced them. Rapid reuniting of families, restoration of familial and occupational routines, rapid and efficient efforts of reconstruction and rehab, can alter these effects. A small proportion may require psychiatric help.

7) Social Solidarity : Integration and disintegration of social solidarity, reemergence of social differentiation process.

There is a dynamic increase in the social solidarity after disaster amongst the affected populace immediately after the emergency. This is due to survival threat as well as common suffering produced by disasters tending to breakdown of pre-existing social distinctions, and altruism.

During first few days, affected people act on common human needs rather than in terms of predisaster differences in social and economic status. This solidarity facilitates recuperation.

If there is no recurrent or persistent survival threat, then after the various emergency tasks are done, the newly engendered social solidarity gradually disintegrates. The process of social differentiation returns and standards of reference change from values of survival to values associated with continuity and stability, in terms of effect on themselves and their intimates rather than the whole community as a whole. Property values and concern with material symbols of status reassert themselves.

Social Conflicts and resentments may also reappear and pre-exisitng conflicts may be

intensified by disaster experience.

Thus what is observed is a rapid shift of values from normal to emergency, from social differentiation to social homogeneity and the uneven, selective return to normal standards. This requires developing greater sensitivity to prevailing climate for aid agencies. Further while While conflicts may develop, newer forms of cooperation also are seen to arise.

8) Coordination and preparedness

Most of the human problems lie in lack of coordination amongst people, small groups, officials disaster response agencies each of whom is viewing and attempting to fulfill the needs in their own perspective and capabilities.

When communities or groups do not have practiced plans of actions which are a part of overall disaster response plan the action is too dominated by immediate present. The challenge lies in development of realistic plans for organizing, training, integrating, and coordinating the actions of both general populace and formal disaster agencies.

RRL - 083

Title Complexity and Diversity : Unlocking Social Domains of Disaster response

Author Dorothea Hilhorst

In Mapping Vulnerability : Disasters, Development and People

Key themes Disaster Response; structure and human agency

Abstract

Outlining the key debates and use and limitations of Structuralist or behavioural paradigm – with first one emphasising structure for action, while the other agency; this paper suggests that the complexity or mutuality paradigm could offer more insight into understanding disaster and responses. However, whilst doing so, it also brings in a new concept of ‘social domains’ within the complexity theory to enable and account for diversity and human agency in responding to risks and disasters.

Summary

Complexity theory and disaster studies: Complexity theories are concerned with stability and change in any systems that are complex – that is consisting of independent agents that interact with each other. While this makes the system inherently unstable, leading to unpredictable and non linear change. This is expressed through principle of spontaneous self organisation – that is interactions within systems and between systems and their environment. Complexity theory is relevant for the disaster studies as they provide an entry point to describe disasters as interaction between two systems – nature and society or hazard and vulnerability. Disasters are caused by natural hazards which result from the complex interaction between nature and society.

Following from the complexity theory – three strands of theories have emerged in the disaster context based on chaos, dissipative structures and adaptive systems. In the chaos theory, change occurs as a result of interaction of different elements in an open system resulting in unpredictable patterns of change. The term dissipating structures emerges from imbalances in chemical and physical systems – which leads to spontaneous formation of new structures. Self organisation in this case, ‘is a property of systems that is triggered by interaction with external factors’. The third strand of complexity theory centres on the notion of complex adaptive systems. The difference between this and the earlier two, is that the adaptive systems have the potential to learn by experience, especially to process information and adapt accordingly. Adaptive systems are not passive but try to turn whatever into their advantage.

It has been argued that paradoxically, much of the work of the complex theories is inspired by the commitment to discover principles of predictability and thus of control at the metal level. Instead, it is suggested that complexity could be treated as ‘instead of capturing and controlling complexity, the challenge then becomes to acknowledge multiple realities’.

To enable a movement towards acknowledging the multiple realities, the author suggests that instead of systems a concept of ‘social domains’ be brought in to do justice to the dynamics of societies and disaster responses. She suggests that the very idea of system supposes that elements of a system relate in a functional and predictable ways. The notion of social domains refer to the central cluster of values, which are recognised as a locus of rules, norms and values implying a degree of social commitment. In social domains of response to disasters, ideas and practices of risk are shared, exchanged and organised due to physical or discursive proximity to the way in which they are referred to by the people. Domain also emphasises the idea of use of languages – but particularly also the contestation, conflict, and negotiation and differential interpretations inherent in this language.

The authors suggests that the three main domains of response to risk and disasters are the domains of science and disaster management; the domain of disaster governance; and the domain of local responses. Each is associated with particular discourses through which meanings are given and therefore are different ways of experiencing and producing nature. These domains are also differentiated and constitute multiple realities. At the same time, there are common aspects in different domains than that apparent at the first site. This property of domains would be the key to developing alliances between common positioning through alliances across domains around policies in disaster responses.

RRL - 084

Title Local knowledge on disaster preparedness: A framework for data collection and analysis

Author Dekens J.

Sustainable Mountain Development (2007). Vol. 52

Key themes Disaster Response and human agency

Summary

The article focuses on the research question like- how do we document local knowledge on disaster preparedness? It argues that not much has been done on this front but it needs serious consideration of the researchers.

RRL - 085

Title Disaster risk management programme 2002-2007

National Disaster Management Division. Ministry of Home Affairs. Government of India. UNDP India.

Key themes Disaster Response and Human Agency

Summary

The thematic focus is on awareness generation and education, training and capacity development for mitigation and better preparedness in terms of disaster risk management and recovery at community, district and state levels and strengthening of state and district disaster management information centres for accurate and timely dissemination of warning. The overall goal of the programme is "Sustainable Reduction in Disaster Risk in some of the most hazard-prone district in the selected states of India."

RRL - 086

Title Images of Withdrawal Behaviour in Disaster: Some Basic Misconceptions

Author(s) Enrico L. Quarantelli

Social Problems. Vol. 8. No. 1. pp 68-79; 1960

Key themes Disaster Response and Human Agency

Summary

In 1950s, the research efforts of social scientists have increasingly been directed to the reaction of people and communities in disaster situation. Much of the research has been stimulated by the threat posed for American society by nuclear warfare and the necessity of deriving civilian defence measures. However, disasters are not confined to wartime and research in the area has theoretical as well as practical implications. The present paper assumes this larger framework.

RRL - 087

Title Sociological Enquiry and Disaster Research

Author(s) Gary A. Kreps

Annual Review of Sociology. Vol. 10. pp 309-330; 1984

Key themes Disaster Response; structures and Human Agency

Summary

This article reviews and critiques recent studies of hazards and disasters from a general sociological perspective. Historical attempts to define and interpret disasters in sociological terms are important and such efforts inevitably raise basic questions about social order. It also reviews the kinds of questions that sociologists have been asking about the social order, as evidenced by several recent large scale studies. Paper closes by presenting some comments about interdisciplinary and cross-cultural research on disasters.

RRL - 088

Title Disaster and Governments

Author(s) Morris Davis and Steven Thomas Seitz

The Journal of Conflict Resolution. Vol. 26. No. 3. pp 547-568; 1982

Key themes Disaster Response; Structures and Human Agency

Summary

The article examines why disasters of similar types differentially affect countries throughout the world. Despite a plethora of studies in the disaster field, such a theme has hitherto not been systematically pursued. Concepts of government effectiveness, government instability, available resources and social context are incorporated into a structural model that seeks to explain differentials in impacts.

RRL - 089

Title The Impact of Natural Disaster on Third World Agriculture: An Exploratory survey of the neo for some new dimensions in development planning

Author Long, F.

American Journal of Economics and Sociology. Vol. 39. No. 2. pp 149-163; 1978

Key themes Disaster Response; Structures and Human Agency

Summary

This is essentially an exploration of the available information on the efforts of natural disasters on Third World agriculture. The effects are a powerful partial explanation of the lack of agricultural self-sufficiency in a large number of low income countries. The paper argues for systematic collection of economic data on disasters and its analysis and for the establishment of agricultural planning mechanism in natural disaster prone developing countries to mitigate the adverse effects of such disasters. The paper also sets out the need for international action on a continuing basis in this field.

RRL - 090

Title of article Disaster and Deritualization: A re-interpretation of findings from early disaster research

Author(s) Alex P. Thornburg, David J. Knottnerus, and Gary R. Webb

Social Science Journal. Vol. 44. pp 161-166; 2007

Key themes Disaster response; Structures and Human Agency

Abstract

Paper focuses on how ritual practices are disrupted in disasters and the ways people deal with those situations. Structural ritualization theory is employed to conduct the investigation on deritualization which refers to the breakdown or loss of ritualized activities that occur in daily life.

RRL - 091

Title Cyclone mitigation, resource allocation and post-disaster reconstruction in South India: Lessons from two decades of research

Author Peter Winchester

Disasters. Vol. 24. No. 1. pp 18-37; 2000

Key themes Disaster Response and Human Agency

Summary

This paper opens with a history of development and disaster prevention strategies in a cyclone prone area of the east coast of India and traces the evolution in the area of British and Indian governments programme and policy over a century. It presents evidence that suggest that NGOs supported co-operatives are best ways to achieve reconstructions.

RRL - 092

Title Local Level Risk Management

Author(s) Aslam Perwaiz, Balaka Dey, Didier Trebucq, G. Padmanabhan, Irene Stephan, Kalika Mohapatra, Rahul Sengupta and Sushil Chaudhary
Government of India. Ministry of Home Affairs; 2001

Key themes Disaster Response phases and Human Agency

Summary

The report deals with community based disaster preparedness, its components and the preparation of the CBDP plan-process. It also focuses on the linkages with development programme and strengthening a decentralized approach.

RRL - 093

Title Community based disaster management during the 1997 Red river flood in Canada

Author(s) Jerry Buckland and Matiur Rahman
Disasters. Vol. 23. No. 2. pp 174-191; 1999

Key themes Disaster Response phases and Human Agency

Summary

This paper examines the relationship between community preparedness and response to natural disaster and their level and pattern of community development. It investigates the extent to which the level and pattern of development affects a community disaster preparedness and response.

RRL - 094

Title Links between relief, rehabilitation and development in the tsunami response: Sri Lanka case study

Author(s) Björn Ternström and Ellen Girard-Barclay; Darini Rajasingham; Yashwant Deshmukh; Susanne B. Pedersen

Published by Tsunami Evaluation Coalition; 2006 Can be downloaded from <http://www.tsunami-evaluation.org>

Key themes Disaster Response phases and Human Agency

Summary

The Sri Lanka Case Study identified some of the successes and challenges faced by those in need, and examined the degree to which the initiatives for relief, rehabilitation and development taken by the population were enhanced or hindered by actions taken by outsiders. The study reported little evidence of a systematic planning to address the needs of special needs groups, such as older adults, and people with disabilities, etc.

Vulnerability and Disasters

RRL - 095

Title At Risk : Natural Hazards, People's Vulnerability and Disasters

Author(s) Ben Wisner, Piers Blackie, Terry Cannon and Ian Davis

Routledge, London and New York; 2004

Key theme(s) Vulnerability and Disasters

Abstract

This book – a revised version of the book first published in 1994 challenges the widespread acceptance of the 'natural disasters' being natural and instead emphasise on the social character of the disasters. The authors look into what makes people vulnerable unmasking and the mainstream development model which makes people vulnerable. It suggests two analytical models for understanding of vulnerability. One links the 'root causes' to 'unsafe conditions' in a 'progression of vulnerability' – the Pressure and Release model. The other uses the concept of 'access' and 'livelihood' to unravel why some households are more vulnerable than the others; and finally reflects on how can the world be made more safe.

Vulnerability is seen as ' the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of the natural hazard (an extreme natural event or process). Key variables explaining the impact are class, occupation, caste, ethnicity, gender, disability, health status, age, and immigrations status – both legal and illegal and the social networks of the affected people.

Vulnerable groups also find it difficult to reconstruct their livelihoods which is determined by the entitlements they enjoy – namely the command they have over a particular bundle of goods – information, cultural knowledge, social networks and legal rights, resources such as land and physical resources. This is developed through livelihood access model in the book.

In the analysis of the book, the natural events are only secondary determinants of disasters – and suggest that poor suffer more from hazards than the rich.

The book also argues that phenomenon of disasters need to be placed in the mainstream policy and practice – and show how ‘normal’ historical processes contribute to the causation of the disaster – they show how ‘normal’ pressures in global, regional and national systems of economic, social and political power contribute to creating more vulnerability to disasters. The access model shows how material conditions of daily life impacts people’s abilities to recover and protect themselves from the disasters.

By applying the PAR and Access model to different empirical situations, the authors draw out lessons for recovery and preventive action. They suggest paying special attention to whether and how ‘dynamic pressures’ and ‘root causes’ of disaster vulnerability can be addressed through the ‘opportunity’ that disasters create for a more safer world. They link human development and Vulnerability reduction emphasising an improvement in governance and livelihood resilience and local capacity through development and disaster response intervention.

RRL - 096

Title The Notion of Disaster Risk : Conceptual Framework for Integrated Management
Study coordinated by Instituto de Estudios Ambientales (IDEA), Manizales – Columbia Aug 2003, Inter-American Development Bank, prepared by Omar Cardona et al.

Key theme(s) Vulnerability, Social constructions of Risks and integrated frameworks

Research Question

What are the various nuances of risk management and how are they defined by the various disciplines? How would an integrated risk management perspective look like? What are the conceptual frames needed to undertake such integrated approach?

Research Methodology

A critical review of existing conceptual frames in relation to risks, vulnerability and disasters.

Summary

The term disaster risk suggest that there is a possibility that a dangerous phenomenon or event will occur and that exposed elements predisposed or susceptible to being affected. The reduction of risk therefore means the reduction of possibility of future disaster.

Risk Management therefore implies different policy or strategy components:

Risk Identification – involves both objective estimations as well as social representations or individual perceptions of risk

Risk Reduction – involves mitigation/ prevention

Disaster Management – involves response and recovery
and

Risk Transference – Insurance and Financial protection – found in developed countries only.

Each of the different policy options imply different disciplinary approaches, values, strategies and involve different social actors. Effectiveness can only be achieved through interdisciplinary and integrated approaches. Therefore Risk Management – has two elements – how they are perceived and represented by the society and how they are measured.

Psychologists, Sociologists and historians generally consider risk as a social phenomenon-- considered as constructivist. From this perspective, understanding risk involves an understanding of social representations and individual perceptions and interactions between different social actors. On the other hand, Economists, Engineers epidemiologists suggest that risk can be quantified and objectively assessed. This may be described as a realist or an objective perspective.

This antagonism must be transcended and confidence must be placed on both quantitative as well as qualitative methods. There is a need to understand the subjective risk perception as well as scientific need for objective measurement – leading to a holistic theory of risk.

The estimation of future losses or effects in determined material and social contexts allows for design of measures that avoid or accentuate the consequences of future disasters. The development of techniques need to permit a permanent monitoring of territorial and social accumulation of vulnerability or the evolution of the physical trigger processes. These should be flexible enough to adjust to continuous changes in natural, economic and social environment. Further this calls for less rigid planning models that allow incorporation of instability, uncertainty and surprise. In other words we need a preventive vision of disasters.

II) Conceptual Frameworks to understand and interpret risk, and vulnerability

A) Framework used to analyse the different dimensions and types of vulnerability is the Global vulnerability framework developed by Wiches-Chaux 1989

- a) Physical dimension : depicts locations in susceptible areas who when exposed to a hazard cannot resist
- b) Economic dimension : Poverty increases vulnerability – expressed at indiv level in

terms of unemployment, lack of income and gaining access to services. At national level, economic dependency and associated issues.

- c) Social dimension : higher the levels of integration of community, easier it is to absorb the consequences of disaster and react more rapidly. Societies are less vulnerable when they are organized as a group.
- d) Educational dimension : Lack of knowledge of causal factors and effects of disaster – lack of preparation and understanding of indiv and groups responses to disaster.
- e) Political dimension : Expressed in the level of autonomy the community has in the use of resources and decisionmaking. Participation in decisionmaking that affects the community will help reduce the vulnerability.
- f) Institutional dimension : relates to difficulty in undertaking risk management. Expresses lack of institutional preparedness or mitigation actions when risk is known to exist. Also institutional vulnerability also denotes to excessive bureaucracy, and lack of flexibility.
- g) Cultural dimension : Relates to a way, individuals and groups perceive themselves which leads to particular behaviour.
- h) Environmental dimension : Increase in vulnerability when developmental models are destructive of nature and natural resources. It leads to deterioration of ecosystem and its capability to self adjust.
- i) Ideological dimension : Relates to the ideas and beliefs about the world, its emergence – expressed in fatalistic attitudes.

The notion of global vulnerability by Wilches – Chaux enables us to visualize vulnerability from different angles and perspective.

B) A Summary of different dominant approaches to Risk, Vulnerability and Disaster

- Risk as a social construction – The notion of Risk is based on the individual and collective perceptions, representations and interpretations by social actors. This approach includes the political economy school or those taking a neo-marxist approach - which emphasise social construction of vulnerability and therefore suggests that risk is socially constructed. The Post modern turn in social science by Ulrich Beck, Niklas Luhmann and Anthony Giddens also influenced this approach. For these authors, Risk is linked with societal development and influenced by decision making and communication processes which in turn are influenced by power relations. A theoretical integration is attempted by Kaspersen (1988) in his theory of social amplification which attempts to outlay a causal process integrating technical, social, cultural and psychological dimensions of risk.
- Natural science approach or Realists : Approaches by Engineers etc that risk can be quantified or objectively assessed. This has led to knowledge of at least one component of risk – the hazard. However newer understandings emphasise that Risk cannot be understood only as possible occurrence of natural hazard.
- Socio-technical approach : focuses on effects of the event and not on event itself and on resistance capacity of the structures which signifies a change in paradigm of risk. But while more complete definition is provided, the approach remains based on too many physical effects. Here the term “social impact” refers to number of victims dead, injured. Also territorial planning is done as the assumption is that elements are located in hazard exposed zones and are vulnerable – eg Earthquake resistant level zones in

India. Thus this approach continues to give hazards an over-riding importance. Use of GIS, has also reinforced this view. Vulnerability is used to explain physical damages – and risk is a potential loss. It does not make real reference to resilience or capacity to recover. It also includes contributions from toxicology, epidemiology, natural and engineering sciences based on probabilistic estimation of risk.

- Socio-cultural approach – Initiated through studies of behaviour of the affected population. In a few cases – led to perceptions of individual or collective social units – but not much analysis in how it leads to social gestation of disaster. Some studies have emphasized the capacity of the communities to absorb and recover from the event. It also includes psychometric analysis and unlike socio-technical approaches do not offer common denominator for measuring social and cultural acceptability of risk.
- Risk as socio-economic and political process : This is more towards the end of 20th century – where social aspects of vulnerability are over emphasized – sometimes ignoring the environmental and potential physical damage in conceiving and estimating risk. Vulnerability is tended and interpreted as a characteristic and not as a condition or predisposition to damage – due to lack of resilience or capacity to recover.
- Vulnerability as a factor of risk : Some authors analyse vulnerability as risk and not as a factor of risk – forgetting that without a hazard there would be no risk. The greatest defect here is the argument that risk is something subjective and no attempt is made to estimate it.

C) Concepts of Risk in these different kinds of theorizations:

All concepts of risk have a common element – that is distinction between reality and possibility. Thus risk can be defined as “ the possibility that an undesirable state of reality (adverse effects) will occur as a result of natural events or human activity” (Luhman 1990). Risk is thus a descriptive concept which takes a normative dimension.

The different conceptualizations approach three questions inherent in this understanding of risk in different ways:

- How may we specify and measure uncertainty?
- What are undesirable results?
- What is the concept of reality we hold to? (Renn 1992).

Thus risk reduction can be understood as having two ends of a continuum – namely as a) objectively associated activity in terms of measurable in probabilistic terms damage, resources given according to the greatest risks, and b) as social or cultural construction where interventions are based on social values, priorities and lifestyles.

D) Overcoming limitations of the objective and constructivist paradigm by an integrated risk management paradigm:

- Need to take into account qualitative as well as quantitative methods
- Subjective risk perception and Objective risk measurement.

This means that an integrated approach to risk management require a series of measures, tools for intervention in hazards and vulnerabilities to reduce or control future possible risks –

in other words we require a preventive view of disasters. It also needs to be participatory and involve social, institutional, public and private forces on a broad and an inclusive basis.

RRL - 097

Title Introduction : Mapping vulnerability

Author(s) Dorothea Hilhorst and Greg Bankoff
In 'Mapping vulnerability: Disasters, Development and People' edited by Greg Bankoff, Georg Frerks and Dorothea Hilhorst, Earthscan publication, UK & USA 2004

Key theme(s) Vulnerability and Disasters

Summary

The context of vulnerability:

Early formulations in 1970s have characterised the relation between environments and human societies in too – technocratic terms – associated with western norms. However, more and more disasters are being viewed as a result of the human actions – as Lewis (1999) says – the 'actualisation of social vulnerability'. Blackie, Cannon et al have argued that while hazards are natural, disasters are social. This needs to be understood in terms of individual, households, a community or a society's vulnerability. Further, the characteristics of class, gender and ethnicity determine vulnerability (Cannon 1994). This links risks with people's abilities – social, economic, and cultural abilities to cope with the damages incurred.

Vulnerability rather than poverty is a useful concept than poverty in disaster policy making although there are useful overlaps. All the three – disaster, poverty and vulnerability are a part of the framework – through which humans and individuals cope with the risks in their lives.

However, vulnerability is sometimes looked upon as a property and not as a result of social relations. Lewis suggests that vulnerability could be looked upon as a changing social, and economic condition in relation to hazard and is dynamic in nature (Lewis 1999). Development processes also create vulnerability. Further, understanding vulnerability means understanding people's experiences and perceptions of vulnerability – local knowledge. Vulnerability does provide a conceptual link between disasters, development and people.

History of vulnerability

Vulnerability is not just about present but about the history of a place – which has shaped the 'present'. For eg, Susman et al (1983) suggests that 1975 earthquake in Guatemala was more of a 'classquake'. That is the present conditions is the outcome of the past factors that transform the hazard into a disaster. A more holistic appreciation between environment and

societies is needed.

Vulnerability and people

People's perception leads them to act in particular ways. People's perception's can be categorised in three different domains of knowledge – science, governance and local custom. Further knowledge is related with power, - both in local and global sense.

Dynamics of vulnerability

Vulnerability is not a property of social groups or individuals but is embedded in social relations and processes. Thus we can then understand what makes people vulnerable – just as what processes - at different levels make people resilient . What is then needed is a transdisciplinary approach to understand vulnerability. However class, age mobility etc can be seen as markers of vulnerability. Further, vulnerability also has temporal links – (Holling 2002). People's vulnerability builds up over time – and varies through rapid variations in economic, social and environmental conditions – are sometimes compounded by cyclical or seasonal changes.

Management and governance:

Disaster management has been a subject of hierarchical forms of governance – for eg armed forces delegation etc (Hewitt 1983). However this top down style has been criticised with an advocacy for the participatory forms of management. What ultimately emerges is a plea for adaptive forms of management – which include several stakeholders and are based on negotiated value system – combining different domains of knowledge and action (Warner et al 2002).

Local resistance and social movements:

This book suggests that resistances are a form of coping practice – that is real change is not possible without pressure of local resistances.

RRL - 098

Title Theorizing Vulnerability in a globalized world : A political Ecological Perspective

Author Anthony Oliver-Smith
In 'Mapping vulnerability: Disasters, Development and People' edited by Greg Bankoff, Georg Frerks and Dorothea Hilhorst, Earthscan publication, UK & USA 2004 (pg 10-24)

Key themes Vulnerability and Disasters

Concepts Used

The concept of vulnerability:

By combining environment, society and culture – in different ways, in a hazard-Disaster context vulnerability is a theoretical framework that encompasses the various dimensions of disasters. Vulnerability in fact expresses the multidimensionality of the disasters. Blackie et al 1994 situate the ideologies of the different social and political systems – leading to distribution of resources and creating unsafe conditions for the disasters to unfold. However illuminating these relationships in globalisation contexts is becoming more complex. The author poses questions that are relevant to the formulation of the theoretical framework for causes of disaster namely as : 1) What are the contributions of the cultural construction of nature to the social production of disaster? 2) How cultural, economic and political conditions characterizing vulnerability are inscribed in the environment 3) What is the relation between cultural interpretation and the material world of risk and disaster? 4) How do we theorise this linkage in the context of globalisation?

Constructions of nature and society:

Dominant western constructions construct human and nature relations in oppositional ways – as done in classical greek or roman as well as in medieval times. However, many cultures do not construct a clear dichotomy between nature and culture as western societies do. In West, the enlightenment ideal of human emancipation and self realisation was closely linked with the idea of use and control of nature

Cultural construction of calamity:

For cultural theorists, nature and even a disaster is a social construction – however the author argues that even when one considers nature in this way, its materiality cannot be ignored. The authors suggests that natural hazards do not exist primarily as social constructions, or are a product of social discourse, but that hazards and disasters demonstrate the 'exo-semiotic agency' of nature.

Globalisation, Vulnerability and Disasters

The globalisation processes – a global system resulting from global capitalist expansion impact vulnerability. The global forces have also set in motion ecological flows – that have reduced the diversity of ecosystems. While societies and nature has always co-evolved, this co-evolution is

now taking place at the global level – each influencing the other in unpredictable ways challenging our traditional understandings of structure and societies with serious implications for adaptive capacities.

Summary

The author suggests that along with the detachment of society and nature – market exchanges came to dominate human relations. Thus with market relations, ‘exchange value’ rather than any other value were ascribed to nature – which in turn has led to environmental destruction and socially constructed vulnerability. Even in socialist states domination of nature was pursued on the grounds of human reason. Disasters are today linked with environmental damages – and the green movement points to the environmental limits as well as the instances of vulnerability that are created when these limits are transgressed. However new theorisations are beginning to discard the duality of nature/culture and creating a synthetic approach that can address mutuality of nature and culture. Disaster research suggests that while hazard or natural forces are present in the environment, it is the society that actualizes the potential of a hazard. Disasters as well as the material needs evoked in these contexts are socio-historical products. In the context of globalisation, the challenge now is to specify these linkages happening at regional and global scales.

RRL - 099

Title The Historical Geography of Disaster : ‘Vulnerability’ and ‘Local Knowledge’ in Western Discourse
Author Greg Bankoff
In ‘Mapping vulnerability: Disasters, Development and People’ edited by Greg Bankoff, Georg Frerks and Dorothea Hilhorst, Earthscan publication, UK & USA 2004; pg 25-36
Key themes Vulnerability, local knowledge and disasters

Summary

Discourse of ‘unsafe world’

The modernisation discourse suggests that societies will take a linear path to development – from traditional or backward to modern and politically speaking from authoritarianism to democracy. Thus here non western world became a discursive creation in western imagination which were synonymous or were signifiers of overpopulation, famine, hunger, illiteracy – that is a dangerous zone a – threat to western well being.

Natural disasters and vulnerability

Hewitt has argued that technocratic approach led to hazard being treated as special problem

to be appropriated by the discourse of expertise that quarantines disaster in thought and practice. Even today, far from being discredited, world bank, and UN etc continue to treat it as such. However critics of this approach construe disasters as societies exposure to hazards in terms of their vulnerability. They suggest that while hazards are nature, disasters are not. As a concept vulnerability offers a radical critique of the technocratic approach – the conditions inscribed in the societal order and the relative advantage or disadvantage that social groups occupy within it. It is the marginality of some people that makes their life a 'permanent emergency'. Ben Wisner suggests that this marginality is determined by a combination of variables such as class, gender, age, ethnicity and disability (Wisner 1993) that affects peoples entitlements and empowerment or their command over basic necessities or rights. Populations are rendered powerless so that they become even more vulnerable in the future. However the discourse of vulnerability still classifies certain parts of the world as more dangerous than the other – one where disasters happen more frequently and in other much less. The cure is also suggested as a transfer of technology or expertise in terms of meteorological and seismic prediction, preventive and preparedness systems and building of the safety codes.

Coping with disasters:

Within this western discourse of certain parts of the world as unsafe places, there is also a counter discourse, which casts traditional cultures as repositories of knowledge.

The current emphasis on the local knowledge is a belated acknowledgement of the non western people who have developed sophisticated systems to reduce vulnerability of their daily life. The respect now given to the coping practices are a wider attempt to broaden local participation through bottom up planning and participation. What is suggested is that what is required is a proper balance between need for external assistance and capacity of the local people to deal with the situation.

However, the concept of local knowledge is applicable only in specific geographical locale unlike western knowledge which is scientific and universal in its application. However, despite these shortcomings, vulnerability and local knowledge – have been useful concepts in assessing disasters and undoubtedly were a conceptual advance on the previous thinking.

RRL -	100
Title	The Lower Lempa River Valley, El Salvador : Risk Reduction and Development Project
Author	Allan Lavell In 'Mapping vulnerability: Disasters, Development and People' edited by Greg Bankoff, Georg Frerks and Dorothea Hilhorst, Earthscan publication, UK & USA 2004; (pg 67-82)
Key themes	Vulnerability, Participation and Risk reduction
Summary	

Research strategy:

This paper is based on the participatory risk and vulnerability reduction project undertaken by local organisations, govt and inter American Development Bank (IADB) in Lower Lempa River area of El Salvador. This area was affected by Hurricane Mitch in October 1998. The exercise finally led to the development of planned intervention strategy agreed by different stakeholders.

Conceptual frames used:

Risk, development and sustainability:

In the project, Disaster risk – was conceptualised as probability of future loss and damage due to adverse physical events. Hazard (probability of physical event occurring) and vulnerability (propensity to suffer loss and recover) were dependent concepts in understanding of risk. Along with disaster risk was considered 'everyday risk'. The everyday risk were the permanent living conditions of the poor populations that was a permanent threat to their physical and mental wellbeing – malnutrition, health, unemployment, social and domestic violence, etc.

Blackie et al model of pressure and release reveal the complex social processes that leads to the creation of risks. And while ultimately the local actors face the problems due to risk, they are not in control of the other processes that lead to the creation of the risks in the first place.

The above conceptual frame led the project to adopt following methodological criteria:

1. Disaster risk must be analysed and dealt with in the light of the everyday risk and lifestyle insecurity experienced by over 70 % of the population.
2. The diagnosis of risk conditions need to take into account local perceptions and variations in groups, populations and organisational representations.
3. Local risk conditions and notions of intervention need to be analysed – taking into account external causal factors and social actors.
4. Strategic intervention need to work on both – everyday as well as disaster risks.
5. The project would actively involve local populations in strategy formulation and other processes.
6. Project personnel will act in impartial ways while dealing with competing interpretations.

The project then through interviews with local organisations, NGOs, govt and local population – went from the preliminary diagnosis to complete the integral diagnosis through participatory discussions and workshop procedures. When the final draft diagnostic document was prepared – the findings were shared through consultation meetings with local representatives

The main ideas which came out of entire processes of consultations for the intervention strategy were:

- 1) Disasters and everyday risk: In the context where large proportions of people were in abject poverty, local groups supported the idea of linking disaster and everyday risk.
- 2) Diverse components of vulnerability: Through workshops local population was sensitized and therefore appreciated vulnerability risk reduction as related to not only technological but also other interventions – such as land use planning, adaptation, agricultural diversification, ecosystem management etc.
- 3) Organisational development and harmony were considered a key to social capital
- 4) Understanding local environment and reducing risk were considered as integral to risk reduction.

Conclusions of the project:

This paper illustrates the importance of concept and method in order to achieve the disaster risk reduction. In particular, every day and disaster risk reduction were connected through development approach to solving of the problems. Further, different levels of vulnerability were identified such as initial well being, strength and resilience, livelihood resilience, self protection, societal protection and social capital and project interventions were designed to address these different levels of vulnerability.

RRL - 0101

Title Assessment of Capability and Vulnerability

Author Ben Wisner

In 'Mapping vulnerability: Disasters, Development and People' edited by Greg Bankoff, Georg Frerks and Dorothea Hilhorst, Earthscan publication, UK & USA 2004; pg 183-193

Key themes Social Vulnerability, Capability and disaster

Summary

Vulnerability implies various dimensions such as :

Structural engineering vulnerability

Lifeline infrastructure vulnerability

Communication system vulnerability

Macro-economic vulnerability

Regional economic vulnerability

Commercial Vulnerability – including insurance exposure

Social Vulnerability

What the above have in common is the 'potential for harm'. Use of Maps for vulnerability assessment can be any of the above in respect to a particular type of hazard. And risk is typically expressed as $\text{Risk} = \text{Hazard} * \text{Vulnerability}$.

Social vulnerability is one of the domains for investigation – however 'social' is a very large domain. The author revisits some of the approaches to social vulnerability in this paper – discussing their potential strengths and weaknesses. Finally he calls for a more situated approach based on local knowledge and capacity building which could help us move beyond social vulnerability approach.

Demographic approach to vulnerability:

This approaches are inspired by an engineering approach 'the potential for damage or loss (Alexander 2000). In this approach human beings are one of the 'elements at risk' to varying degree due to certain characteristics for a potential for a loss – thus structural vulnerability of the buildings, health care systems and people.

The taxonomic approach to vulnerability

The second approach focuses on vulnerability of 'social groups' and the causes of their vulnerability. This approach is based on empirical observation about different groups suffering from differential losses and the differential nature of their recovery. This approach breaks vulnerability into different elements – social, economic, environmental, informational vulnerability and on empirically developed taxonomies. – such as vulnerability of women, children, differently abled, minorities etc. This approach is an advance in the conventional approach which used term vulnerable in an undifferentiated way. This approach has a practical application – in the sense it is useful for the busy administrators and planners for planning as well as responding in disasters.

Cannon (2000) identifies four components of vulnerability:

- initial well being
- livelihood resilience
- Self protection
- Societal protection
- Social capital (social cohesion, conflicting and cooperative groups)

The situational approach

The third approach suggests that we go beyond the taxonomies – although they yield practical benefit; towards a more situational approach – the key question addressed here would be not what kind of group, but the nature of their daily life and their situation. This would be in line with analysis of household economy (Sanderson 2000) or the access model by Blackie et al 1994 or Wisner et al 2003). Here disasters are not seen as exceptional scenarios but an extension of daily life (Wisner 1993; Cannon 2000).

The Situational approach recognises three kinds of contingencies – social vulnerability is not a permanent property of persons or groups; second deals with the constantly changing daily, seasonal and yearly circumstances of people's situation in terms of their access to resources and power; and third contingency arising due to complex overlappings of identities and marginality. Situational analysis separates humans from all their complexities and is a more sensitive tool of analysis.

Towards a contextual and pro-active approach:

This approach suggests that while taxonomies are generated by outsiders, it is in the subjective lived experience in a particular locale – that their meanings are generated – and thus the need to identify not only vulnerability but also capabilities existing in the local context.

Strengths and weaknesses of the four approaches

The first three approaches are structuralist – this kind of disaster discourse has much in common with other forms of development discourse – in the sense that the discourse speaks for the other – the marginalised groups. Despite this difficulty, Wisner suggests that this kind of discourse – provides a space for an alternative subaltern stories and voices. However he suggests that it is the fourth approach to social vulnerability – based on self knowledge and empowerment – that is an expression to break out. What is thus needed is how can the local knowledge be reclaimed by the local people for their empowerment. The author suggests that a richer approach would be to see everyone with some capabilities for self protection and collective action.

Title	Self Assessment of Coping Capacity : Participatory, Proactive and Qualitative engagement of communities in their own risk management
Author	Ben Wisner In Measuring Vulnerability to Natural Hazards : Towards disaster resilient societies, Edited by Jorn Birkmann, United Nations university press, Tokyo 2006 (pg316-327)
Key themes	Vulnerability, Participation and Disasters

Summary

This paper draws from the participatory approaches developed by Robert Chambers and Paulo Friere which encouraged local communities to reflect on their own realities, analyse them and develop an action plan to change their situations. Here the participatory approaches and techniques have been applied to communities in risk prone areas and/or have been impacted by some disaster. Termed as Community based disaster management (CBDM), this approach leads to local self assessment, planning and action based on people's knowledge about their own environment. CBDM also emphasises an understanding of vulnerability of people to hazards; and their capacity to cope with them. Hazard mapping and planning are integrated in this approach.

The author suggests that the social vulnerability perspective which drew on taxonomic approach of listing vulnerable social groups have a utilitarian value – however before disasters, whilst working proactively with the govt and other stakeholders to assess vulnerability in advance, the taxonomic approach would be inadequate. Instead he discusses the situational and proactive approach - whose goal is enable people through reflection and action improve their self protection and demand or fight for social protection.

Methodology used in the approach:

This approach aims to build trust, common purpose, and motivation among the people through simple participatory tools such as historical time line, problem tree analysis, wealth ranking etc. The key questions asked are around threats as well as capacities and opportunities. Through the self assessment along these lines, the community then develops a community based disaster management plan. Given the contextual approach implicit in this methodology, the author calls this approach as a special case of what is formally known as 'adaptive planning' .

Following the methodology from Chambers and Freire, this approach suggests that there is no teacher or a expert – the facilitator seeks to understand the reality on the ground and together with the participants finds a way forward. Local knowledge is reflected upon – outside knowledge brought into – to be added and not as a replacement of the local understanding.

The author discusses examples from Africa, where several of these methods have been used for self assessment of vulnerability.

The author finally suggests that while this approach has many benefits, it may have to engage with its political limitations. The 'Limit situations' may be reached where participants agree that they cannot take further risk reduction without a change in policy or practices over which they have no control. While in a democratic, open and accountable systems of governance – this may be turned into a strength to influence policy making. However in authoritarian or non democratic systems, organisers and facilitators may be in danger and would need protection.

This approach is now popularised and used by Pro Vention Consortium which has initiated the process of collection, dissemination of the methods for participatory capacity and vulnerability assessment through Pro Vention tool kit.

RRL - 0103

Title Measuring Vulnerability to Promote disaster-resilient societies : Conceptual Frameworks and definitions

Author Jorn Birkmann
In Measuring Vulnerability to Natural Hazards : Towards disaster resilient societies, Edited by Jorn Birkmann, United Nations university press, Tokyo 2006

Key themes Vulnerability, Disasters and sustainable development

Summary

This paper discusses different conceptual frameworks used to define vulnerability. It discusses six main schools of thoughts :

- the school of the double structure of vulnerability (Bohle 2001)
- conceptual frameworks of the disaster risk community (Davidson, 1997; Bollin et al 2003)
- the school of political economy which addresses the root causes, dynamic pressures and unsafe conditions that determine vulnerability (Wisner et al 2004)
- the holistic approach to risk and vulnerability assessment (Cardona 1999 and 2001; Cardona and Barbat 2000; Carreno et al 2004, 2005)
- The BBC (Bogardi, Birkmann and Cardona) framework which places vulnerability within a feedback loop system and links it to sustainable development discourse (based on Birkmann and Bogardi, 2004 and Cardona 1999 and 2001).

The author suggests that it is the sixth school of BBC which links the concept of disaster vulnerability with the sustainable development frameworks. It does this linking by stressing on the need to focus on exposed or susceptible elements and their coping capacities at the same time. It also includes an understanding of vulnerability which goes beyond the estimation of damage or loss and suggests vulnerability as a process – thus this means intervening in disaster contexts as well as addressing the coping capacity with regard to social, economic and environmental spheres – which are the three dimensions of sustainable development.

The authors also raise following questions that still need further reflections in relation to vulnerability:

- Is coping capacity a part of vulnerability or should it be viewed as a different feature?
- Does vulnerability encompass exposure or should exposure be seen as a characteristic of the hazard or as a separate parameter?
- Which part and characteristics of vulnerability are hazard dependent and which are hazard independent?
- What dimensions and themes should vulnerability assessment cover?
- How can root causes of vulnerability be defined and measured?
- How far can one measure the interlinkages of the root causes at national and global levels and the major driving forces and root cause at local level that determine local vulnerability?
- Is resilience the opposite of vulnerability or a concept that covers coping and adaptation capacity as these relate to vulnerability?
- Should vulnerability focus primarily on human vulnerability alone or is it more appropriate to view vulnerability within a coupled human environment system?
- How far is environment degradation a hazard or a revealed vulnerability of the environment?

On the links between vulnerability and sustainable development, author suggests that as the concept of sustainable development suggests, both inter as well as intragenerational justice will have to be key principle for risk and vulnerability reduction. The author suggests that from a sustainable development perspective, an integrated perspective of the environmental sphere is thus more appropriate for holistic view of vulnerability to hazards of natural origin.

RRL - 0104

Title Social Vulnerability and the 2002 flood : Country Report Germany (Mulde River)

Author(s) Annete Steinfuhrer, 2007
Downloaded from www.floodsite.net

Key themes Vulnerability and Disasters

Summary

This report presents and summarises the findings of a questionnaire survey carried out in five research locations of the Mulde (River). It talks about social vulnerability as social inequality. Also focuses on methodology of research, issues of risk perception, preparedness and perceived responsibility of public.

RRL - 0105

Title The study of natural disaster 1977-1997: Some reflections on a changing field of knowledge

Author David Alexander

Published in Disasters. Vol. 21. No. 4. pp 284-304; 1997

Key themes Vulnerability and Disasters

Summary

This article is a good review of the works done on disaster and how there have been shifts in the field of study. Paper begins with review of major natural disasters and then a review of what has occurred in this period and its impacts.

RRL - 0106

Title Disaster risk management and vulnerability reduction: Protecting the poor

Author(s) Suvit Yodmani

Paper presented at Social Protection workshop Manila; 2001

Key themes Vulnerability and Disasters

Summary

The article deals with the vulnerability of the poor during the disaster situation. It very well brings out the relationship between vulnerability and poverty. It also deals with disaster risk management and community based disaster management approach.

RRL - 0107

Title Disaster Research: Exploring the Sociological Approach to Disaster in Bangladesh

Author Mahbuba Nasreen
In Bangladesh e-Journal of Sociology. Vol 1. No.2; 2004

Key themes Vulnerability and Disasters

Summary

In this paper an attempt has been made to explore what research has been done to address disasters in Bangladesh and to what extent disasters have been examined from the social perspective. The paper, in the process also tries to define disasters and identify approaches to disaster research. The paper looks at the major works completed on disaster from various approaches. It has been argued that application of sociological approach to disaster research is very limited.

RRL - 0108

Title Societal Response to Hazard and major Hazard events: Comparing natural and technological hazards

Author(s) Roger E. Kasperson and K. David Pijawka
Published in Public Administration Review. Vol. 45. pp 7-18; 1985

Key themes Vulnerability and Disasters

Summary

This article enquires into the range of problems encountered by society as it attempts to avoid and respond to the hazardous events rooted in technology. Two tasks are recognized: first, to characterize the hazard management process and to highlight the particularly difficult problems encountered and second, to assess how the major hazardous events arising from technology affect people, their communities and their institutions.

RRL - 0109

Title Comparative behavioural response to future earthquakes: The case of Turkey and USA

Author(s) Aytül Kasapoglu, Mehmet Ecevit
Published in Social Behaviour and Personality. Vol. 32. No. 4. pp 373-382; 2004

Key themes Vulnerability and Disasters

Summary

The primary aim of this study is to demonstrate the impact of knowledge in terms of risk information on what people have thought and done to be prepared for the next probable earthquakes in both USA and Turkey. The study revealed that for risk, knowledge alone is not sufficient and societal factors along with the urgent need for cultural change in accordance with sustainable development should be taken into consideration.

RRL - 0110

Title Chains of damages and failures in a metropolitan environment: Some observations on the Kobe earthquake in 1995

Author(s) Scira Menoni
Published in Journal of Hazardous Materials. Vol. 86. pp 101-119; 2001

Key themes Vulnerability and Disasters

Summary

The paper highlights that how physical organizational and systemic vulnerabilities are intimately connected. The analysis suggests that not only parameters related to physical weakness or strength of the built environment should be considered but organizational, social and systemic factors are equally crucial to understand the magnified dimensions of disasters at increasing levels of exposed systems vulnerability

Disasters and Media

RRL - 0111

Title Disasters, the media and social structures: A typology of credibility hierarchy persistence based on newspaper coverage of the love canal and six other disasters

Author Penelope Ploughman
Published in Disaster. Vol. 21. No. 2. pp 118-137; 1997

Key themes Disasters and Media

Summary

The starting point of this paper is the assumption that credibility and the right to be heard are differentially distributed in any social system and therefore a 'hierarchy of credibility' exists. According to the hierarchy of credibility argument, distinct patterns in the differential distribution of social power and prestige are reflected in news selection and news-making power. Credibility is both- the right to be heard and the perceived importance of the communicator's view. There are super-ordinate (high) and sub-ordinate (low) levels of credibility.

RRL - 0111

Title Information and communication technology in disaster management

Author(s) Davis I., De Costa K.P., Alam K., Ariyabandu M.M., Bhatt M.R., Schneider R. and Balsari S. (ed.)
Published by Southasia disasters.net 2007

Key themes Disaster and Media

Summary

The paper deals with questions like- how information and communication technology reduces disaster risk, information and communication technology (ICT) in disaster risk identification, ICT in disaster risk communication, ICT tools for disaster risk reduction, Institutional arrangements for disaster management in selected south asian countries, how different stakeholders contribute to disaster risk management, early warning strengthening project for the countries in the Indian Ocean region

RRL - 0112

Title Disasters and the Information Technology Revolution

Author(s) Robin Stephenson; Peter S. Anderson
Published in Disasters. Vol. 2. No. 4. pp 305-334; 1997

Key themes Disaster and Media

Summary

This paper examines the evolution and possible medium term future of information technology in disaster management. There are presently major changes under way in emergency related global information access and networking the implication of which have yet to be played out. The last part of the paper highlights set of key technologies which may shape disaster planning.

Disasters and Mental Health

RRL - 0113

Title Effect of family role on response to disaster

Author(s) Susan D. Solomon, Milagros Bravo,
Maritza Rubio-Stipec, Glorisa Canino
Published in Journal of Traumatic Stress'. Vol.6 No. 2 pp 255-269.; 1993

Key themes Disasters and Mental Health

Summary

This study hypothesized that family role (marital and parental status) would moderate the effect of disaster exposure on the mental health of victims. Perceived emotional support was found to be an important moderator of disaster's effect on psychiatric distress, generally overriding the effect of family role. This study suggests that both single and married parents constitute important high risk victim group. The findings also suggest that those perceiving they lack adequate emotional support, regardless of family role, may be in special need of service

RRL- 0114

Title Hurricane Katrina: prior trauma, poverty and health among Vietnamese-American survivors

Author(s) A.C.-C. Chen, V.M. Keith, K.J. Leong, C. Airriess

International Nursing Review, 2007 ISN 57

Key theme(s) Disasters and Mental Health, Katrina, Post-Traumatic Stress Disorder, Poverty, Prior Trauma, Social Support, Vietnamese

NB: Also filed under Key theme: Ethnicity and Disaster

Abstract

Background: The flooding of New Orleans after Hurricane Katrina revealed the disproportionate vulnerability of ethnic minority communities for emergency preparedness, disaster relief and health. Nurses need to analyse Katrina's health consequences for the most vulnerable segments of our society.

Aim: To examine factors contributing to differential health outcomes among the New Orleans Vietnamese community in response to Katrina.

Methods: A sample of 113 adult Vietnamese Katrina survivors from New Orleans was recruited. A mixed-method approach, including survey and focus groups, was used to collect data. Survey questions were modified from standardized instruments to evaluate survivors' health status and factors contributing to health outcomes. Multivariate and content analysis were used to investigate effects of prior trauma, financial strain, social support and acculturation level in predicting survivors' health outcomes.

Results: Findings suggested financial strain was the strongest risk factor for Vietnamese survivors' post-traumatic stress disorder (PTSD) symptoms, and physical and mental health post-disaster; while social support was a strong protective factor for health. Survivors who perceived higher impact from previous traumatic experiences had poorer physical health, but not PTSD symptoms or poor mental health after controlling for financial strain and social support, suggesting complex relationships among these measures in predicting PTSD symptoms and health. Less-acculturated individuals also reported higher levels of PTSD symptoms and poorer physical health.

Conclusions: Catastrophic events like Katrina can result in disproportionate risk of negative health outcomes among vulnerable populations. Nurses should take into account prior trauma, financial strain, social support network and acculturation level, to adequately address survivors' needs.

RRL - 0115

Title Research on psychiatric outcomes and interventions subsequent to disasters:
A review of the literature

Author(s) Craig L. Katz, Lori Pellegrino, Anand Pandya, Anthony Ng, Lynn E. DeLisi
In *Psychiatric Research*. Vol. 110. pp 201-217; 2002

Key themes Disaster and Mental Health

Summary

This review was undertaken to identify whether there exists a scientific basis for the practice of psychiatry in the aftermath of disasters. Most of the extensive literature over the past 30 years suggest that disasters have psychopathological consequences as well as medical and social ones.

RRL - 0116

Title Impacts of an environmental disaster on psychosocial health and well being in
Karakalpakstan

Author(s) Eric J. Crighton, Susan J. Elliott, Joost van der Meer, Ian Small, and
Ross Upshur
Published in Social Science and Medicine, 2003 Vol.56. pp 551-567

Key themes Disasters and Mental Health

Summary

Paper highlights that environmental exposures may impact not only the physiological but also the psychosocial health of individuals. The paper also talks about the psychosocial impact research before focusing on Karakalpakstan.

RRL - 0117

Title The psychosocial impact of Hurricane Katrina: Contextual differences in psychological symptoms, social support, and discrimination

Author(s) Carl F. Weems; Sarah E. Watts; Monica A. Marsee
Behaviour Research and Therapy, Vol 45(10), Oct 2007. pp. 2295-2306

Key themes Disaster and Mental Health

Abstract

This study tested a contextual model of disaster reaction by examining regional differences in the psychosocial impact of Hurricane Katrina. A total of 386 individuals participated in this study. All were recruited in the primary areas affected by Hurricane Katrina and included residents of metropolitan New Orleans (Orleans Parish, Louisiana), Greater New Orleans (i.e., Metairie, Kenner, Gretna), and the Mississippi Gulf Coast (i.e., cities along the coast from Waveland to Ocean Springs, Mississippi). Participants were assessed for posttraumatic stress disorder (PTSD) symptoms, other psychological symptoms, perceptions of discrimination, perceptions of social support, evacuation distance, and the extent to which they experienced hurricane-related stressful events. Results were consistent with previous research on the impact of disasters on mental health symptoms. Findings extended research on individual differences in the response to trauma and indicated that regional context predicted unique variance in the experience of discrimination, social support, and emotional symptoms consistent with the theoretical model presented.

RRL - 0118

Title The psychosocial consequences for children of mass violence, terrorism and disasters

Author Richard Williams
International Review of Psychiatry, Vol 19(3), Jun 2007. pp. 263-277

Key themes Disaster, Mental Health and Age

Abstract

Children and families are now in the front line of war, conflict and terrorism as a consequence of the paradigm shift in the nature of warfare and the growth of terror as a weapon. They are as vulnerable as are adults to the traumatizing effects of violence and mass violence. Furthermore, employing children as soldiers is not new, but it is continuing and young people are also perpetrators of other forms of violence. This paper summarizes a selection of the literature showing the direct and indirect psychosocial impacts on minors of their exposure to single incident (event) and recurrent or repetitive (process) violence. Additionally, children's psychosocial and physical development may be affected by their engagement with violence as victims or perpetrators. Several studies point to positive learning from certain experiences in particular communities while many others show the potential for lasting negative effects that

may result in children being more vulnerable as adults. The spectrum of response is very wide. This paper focuses on resilience but also provides access to several frameworks for planning, delivering and assuring the quality of community and family-orientated and culture-sensitive responses to people's psychosocial needs in the aftermath of disasters of all kinds including those in which children and young people have been involved in mass violence.

RRL - 0119

Title Placing age differences in the context of the Orissa supercyclone : Who experiences psychological distress?

Author(s) Suar, Damodar, Mishra, Sasmita and Khuntia, Rooplekha
Blackwell Publishing Ltd, with the Asian Association of social Psychology and the Japanese Group Dynamics Association 2007 in Asian Journal of Social Psychology (2007), 10, 117-122

Key themes Mental Health and Disasters

NB: Also filed under Key theme Age and Disasters

Abstract

The present study examines the influence of age on anxiety, depression, and post-traumatic stress of the supercyclone-affected people in Orissa. When the effects of exposure, caste, and gender were controlled, linear effects of age on psychological distress were found to be significant, whereas quadratic effects of age on psychological distress were non-significant. With increasing age, survivors experienced more anxiety, depression and post-traumatic stress. The elderly people were the most vulnerable.

Research Methodology

The data were collected in structured interview sessions 3 months after the disaster struck. Of the 130 interviewees, 65 persons were severely exposed and the rest were mildly exposed to the supercyclone.

The study hypothesized that if psychological distress increases with age and elderly people are the worst sufferers, the relationship between age and distress will be directly linear. If younger people experience distress, middle-aged people experience more than them, and the older people experience less distress than the middle-aged, the relationship between age and distress will resemble an inverted 'U' shape curve.

Exposure and resource perspective

This perspective explains more vulnerability of older people to trauma than younger ones. The

coping capacity of older people decreases because of declining health and lower socioeconomic resources. (Friedsam, 1961; Phifer, 1990). They have lesser likelihood of receiving warning, greater reluctance to evacuate, higher resistance to alter accustomed patterns of life, and a severe sense of deprivation resulting from losses. They are more likely to experience disaster-related injuries (Bolin & Klenow, 1982–1983), substantial economic losses (Bell, Kara, & Batterson, 1978), and evaluate their situation as worse compared to those around them (Bolin & Klenow, 1982–1983). They are also less likely to use post-disaster services of counselling and social support

Measures used

With the collection of demographic and socioeconomic information on location, age, sex, education, caste, and loss of life and property, three inventories/scales measured anxiety, depression (Depression Inventory; Beck, 1967), and PTSD (DSM-IV, 1994). Except for the diagnostic criteria involved in PTSD, items in the anxiety and depression inventories were reduced. To lessen the interview time, items that were found common in the judgment of three psychologists were retained.

Finding(s)

The mean score from the aggregate data indicated that the younger adults experienced less, middle-aged people experienced more, and the older people experienced still more anxiety, depression, and PTSD (Table 1). In the table, the cluster B denotes intrusion, the cluster C denotes avoidance/numbing and cluster D includes arousal symptoms – all which continued or persisted for more than one month.

Table 1 Descriptive statistics on psychological distress in different age groups

Age group	N	M and SD	Anxiety	Depression	PTSD cluster			PTSD (B + C + D)
					B	C	D	
18–35	71	M	18.65	19.07	1.08	1.86	1.76	4.70
		SD	4.72	3.40	0.82	1.50	1.15	3.25
36–55	46	M	19.78	19.67	1.11	2.12	1.92	5.15
		SD	4.51	2.97	0.82	1.56	1.16	3.29
56–80	12	M	20.28	20.28	1.31	2.66	2.22	6.22
		SD	4.89	3.40	0.75	1.38	0.93	2.68
Total	130	M	19.22	19.42	1.12	2.04	1.87	5.02
		SD	4.67	3.26	0.81	1.52	1.14	3.23

PTSD, post-traumatic stress disorder.

The first step of regression analysis revealed that severe exposure to the supercyclone consistently increased anxiety, depression, and PTSD. Only females experienced more anxiety than males. When the confounding effects of exposure, caste status, and gender were controlled in the second step of regression analysis, elderly people were found to be more vulnerable to anxiety, depression, and PTSD (Table 2). All beta coefficients were positive and significant for linear effects of age on distress. In the third step, none of the beta coefficients were significant for quadratic effects of age on distress. Both approaches specifying an inverted ‘U’ shape curve were refuted. Hence, the older the age of disaster victims, the greater was their psychological distress.

A closer inspection of the results showed that excluding the effects of control variables, the linear term of age explained an additional 3% variance each of anxiety and depression, and 2% variance of PTSD. All the explained additional variances were found to be significant. Contrarily, the quadratic terms for age did not explain any additional variance of distress.

Table 2 Regression analysis predicting the effects of age on psychological distress

Dependent variable	Step	Independent variable	B	SEB	β	R^2	F	R^2 change	ΔF
Anxiety	Step 1	Exposure	2.32	0.84	0.25**	0.11	5.07**		
		Gender	-0.95	0.85	-0.10				
		Gender	1.91	0.82	0.20*				
	Step 2	Age	0.06	0.03	0.19*	0.14	5.14***	0.03	4.87*
	Step 3	Age ²	0.00	0.00	0.09	0.14	4.09***	0.00	0.05
Depression	Step 1	Exposure	1.22	0.60	0.19*	0.08	2.41*		
		Gender	-1.00	0.61	-0.15				
		Gender	0.56	0.58	0.08				
	Step 2	Age	0.04	0.02	0.18*	0.11	3.65**	0.03	4.10*
	Step 3	Age ²	0.01	0.01	0.07	0.11	2.90*	0.00	0.03
Total no. PTSD symptoms	Step 1	Exposure	4.87	0.39	0.76***	0.60	62.86***		
		Gender	-0.30	0.39	-0.04				
		Gender	0.06	0.38	0.01				
	Step 2	Age	0.02	0.01	0.13*	0.62	49.91***	0.02	5.03*
	Step 3	Age ²	-0.01	0.00	-0.41	0.62	40.68***	0.00	2.06
	Step 3	Midage ²	0.01	0.00	0.10	0.62	40.68***	0.00	2.06

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

**F in step 1 is against 3, 126 d.f., in step 2 against 4, 125 d.f., and in step 3 against 5, 124 d.f.

B, beta; β , standardized beta; PTSD, post-traumatic stress disorder; SEB, standard error of beta.

Implications of the findings for intervention :

Age plays a role in recovery. Older the age of the victims, greater is their psychological distress. In the culture of India, collectivistic values of interdependence, social support, cooperation and interpersonal sensitivity coexist with power distance. Senior members are respected and they informally represent the family, take care of others and provide advice for the family and community prosperity.

The Supercyclone however depleted the personal (self esteem, mastery, well being), social, economic and work resources that survivors had built and conserved over time. These resources sustained the living.

Elderly people being custodian of family and community had a greater sense of resource loss with little hope to regain the resources at the end of their lives inducing more distress. Further, elderly in this culture live with a high uncertainty avoidance and low tolerance for ambiguity – and the sudden crisis was cognitively painful.

Interventions such as preserving resources such as “sense of mastery” and self esteem would help the old people regain their status.

RRL - 0120

Title Psychosocial support in disaster-affected communities

Author(s) Kiran Rao

International Review of Psychiatry, Vol 18(6), Dec 2006. pp. 501-505

Key themes Disaster, Mental Health and vulnerable groups

Abstract

The paper outlines psychosocial interventions in providing care and support to disaster-affected communities. Any impact of disaster can be looked at in two ways: firstly by ascertaining the characteristics of the event itself, and secondly, how that event is appraised by those affected. Depending on different phases of the impact of the disaster, individuals will respond in different styles. Psychosocial interventions must be tailored to address the needs of the target population, with special attention paid to vulnerable groups such as children, women and the elderly. These should also be modulated according to the phase of recovery following the event occurrence because each phase will highlight different needs. The four phases of intervention, although determined separately, may show an overlap. In the initial phases, the emphasis is on social intervention that can be delivered by community-level workers. In the later phases, the psychological issues that emerge necessitate the services of trained professionals. Initial social care will need to give way to psychological care, and on occasion both will need to be combined for a considerable period. Since psychosocial care is a long-term, continuous process, disaster management and preparedness programmes must invest in training for capacity building by training community workers and primary care health professionals.

RRL - 0121

Title The Aftermath of Disaster: Children in Crisis

Author Donna A. Gaffney

Journal of Clinical Psychology, Vol 62(8), Aug 2006. pp. 1001-1016

Key themes Disaster, Mental health and Age

Abstract

This article uses examples from the terrorist attacks on the World Trade Center and the hurricane disasters of Katrina and Rita to illustrate the impact of crisis in the lives of children and adolescents. The author reviews children's responses to loss and crisis. Therapeutic approaches that facilitate integration of crisis and loss are provided, including illustrations of self-care, comfort strategies, and developmental, traditional, and nontraditional methods.

RRL - 0122

Title Early post-traumatic stress disorder in relation to acute stress reaction: An ICD-10 study among help seekers following an earthquake

Author(s) Soldatos, Constantin R.; Paparrigopoulos, Thomas J.; Pappa, Dimitra A
Psychiatry Research, Vol 143(2-3), Aug 2006. pp. 245-253

Key themes Disasters and Mental Health

Abstract

Disaster research related to earthquakes has almost exclusively dealt with their long-term psychosocial impact; besides, diagnoses were previously based only on DSM criteria. Therefore, it is pertinent to assess stress-related reactions of earthquake victims during the early post-disaster period through the application of ICD-10 criteria. For the first 3 weeks following an earthquake, 102 help-seekers were assessed based on a checklist of sociodemographic variables and a semi-structured interview for the detection of acute stress reaction (ASR) and posttraumatic stress disorder (PTSD) according to ICD-10. Forty-four subjects (43%) fulfilled the ICD-10 criteria for PTSD; all but one of them had suffered ASR. Moreover, among a series of potential predictors for PTSD, ASR was found to be the only significant one; this indicates a definite association between ASR and early development of PTSD. Logistic regression to predict group membership (PTSD/no PTSD) based on specific ASR symptoms showed that accelerated heart rate and feelings of derealization were the only significant predictors for early PTSD. Individuals who fulfill the ICD-10 diagnostic criteria for ASR following an earthquake are at high risk for subsequent occurrence of early PTSD. Increased heart rate and feelings of derealization within the first 48 h after the traumatic event appear to be the principal factors associated with the development of early PTSD. In addition to their potential value for timely prevention and treatment, these findings raise important nosological issues pertaining to the current diagnostic classification of stress-related disorders (ICD-10 versus DSM-IV).

RRL - 0123

Title Mental health, psychosocial support and the tsunami
Author(s) Bhugra, Dinesh; Van Ommeren, Mark
In *International Review of Psychiatry*, Vol 18(3), Jun 2006. pp. 213-216
Key themes Disasters, Mental Health and Culture
Summary

Disasters can have major impact on social and psychological functioning when individuals are exposed to these either indirectly or directly. The responses and coping strategies used by individuals are strongly influenced by cultural factors as well as social support and other factors. In this paper the challenges in planning and delivery of mental health services are described and suggestions put forward for preparedness of future disasters. In cultures which are kinship-based, the help may be available within kinship, and statutory services may rely on such systems.

RRL - 0124

Title Impact of the tsunami on psychosocial health and well-being
Author(s) Carballo, Manuel; Heal, Bryan; Horbaty, Gabriela
In *International Review of Psychiatry*, Vol 18(3), Jun 2006. pp. 217-223
Key themes Disasters and Mental Health
Abstract

Natural and man-made disasters affect everyone in their path. Some people are nevertheless more vulnerable than others and suffer in different ways and to different extents. The tsunami highlighted a number of pre-existing factors that made some people especially vulnerable and it also brought out the ways in which other people became vulnerable as a result of disaster. Major social and demographic shifts occurred, and the social fabric of communities was severely eroded. Gender, age, extent of personal loss, personal experience in terms of how direct or indirect exposure emerged as key factors together with loss of place, problems of temporary and permanent housing, poor income generation and uncertainty about if and when it would be possible to return to original home sites and communities. Host communities were also affected, albeit indirectly. How and to what extent people were psychologically 'damaged' in, and by, the tsunami nevertheless remains poorly defined because of the paucity of real-time monitoring and the fact that in some countries there was little agreement on the nature and classification of psychosocial problems and morbidity.

RRL - 0125

Title The changing impact of a severe disaster on the mental health and substance misuse of adolescents: Follow-up of a controlled study

Author(s) Reijneveld, Sijmen A.; Crone, Mathilde R.; Schuller, Annemarie A.

In *Psychological Medicine*, Vol 35(3), Mar 2005. pp. 367-376

Key themes Disasters and Mental Health and Age

Abstract

Disasters are believed to have large effects on the mental health of adolescents but the lack of prospective pre- and post-disaster data on affected and control populations have limited our knowledge on the validity of these claims. We examined the medium-term, 12 months' effects of a severe disaster on the mental health of adolescents, and compared them to effects after 5 months. Method: A cafe fire in The Netherlands injured 250 adolescents and killed 14. We obtained data 15 months before and 12 months after the disaster about behavioural and emotional problems (using the Youth Self-Report) and substance misuse, in 124 students of an affected school of whom 31 were present at the fire (response 77.5%) and 830 other students (56.4%); mean age at baseline, 13.8 years. Results: We found differences between students from the affected school and others for excessive use of alcohol (odds ratio 3.42, 95% confidence interval 2.00-5.85, $p < 0.0001$), but not for behavioural and emotional problems and use of other substances. Effects had decreased compared to those after 5 months. Conclusions: In the long run, the effects of disaster decrease regarding self-reported behavioural and emotional problems, but they remain regarding alcohol misuse among those present at the disaster, and their peers.

RRL - 0126

Title The Latin American and Caribbean experience

Author(s) Almeida, José Miguel Caldas de; Rodriguez, Jorge
In *Disasters and mental health*. Ed by López-Ibor, Juan José; Christodoulou, George; Maj, Mario; Sartorius, Norman; Okasha, Ahmed; New York, NY, US: John Wiley & Sons Ltd, 2005. pp. 201-216

Key themes Disasters and Mental Health

Summary

Natural disasters in Latin America and the Caribbean are not only occurring with increasing frequency, but also with greater destructive potential, making this a significant problem in terms of its social, economic, and health impact. After the major disasters of 1985 in Mexico and Colombia, the governments of the Americas met in Costa Rica in 1986 and laid the foundations for a common policy to make health care more efficient and more compatible with the needs of the population. Since then, great progress has clearly been made. In recent years, responses have begun also to pay attention to the psychosocial component that is always present in these human tragedies. In addition, the approach to emergency management has evolved toward a new perspective that goes beyond the response to damages to focus on risk management, seeking to eliminate or reduce the probability that damages will occur. This chapter examines psychosocial consequences of disasters and emergencies in Latin America, as well as elaborates on lessons learned regarding mental health protection from such disasters

RRL - 0127

Title Disasters and Psychosocial Rehabilitation: The nature, frequency, and effects of disasters

Author Gittelman, Martin
International Journal of Mental Health, Vol 32(4), Win 2003-2004. Special issue: Disasters: The Mental Health Component (I). pp. 51-69.

Key themes Disasters and Mental Health

Abstract

A disaster is defined as the impact of a natural or technological catastrophe on a specific population, and its consequences are the product of that interaction (Lima & Gittelman, 1990). Disasters happen regularly, exact an enormous toll in lives, and have a profound psychosocial impact on millions each year. Natural disasters such as floods, drought, earthquakes, and storms, in their aggregate, now occur with greater frequency than civil strife (Hagman, 1984). Floods account for more than a third of all natural disasters, but earthquakes cause the most deaths and have the greatest economic impact. Between 1900 and 1986, one disaster occurred somewhere in the world approximately every two weeks--a total of 2,392 over that period. The U.S. Agency for International Development (USAID) (1986) has estimated that since the beginning of the century, more than half a million persons have died in disasters each year.

RRL - 0128

Title Trauma and psychosocial aftermath among high- and low-exposure adults three months post the 921 Chi-Chi earthquake in Taiwan

Author(s) Chen, Sue-Huei; Hung, Fu-Chien; Lin, Yaw-Sheng
Chinese Journal of Psychology, Vol 44(2), Dec 2002. pp. 167-188

Key themes Disaster, Mental Health and Age

Abstract

This study examined the peri- and post-traumatic psychological responses and changes of physical and psychological health, outlook on life, and interpersonal relationships 3 mo after the devastating September 21, 1999 Chi-Chi Earthquake among 2 groups of middle-aged adults in Taiwan. 197 adults from high-impact areas (mean age 46 yrs), and 117 adults (mean age 37 yrs) from Taipei, a low-impact area, were evaluated. Self-report measures included demographic and earthquake exposure information, the Peritraumatic Psychological Reaction Index (PPRI), the Posttraumatic Stress Reaction Index (PTSRI), and the Psychosocial Change Questionnaire (PCQ). Results show that: 1) high-exposure adults manifested significantly more immediate and persistent posttraumatic psychological responses, and endorsed more negative reports concerning physical/psychological health and intimate/general interpersonal relationships; and 2) while previous trauma studies often reported more negative and pathology-toned behavioral manifestations, this study found both positive and negative changes among high-exposure adults after the disaster.

RRL - 0129

Title Demographic and psychosocial features and their effects on the survivors of the 1999 earthquake in Turkey

Author(s) Ecevit, Mehmet; Kasapoglu, Aytül
Social Behavior and Personality, Vol 30(2), 2002. pp. 195-202

Key themes Disasters, Mental health and Education

Abstract

A survey was conducted of 500 male and female survivors (aged 19-80 yrs) of the 1999 earthquake in Turkey to investigate their levels of alienation and forms of preparedness for future disasters. It was found that the level of alienation in general is not very significant and that level of education is the most important influential independent variable. The only alienation component found to have a negative impact on the responsible behavior related to preparedness for earthquakes was the social isolation variable. As level of education increases and social isolation decreases, responsible behavior increases. The existence of little such research in developing societies like Turkey increases the importance of this work and it is expected that it will have a positive impact on similar future studies.

RRL - 0130

Title Psychological consequences of the 1998 landslide in Sarno, Italy: A community study

Author(s) Catapano, F.; Malafronte, R.; Lepre, F.
Acta Psychiatrica Scandinavica, Vol 104(6), Dec 2001. pp. 438-442

Key themes Disasters and Mental Health

Abstract

Presents results from a community study assessing the prevalence of post-traumatic stress disorder (PTSD) and the psychosocial consequences of the landslide which occurred in Sarno, Southern Italy, in May 1998. A random sample of 272 adults (aged 18-65 yrs) was recruited from the population living in the highest risk area of Sarno, and a control group was recruited in a small town situated near the disaster area, but not affected by the event. All subjects (Ss) were assessed 1 yr after the disaster by standardized instruments. Of Ss recruited in Sarno, 27.6% met DSM-IV criteria for PTSD; 59% subjects recruited in Sarno and 35% of the control group were identified as "probable cases" by the General Health Questionnaire (GHQ-30). Ss recruited in Sarno had significantly higher scores on the 4 GHQ-30 subscales identified by factor analysis. These data emphasize the negative impact of a natural catastrophic event on mental health, and the need for preventive interventions.

RRL - 0131

Title Natural disaster and depression: A prospective investigation of reactions to the 1993 Midwest floods

Author(s) Ginexi, Elizabeth M.; Weihs, Karen; Simmens, Samuel J.
American Journal of Community Psychology, Vol 28(4), Aug 2000. pp. 495-518

Key themes Disasters and Mental Health

Abstract

A statewide sample of 1735 Iowa residents, approximately half of whom were victims of the 1993 Midwest Floods, participated in interviews 1 year prior to, and 30 to 90 days after, the disaster. Employing a rigorous methodology including both control-group comparisons and predisaster assessments, we performed a systematic evaluation of the disaster's impact. Overall, the disaster led to true but small rises in depressive symptoms and diagnoses 60–90 days postflood. The disaster–psychopathology effect was not moderated by predisaster depressive symptoms or diagnostically defined depression; rather, predisaster symptoms and diagnoses uniquely contributed to increases in postdisaster distress. However, increases in symptoms as a function of flood impact were slightly greater among respondents with the lowest incomes and among residents living in small rural communities, as opposed to on farms or in cities. Implications for individual- and community-level disaster response are discussed.

RRL - 0132

Title Socio-structural differentials in the mental health impact of the 1994 Northridge earthquake. (California)

Author(s) D'Souza, Melvin J. J.
Dissertation; International Section A: Humanities and Social Sciences, Vol 60(4-A), Oct 1999. pp. 1351

Key themes Disasters, Mental health and Vulnerability

Abstract

In the field of disaster research, the mental health consequences of disasters is a matter of controversy, with claims ranging from long-term psychological distress to positive effects on mental health. Using a model of psychosocial stress, this study analyzes post-disaster psychological distress as a function of social location, disaster stressors, and other life events. It is hypothesized that persons of disadvantaged social status would have higher levels of distress due to differential exposure to stressors and differential vulnerability to stressors. Multi-staged regression analysis indicates that in the 1994 Northridge Earthquake in Southern California, persons of disadvantaged social status (such as minorities and persons of low socioeconomic status) were in general less exposed than others to earthquake-related stressors. Five of the seven earthquake stressors (MMI, residential damage, injury to self, injury to household members, and neighborhood damage) were found to have a dose-response effect on psychological distress. Post-disaster psychological distress was higher for Hispanics, non-Black ethnic minorities, widowed persons, and persons with low family income. In addition, Hispanics, divorced/separated persons, and persons with low family income were more vulnerable than others to two or more earthquake stressors. Finally, as measured in this study, other life events were found to be stronger predictors than earthquake stressors of distress. By analyzing the relationship between disasters and psychological distress in a socio-structural context, this study highlights the importance of considering both differential exposure and differential vulnerability as complementary explanations of post-disaster psychological distress

RRL - 0133

Title Environmental hazards and home loss: The social construction of becoming homeless

Author(s) Wiesenfeld, Esther; Panza, Rebeca
Community, Work & Family, Vol 2(1), Apr 1999. pp. 51-65.

Key themes Disasters, Mental Health and homelessness

Abstract

Examined the psychological and social aspects of becoming homeless through in-depth interviews with 27 Venezuelans (aged 15-55 yrs) who lost their homes due to a landslide. The main topics brought up by the interviewees included: (1) the meaning of their homes; (2) the impact of having lost them; (3) the impact on their sense of family; (4) the meaning of having become homeless and remaining indefinitely as such; and (5) attribution of responsibilities for the disaster and for solutions to their homelessness. An analysis of some of the psychosocial processes related to these topics is presented, as well as some ideas derived from the interpretation of the information gathered regarding risk prevention and the conception of homelessness.

RRL - 0134

Title Impact of the 1997 flood on cognitive performance in the elderly

Author(s) Ferraro, F. Richard; Morton, M.; Knutson, S.
Clinical Gerontologist, Vol 20(2), 1999. pp. 79-82

Key themes Disasters, Mental Health and Age

Abstract

The present study was partly exploratory. The opportunity arose to examine the impact of the Spring 1997 flood on older adults who had been providing similar psychometric and experimental data up to 5 yrs before the flood event. A total of 68 elderly adults (mean age 71 yrs) participated. Ss took psychometric tests and provided demographic information before the flood and within 12-18 mo following the flood, Ss were called back to the laboratory to take the same battery of tests. The authors examined the same demographic, psychometric, and experimental (i.e., cognitive) performance on only 57 of the 68 Ss who provided both pre-flood and post-flood data. Results indicated a main effect of gender for medication use, with females using more medications after the flood than males. Also, females spent more days away from home following the flood than did males

RRL - 0135

Title Recovery from post-earthquake psychological morbidity: Who suffers and who recovers?

Author(s) Lewin, Terry J.; Carr, Vaughan J.; Webster, Rosemary A.
Australian and New Zealand Journal of Psychiatry, Vol 32(1), Feb 1998. pp. 15-20.

Key themes Disasters and Mental Health

Abstract

This study sought to identify the psychosocial characteristics of high earthquake exposure that were associated with the development of post-disaster morbidity and with recovery. Data reported are from 515 participants (mean age 43.4 yrs at the time of the earthquake) in a longitudinal study of the effects of the 1989 Newcastle (Australia) earthquake. Ss were allocated to 3 subgroups (low morbidity; recovered; and persistent morbidity) on the basis of their Impact of Event Scale (M. Horowitz et al, 1979) scores across the 4 phases of the study. Differences between these subgroups were examined on a broad range of variables. Results show several background, dispositional, coping style and exposure-related factors characterized those who developed psychological morbidity, only a small subset of which differentiated between those who recovered and those with persistent morbidity. It is concluded that post-earthquake morbidity persists longer in those who are older, have a history of emotional problems, have higher neuroticism, use more neurotic defenses, and report higher levels of post-disaster life events.

RRL - 0136

Title A synthesis of the findings from the Quake Impact Study: A two-year investigation of the psychosocial sequelae of the 1989 Newcastle earthquake.

Author(s) Carr, V. J.; Lewin, T. J.; Webster, R. A.
Social Psychiatry and Psychiatric Epidemiology, Vol 32(3), Apr 1997. pp. 123-136.

Key themes Disasters and Mental Health

Abstract

This paper summarises major findings from the Quake Impact Study (QIS), a 4-phase longitudinal project that was conducted following the 1989 Newcastle (Australia) earthquake. 3,484 Ss participated in at least 1 component of the QIS, comprising a stratified sample of 3,007 drawn from community electoral rolls and 464 from specially targeted supplementary samples (the injured, the displaced, the owners of damaged businesses, and the helpers). Ss' initial earthquake experiences were rated in terms of weighted indices of exposure to threat and disruption. Psychological morbidity was measured at each phase using the General Health Questionnaire and the Impact of Event Scale. Selected findings and key conclusions are presented for each of six areas of investigation: service utilisation during the first 6 months post-disaster; patterns of earthquake experience and short-term (6-month) psychosocial outcome; earthquake exposure and medium term (2-year) psychosocial outcome; vulnerability factors and medium-term psychosocial outcome; specific community groups at increased risk (e.g., the elderly and immigrants from non-English-speaking backgrounds); the effects of stress debriefing for helpers. Threshold morbidity (i.e., likely caseness) rates are also presented for a broad range of subgroups.

RRL - 0137

Title The psychosocial impact of an earthquake on the elderly

Author(s) Ticehurst, Stephen; Webster, Rosemary A.; Carr, Vaughan J
International Journal of Geriatric Psychiatry, Vol 11(11), Nov 1996. pp. 943-951

Key themes Disaster, Mental Health and Age

Abstract

A 4-phase community survey examined psychosocial effects of an earthquake that occurred in Newcastle, Australia, in 1989. Comparisons were made between 2,371 adults aged less than 65 yrs and 636 adults aged 65 yrs and older; 845 Ss participated in the 2-yr follow-up. Older Ss reported fewer threat and disruption experiences and used fewer general and disaster-related support services. However, older Ss reported higher overall levels of posttraumatic stress symptoms (PTSSs) on the Impact of Event Scale (IES) than did younger Ss. On both the IES and a general measure of morbidity, the effects of earthquake exposure were more marked among the elderly. Within the older group, Ss who had high levels of PTSSs were more likely to be female, to report higher levels of exposure, and to use behavioral and avoidance coping styles. Although psychological distress declined with time, PTSSs remained higher for the high exposure group throughout the study.

RRL - 0138

Title Impact of a natural disaster on preschool children: Adjustment 14 months after a hurricane.

Author(s) Swenson, Cynthia Cupit; Saylor, Conway F.; Powell, M. Paige
American Journal of Orthopsychiatry, Vol 66(1), Jan 1996. pp. 122-130

Key themes Disaster, Mental Health and Age

Abstract

This paper examines the duration of emotional and behavioral problems among children (aged 2-6 yrs) 14 months after they had experienced hurricane Hugo and assessed factors that predicted longevity of these problems. Mothers of those who had experienced the storm provided information on their children's behavioral problems, trauma symptoms, effects of the hurricane, life stressors, and duration of symptoms; this information was compared with information provided by mothers of control children (aged 2-10 yrs) who had not experienced the storm. Those who had experienced the storm showed significantly higher anxiety and withdrawal and more behavior problems than did children who had not. Behavioral problems decreased steadily over the 6 mo following the storm. Mothers' distress in the hurricane's aftermath was associated with longevity of their children's emotional and behavioral difficulties

RRL - 0139

Title Natural disasters and post-traumatic stress disorder: Short-term versus long-term recovery in two disaster-affected communities

Author(s) Steinglass, Peter; Gerrity, Ellen
In *Journal of Applied Social Psychology*, Vol 20(21, Pt 1), Dec 1990. Special issue: Traumatic stress: New perspectives in theory, measurement, and research: II. Research findings. pp. 1746-1765

Key themes Disasters and Mental health

Abstract

This study investigated posttraumatic stress disorder (PTSD) in 115 adults from 2 communities following disaster-precipitated family relocation in a longitudinal study of family and individual response to natural disasters. Psychosocial adjustment was measured at 4 mo and 16 mo after the disaster. Instruments used for assessing stress-related symptomatology included an impact of event scale and the Diagnostic Interview Schedule. Levels of short-term stress symptomatology and diagnosable PTSD were substantial in both communities, and significant decrements in these levels occurred by 16 mo postdisaster. Substantial gender differences (greater levels for women) were apparent in both short- and long-term PTSD response rates. Patterns and levels of PTSD symptoms were different in the 2 communities.

RRL - 0140

Title Predictors of PTSD and delayed PTSD after disaster: the impact of exposure and psychosocial resources

Author(s) Adams RE, Boscarino JA
In *J Nerv Ment Dis*. 2006 Jul;194(7):485-93.

Key themes Disasters and Mental health

Abstract

In the present study we sought to identify factors associated with posttraumatic stress disorder (PTSD) following the World Trade Center Disaster (WTCD) and examine changes in PTSD status over time. Our data come from a two-wave, prospective cohort study of New York City adults who were living in the city on September 11, 2001. We conducted a baseline survey 1 year after the attacks (year 1), followed by a survey 1 year later (year 2). Overall, 2368 individuals completed the year 1 survey, and 1681 were interviewed at year 2. Analyses for year 1 indicated that being younger, being female, experiencing more WTCD events, reporting more traumatic events other than the WTCD, experiencing more negative life events, having low social support, and having low self-esteem increased the likelihood of PTSD. For year 2, being middle-aged, being Latino, experiencing more negative life events and traumas since the WTCD, and having low self-esteem increased the likelihood of PTSD. Exposure to WTCD events was not related to year 2 PTSD once other factors were controlled. Following previous research, we divided study respondents into four categories: resilient cases (no PTSD years 1 or

2), remitted cases (PTSD year 1 but not year 2), delayed cases (no PTSD year 1 but PTSD year 2), and acute cases (PTSD both years 1 and 2). Factors predicting changes in PTSD between year 1 and year 2 suggested that delayed PTSD cases were more likely to have been Latino, to have experienced more negative life events, and to have had a decline in self-esteem. In contrast, remitted cases experienced fewer negative life events and had an increase in self-esteem. We discuss these findings in light of the psychosocial context associated with community disasters and traumatic stress exposures.

RRL - 0141

Title Understanding community psychosocial needs after disasters: Implications for mental health services

Author(s) Silove D, Steel Z, Psychol M.
Symposium; 2006; Vol 52, Issue 2 pg 121-125

Key themes Disaster and Mental health and recovery

Abstract

The psychosocial impact of disasters has attracted increasing attention. There is little consensus, however, about what priorities should be pursued in relation to mental health interventions, with most controversy surrounding the relevance of traumatic stress to mental health. The present overview suggests that acute traumatic stress may be a normative response to life threat which tends to subside once conditions of safety are established. At the same time, there is a residual minority of survivors who will continue to experience chronic posttraumatic stress disorder (PTSD) and their needs can be easily overlooked. The ADAPT model offers an expanded perspective on the psychosocial systems undermined by disasters, encompassing threats to safety and security; interpersonal bonds; systems of justice; roles and identities; and institutions that promote meaning and coherence. Social reconstruction programs that are effective in repairing these systems maximize the capacity of communities and individuals to recover spontaneously from various forms of stress. Within that broad recovery context, clinical mental health services can focus specifically on those psychologically disturbed persons who are at greatest survival risk. Only a minority of persons with acute traumatic stress fall into that category, the remainder comprising those with severe behavioural disturbances arising from psychosis, organic brain disorders, severe mood disorders and epilepsy. Establishing mental health services that are community-based, family-focused and culturally sensitive in the post-emergency phase can create a model that helps shape future mental health policy for countries recovering from disaster.

RRL - 0142

Title The impact of disaster on culture, self, and identity: increased awareness by health care professionals is needed

Author(s) Deeny P, Mc Fetridge B
In Nursing Clinics of North America; 40 (3); 431-440; 2005

Key themes Disaster, Mental Health and Culture

Abstract

Self, identity, and culture are important psychosocial concepts in the analysis of how individuals perceive self in social context, self across the lifespan, and self in relation to cultural context. Contemporary theories emphasize the importance of a holistic perspective and promote the idea of identity as opposed to self-concept. This article explores the application of these ideas to disasters to provide guidance for health care professionals on how disasters impact individuals, groups, and communities. Disasters have a major impact on social infrastructure and culture, and in turn result in a range of human responses. Placing identity and maintenance of cultural integrity at the heart of practice, health care professionals are encouraged to take a holistic perspective across all phases of the disaster. Individuals, groups, and communities exhibit a range of responses influenced by levels of vulnerability or resilience. Facilitating expression of feelings related to the disaster experience is an important focus for health care. Always working within the cultural context and being sensitive to the rituals related to remembering and mourning help preserve dignity and possibly facilitate creation of a new identity and a revised culture after a disaster.

RRL - 0143

Title Overview of the Psychosocial Impact of Disasters

Author(s) Gloria R. Leon
In Prehospital and Disaster Medicine; 2004; <http://pdm.medicine.wisc.edu>; Vol 19; No 1

Key themes Disaster and Mental Health

Abstract

The psychosocial consequence can be intense and of long duration in the aftermath of natural and technological disasters, as well as terrorist attacks. Posttraumatic stress symptoms and full syndrome disorder, depression, anxiety, somatic complaints, and excessive alcohol use have been demonstrated consistently, particularly following large-scale disasters. This paper examines the psychological research conducted at various intervals after extensive natural disasters, the Three Mile Island and Chernobyl technological accidents, and recent terrorist events in the United States. Factors predictive of the emergence of emotional distress and psychological and physical problems following a disaster also are discussed.

RRL - 0144

Title Psychological Impact of Disasters and Terrorism on Children and Adolescents: Experiences from Australia

Author(s) Sally Wooding and Beverley Raphael
In Prehospital and Disaster Medicine 2004, <http://pdm.medicine.wisc.edu>; Vol 19; No 1

Key themes Disaster and Mental Health

Abstract

Recent acts of terrorism have emphasised the need for research to further establish not only the nature of the impact of disaster and terrorism on the population, but also further define methods of effective intervention. Those affected, and often overlooked, include children and adolescents, yet, our knowledge of the impact upon the younger members of our community is limited. The literature is evolving, and there are a small number of valuable studies that can inform a response to the mental health needs of this younger population. This article reviews some of the psychological impacts of disaster and terrorism upon children and adolescents, and considers both risk and protective factors. The importance of a developmental approach to children's understanding of disaster, particularly death and the nature of grief and loss are discussed as is the distinction between the phenomenology of bereavement and trauma. Family and community support are highlighted as protective factors, and a number of recent, valuable recommendations for intervention including psychological first aid and cognitive-behavioral therapy are described. Finally, the complex role of the media and the degree that children should be exposed to images of violence and disaster is considered. Disasters, whether they are natural or human-made always will be with us. It is necessary that a public-health approach that not only prepares for such scenarios, but responds by maximising the use of existing systems and agency linkages, is taken.

RRL - 0145

Title The Traumatic Process: Conceptualization and Treatment

Author(s) Shabtai Noy
Traumatology; Vol 10; No 4; pg 211-230; 2004 DOI; Sage publications

Key themes Disasters and Mental Health

Abstract

Traumatic stress stems from a threat to an individual's or a group's very existence. The impact of the existential threat may be compounded by an inability to cope, which affects the perception of helplessness and loss of lawfulness. A model is proposed in which the traumatic process is conceptualized to develop through three stages: (1) Alert; (2) Impact; and (3) Post-trauma. In this model, treatment of traumatic stress emphasizes the need to control and expand life, and to achieve lawfulness and meaningfulness. In the proposed model of treatment, there are essential differences at each of the stages of the traumatic process: (1) primary prevention at the stage of alert focuses on planning strategies for coping; (2) secondary prevention at the stage of impact is based on forward treatment and debriefing; and (3) tertiary treatment at the post-trauma stage attends to coping with internal chaos and arbitrariness.

RRL - 0146

Title Risk Factors for Adolescent Alcohol Use Following a Natural Disaster

Author(s) Janine M. Schroeder, Melissa A. Polusny
In Prehospital and Disaster Medicine; <http://pdm.medicine.wisc.edu>; Vol 19; No 1; 2004

Key themes Disasters and Mental Health

Abstract

On 29 March 1998, a series of category F-3 and F-4 tornadoes caused wide-spread destruction in four rural southern Minnesota counties in the United States. Extensive research has examined the impact of disaster exposure on adults' psychological functioning, including alcohol use. However, there has been little research on potential risk factors for adolescents' alcohol use following disaster exposure.

Hypothesis: It was hypothesized that demographic variables such as age and gender, prior drinking involvement, extent of prior trauma history, level of disaster exposure, and current disaster-related post-traumatic stress disorder (PTSD) symptomatology would predict alcohol use among adolescents.

Methods: Six months following a natural disaster, survey data were collected from 256

adolescents assessing these factors. Risk factors for adolescents alcohol use were identified using hierarchical, multiple regression and logistic regression analyses.

Results: Greater age, prior drinking involvement, and the extent of prior trauma history were significantly associated with higher levels of binge drinking. Prior trauma history and current levels of disaster-related PTSD symptomatology were significant risk factors for adolescents' report of increases in their alcohol consumption since the tornado.

Conclusion: In general, the extent of trauma exposure was associated with greater binge drinking among adolescents. Similar to adults, post-traumatic stress symptoms experienced in the aftermath of a disaster can lead to increased alcohol consumption among adolescents.

RRL - 0147

Title Impacts of an environmental disaster on psychosocial health and well-being in Karakalpakstan

Author(s) Crighton EJ; Elliott SJ; Meer J; Small I; Upshur R 2003
In *Social Science and Medicine*, Vol 56, No 3; 551-67

Key themes Disasters, Mental Health and Age

Abstract

The people of Karakalpakstan, along with those of the entire Aral Sea region, are facing a multitude of health problems corresponding to the drying of the Aral Sea and accompanying ecological consequences. In case studies of other environmental disasters, research has shown that environmental exposures may impact not only the physiological but also the psychosocial health of individuals. This research aims to determine the contribution of the environmental disaster to the psychosocial health of people living in Karakalpakstan, a semi-autonomous Republic in Uzbekistan. An interview survey was carried out by Médecins Sans Frontières, with the assistance of the McMaster Institute of Environment and Health, local Universities and local health care workers, on a random sample of 1118 individuals aged 18 years and older in three communities in Karakalpakstan in May/June 1999. The communities were chosen according to distance from the former seashore, urban/rural characteristics and ethnic composition. The survey included questions about perceived general health, the General Health Questionnaire, the somatic symptom checklist of the Symptom Check List-90, questions about perceptions of the environmental disaster, social support as well as socio-demographic and socio-economic characteristics. Findings show that 41% of all respondents reported environmental concern while 48% reported levels of somatic symptoms (SCL-90) associated with emotional distress, above the normalized cut-point. Significant differences in levels of emotional distress were reported between men and women as well as between ethnic groups. Environmental problems are commonly perceived to be the cause of somatic symptoms and are significantly related to self-rated health status.

RRL - 0148

Title Physical symptoms of chronic fatigue syndrome are exacerbated by the stress of Hurricane Andrew

Author(s) Susan K. Lutgendorf, PHD, Michael H. Antoni, PHD, Gail Ironson, MD, PHD, Mary Ann Fletcher, PHD, Frank Penedo, BS, Andrew Baum, PHD, Neil Schnelderman, PHD, and Nancy Klimas, MD
Psycho som Med. 1995 Jul-Aug;57(4):310-23

Key themes Disaster and Mental Health

Abstract

This study examined the effects of Hurricane Andrew on physical symptoms and functional impairments in a sample of chronic fatigue syndrome (CFS) patients residing in South Florida. In the months after Hurricane Andrew (September 15-December 31, 1992), 49 CFS patients were assessed for psychosocial and physical functioning with questionnaires, interviews, and physical examinations. This sample was made up of 25 CFS patients living in Dade county, a high impact area, and 24 patients in Broward and Palm Beach counties, areas less affected by the hurricane. Based on our model for stress-related effects on CFS, we tested the hypothesis that the patients who had the greatest exposure to this natural disaster would show the greatest exacerbation in CFS symptoms and related impairments in activities of daily living (illness burden). In support of this hypothesis, we found that the Dade county patients showed significant increases in physician-rated clinical relapses and exacerbations in frequency of several categories of self-reported CFS physical symptoms as compared to the Broward/Palm Beach county patients. Illness burden, as measured on the Sickness Impact Profile, also showed a significant increase in the Dade county patients. Although extent of disruption due to the storm was a significant factor in predicting relapse, the patient's post hurricane distress response was the single strongest predictor of the likelihood and severity of relapse and functional impairment. Additionally, optimism and social support were significantly associated with lower illness burden after the hurricane, above and beyond storm-related disruption and distress responses. These findings provide information on the impact of environmental stressors and psychosocial factors in the exacerbation of CFS symptoms.

RRL - 0149

Title of article Effects of a natural disaster on immigrants and host population

Author(s) Webster, Rosemary A.; McDonald, Robert; Lewin, Terry J.; Carr, Vaughan J.
In J Nerv Ment Dis. 1995 Jun;183(6):390-7

Key themes Disaster, Mental Health and Vulnerability

Abstract

The psychosocial effects of the 1989 Newcastle earthquake on 250 immigrants from non-English-speaking backgrounds (NESB) were compared with a matched sample of 250 Australian-born subjects. The NESB subjects had higher levels of both general (General Health Questionnaire-12) and event-related (Impact of Event Scale) psychological morbidity. Furthermore, NESB females had the highest levels of distress, particularly those who were older on arrival in Australia and those who experienced high levels of disruption. The results suggest that NESB immigrants, particularly women, appear to be more at risk for developing psychological distress following a natural disaster. However, level of exposure and an avoidance coping style contributed more substantially to psychological distress than ethnicity.

RRL- 0150

Title Predictors of PTSD and Delayed PTSD After Disaster: The Impact of Exposure and Psychosocial Resources

Author(s) Richard E. Adams, Joseph A. Boscarino

The Journal of Nervous and Mental Disease, 2006 Vol 194 ISN 7

Key theme(s) Posttraumatic stress disorder, delayed PTSD, disasters, psychosocial factors, stress exposure.

Abstract

In the present study we sought to identify factors associated with posttraumatic stress disorder (PTSD) following the World Trade Center Disaster (WTCD) and examine changes in PTSD status over time. Our data come from a two-wave, prospective cohort study of New York City adults who were living in the city on September 11, 2001. We conducted a baseline survey 1 year after the attacks (year 1), followed by a survey 1 year later (year 2). Overall, 2368 individuals completed the year 1 survey, and 1681 were interviewed at year 2. Analyses for year 1 indicated that being younger, being female, experiencing more WTCD events, reporting more traumatic events other than the WTCD, experiencing more negative life events, having low social support, and having low self-esteem increased the likelihood of PTSD. For year 2, being middle-aged, being Latino, experiencing more negative life events and traumas since the WTCD, and having low self-esteem increased the likelihood of PTSD. Exposure to WTCD events was not related to year 2 PTSD once other factors were controlled. Following previous

research, we divided study respondents into four categories: resilient cases (no PTSD years 1 or 2), remitted cases (PTSD year 1 but not year 2), delayed cases (no PTSD year 1 but PTSD year 2), and acute cases (PTSD both years 1 and 2). Factors predicting changes in PTSD between year 1 and year 2 suggested that delayed PTSD cases were more likely to have been Latino, to have experienced more negative life events, and to have had a decline in self-esteem. In contrast, remitted cases experienced fewer negative life events and had an increase in self-esteem. We discuss these findings in light of the psychosocial context associated with community disasters and traumatic stress exposures.

Research Methodology

The data for the present study come from a two-wave panel study of English or Spanish speaking adults living in New York City (NYC) on the day of the WTCD. For year 1 (Y1), we conducted a telephone survey 1 year after the attacks, using random-digit dialing. As part of the overall study, we oversampled residents who reported receiving any mental health treatment in the year after the attacks. The population was also stratified by the five NYC boroughs and gender, and sampled proportionately. Questionnaires were translated into Spanish and then back-translated by bilingual Americans to ensure the linguistic and cultural appropriateness. Y1 interviews occurred between October and December 2002.

For year 2 (Y2), we attempted to reinterview all Y1 participants 1 year later (i.e., 2 years after the WTCD). All Y2 interviews occurred between October 2003 and February 2004. The procedures were the same for both survey waves. Trained interviewers using a computer-assisted telephone interviewing system conducted the surveys and were supervised by the survey contractor in collaboration with the investigative staff. A protocol was in place to provide mental health assistance to participants who required psychiatric counseling. The mean duration of the interviews was about 45 minutes for Y1 and 35 minutes for Y2. Incentives of \$10 and \$20 were offered to Y1 and Y2 participants, respectively.

The Institutional Review Board of the New York Academy of Medicine reviewed and approved the study's protocols.

Overall, 2368 individuals completed the Y1 survey, and 1681 completed the Y2 survey.

Finding(s)

Being 18–29, being female, experiencing more WTCD-related events, reporting low social support, and having low self-esteem were risk factors for the onset of Y1 PTSD, even after taking other stressful events into account. Two years after the attacks, however, younger age, gender, and social support were no longer related to PTSD. Instead, Latinos and respondents between 30 and 64 were at risk for PTSD, as well as those with low self-esteem, again controlling for other stressful events. Finally, our study documents a small but significant number of respondents who had increases in PTSD symptoms between 1 and 2 years post-WTCD, which also is consistent with previous research (Creamer et al., 2001; Gray et al., 2004; Orcutt et al., 2004). However, our study went beyond prior studies and explored some of the reasons for delayed and remitted PTSD. Although each of these two symptom trajectory

groups represent only 3% of the sample, they show that changes both in social circumstances and psychological resources are potential explanations as to why some persons had their PTSD symptoms remit, while others experienced delayed PTSD. More specifically, individuals with delayed PTSD reported experiencing more negative life events postdisaster and had a marked decline in self-esteem, whereas remitters reported fewer negative events and showed an increase in self-esteem during this same period. PTSD symptoms and symptom severity show a similar pattern, with delayed PTSD respondents becoming more symptomatic and experiencing the symptoms more severely, whereas remitted PTSD cases show significant improvement in these areas. In multivariate comparisons with other groups, those most at risk for delayed PTSD were Latinos, those who experienced more negative life events, and those with low self-esteem. It is noteworthy that the delayed-onset group was more like the resilient group at Y1 and more like the acute group at Y2, while, again, the opposite was observed in the remission group.

RRL- 0151

Title Psychological distress among Bam earthquake survivors in Iran: a population-based study

Author(s) Hamid Baradaran, Ali Montazeri, Sepideh Omidvari, Seyed Ali Azin

BMC Public Health, 2005 Vol 5

Key theme(s) Bam earthquake, psychological distress

Abstract

Background: An earthquake measuring 6.3 on the Richter scale struck the city of Bam in Iran on the 26th of December 2003 at 5.26 A.M. It was devastating, and left over 40,000 dead and around 30,000 injured. The profound tragedy of thousands killed has caused emotional and psychological trauma for tens of thousands of people who have survived. A study was carried out to assess psychological distress among Bam earthquake survivors and factors associated with severe mental health in those who survived the tragedy.

Methods: This was a population-based study measuring psychological distress among the survivors of Bam earthquake in Iran. Using a multi-stage stratified sampling method a random sample of individuals aged 15 years and over living in Bam were interviewed. Psychological distress was measured using the 12-item General Health Questionnaire (GHQ-12).

Results: In all 916 survivors were interviewed. The mean age of the respondents was 32.9 years (SD = 12.4), mostly were males (53%), married (66%) and had secondary school education (50%). Forty-one percent reported they lost 3 to 5 members of their family in the earthquake. In addition the findings showed that 58% of the respondents suffered from severe mental

health as measured by the GHQ-12 and this was three times higher than reported psychological distress among the general population. There were significant differences between sub-groups of the study sample with regard to their psychological distress. The results of the logistic regression analysis also indicated that female gender; lower education, unemployment, and loss of family members were associated with severe psychological distress among earthquake victims.

Conclusion: The study findings indicated that the amount of psychological distress among earthquake survivors was high and there is an urgent need to deliver mental health care to disaster victims in local medical settings and to reduce negative health impacts of the earthquake adequate psychological counseling is needed for those who survived the tragedy.

RRL- 0152

Title Traumatic Stress Responses in Earthquake Survivors in Turkey

Author(s) [Başoğlu M](#), [Salcioğlu E](#), [Livanou M](#)

Journal of Traumatic Stress, 2002 Vol 15 ISN 4

Key theme(s) Earthquake; natural disaster; PTSD; depression; Turkey.

Summary

This study examined the rates of posttraumatic stress disorder (PTSD) and depression and associated risk factors in earthquake survivors in Turkey. A group of 1,000 people from 3 camps and 2 prefabricated housing sites in the epicenter region was assessed using the Screening Instrument for Traumatic Stress in Earthquake Survivors. The estimated rates of PTSD and major depression were 43 and 31%, respectively. Traumatic stress symptoms related to more intense fear during the earthquake, female gender, having been trapped under rubble, death of a family member, past psychiatric illness, having participated in rescue work, and lower education. Avoidance of trauma reminders was the most common symptom and needs special attention in survivor care because of its mental health, social, and economic implications.

Research Question(s)

- What are psychological consequences of earthquakes in countries that are prone to large-scale destruction because of their geographical location, poor structural quality of buildings, and unpreparedness for earthquakes?
- a. What are the rates of PTSD and major depression in 1,000 earthquake survivors in Turkey?
 - b.

Research Methodology

The present report is based on a project designed to provide psychological help for earthquake survivors. This project was launched in September 1999 and involved five field sites in Gölçük (epicenter). The project team that did the fieldwork consisted of five psychologists, two social workers, and two volunteer psychology students.

The SITSES consisted of three parts (1) Survivor Information Form (SIF)—28 items concerning demographics, personal and family history, trauma characteristics, and intensity of fear during the earthquake (0 D *None*; 1 D *Mild*; 2 D *Somewhat severe*; 3 D *Severe*; 4 D *Extremely severe*), (2) Traumatic Stress Symptom Checklist (TSSC)—17 *DSM-IV* PTSD and 6 depression symptoms in the last week, all measured on an intensity scale (0 D *Not at all bothered*, 1 D *Slightly*; 2 D *Fairly*; 3 D *Very much bothered*), and (3) Severity of Disability Scale (SDS)—3 items measuring the global severity of distress (How distressed/bothered are you by the problems listed above?; 0 D *Not distressed at all*, 1 D *Slightly*; 2 D *Fairly*; 3 D *Extremely distressed*), the degree of disability in work, family, and social functioning (How impaired/ limited is your work, family life, and relationships with others because of the problems above?; 0 D *Not at all impaired*, 1 D *Slightly*; 2 D *Fairly*; 3 D *Extremely impaired*), and request for help (Would you like help from a doctor or a psychologist?; 0 D *No*; 1 D *Yes*; 2 D *Not sure*).

Finding(s)

The estimated prevalences of PTSD and MDE were 47 and 33%, respectively. Women had a significantly higher estimated prevalence of PTSD, 53% versus 33%, $\chi^2(1; N = 1,000) = 36.81; p < .001$, and MDE, 38% versus 24%, $\chi^2(1; N = 1,000) = 18.06; p < .001$, than did men. Taking into account the fact that 68% of the respondents were women, the adjusted rates for PTSD and MDE were 43 and 31%, respectively. As our study included more than one person from 33% of the 682 households that were screened, familial factors might have led to an overestimation of PTSD and MDE. When the analyses included only one randomly selected person from each household ($n = 682$), the results were essentially the same, yielding unadjusted rates of 48 and 34% for PTSD and MDE, respectively.

RRL- 0153

Title of article Prevalence of posttraumatic stress disorder and comorbid depression in earthquake survivors in Turkey: an epidemiological study.

Author(s) [Başoğlu M](#), [Kiliç C](#), [Salcioğlu E](#), [Livanou M](#)

Journal of Traumatic Stress, 2004 Vol 17 ISN 2

Key theme(s) PTSD; earthquake; Turkey

Summary

This study examined the prevalence of posttraumatic stress disorder (PTSD) and depression 14 months after the earthquake in Turkey in 2 randomly selected samples from the epicenter (n = 530) and a suburb of Istanbul 100 km from the epicenter (n = 420). The rates of PTSD and depression comorbid with PTSD were, respectively, 23 and 16% at the epicenter and 14 and 8% in Istanbul. The strongest predictor of traumatic stress symptoms was fear during the earthquake, whereas predictions with female gender, past psychiatric illness, damage to home, participation in rescue work, past trauma, and loss of close ones were significant but weak. Our findings suggest that devastating earthquakes have long-term psychological effects. Psychological interventions reducing fear may improve PTSD in survivors.

RRL- 0154

Title Conservation of resources and coping self-efficacy predict distress following a natural disaster: a causal model analysis where the environment meets the mind.

Author(s) Benight, Charles C., Ironson, Gail, Carver, Charles S., Wynings, Christina
Anxiety, Stress & Coping, 1999 Vol 12 ISN 2

Key theme(s) Coping self-efficacy; Lost resources; Disaster; Coping; Stress

Summary

Disaster research has increasingly examined how personal characteristics mediate emotional recovery following disaster exposure. We investigated the importance of lost resources, coping self-efficacy, and coping behavior as important variables in acute disaster reaction and medium range disaster recovery following Hurricane Andrew. One hundred and eighty participants living in southern Dade county completed the initial phase of the study (1-4months post-hurricane), with 135 individuals completing the second wave (8-12months post-hurricane). Results confirmed that lost resources, coping self-efficacy, and coping behavior are important in understanding psychological reactivity following a natural disaster. These variables together provided the best fitted causal model for describing psychological reactions to the hurricane over time. Results are discussed in relation to how coping self-efficacy may serve as an important intra-personal factor that mediates how lost resources are managed and how

effective coping ensues. Implications for clinical interventions are also addressed.

Research Objective

To understand the underlying mechanisms by which lost resources, coping self-efficacy (CSE), and coping behavior influence acute disaster reaction and subsequent disaster recovery following Hurricane Andrew.

Research Methodology

This study is part of a larger community study (Ironson et al., 1997) investigating the overall impact of Hurricane Andrew on the general population. Participants were 180 residents from southern Dade county, who completed the first phase of the study. Of this original sample 135 individuals completed the second wave. Thus, we had a follow-up response rate of 75%. General psychological distress levels were found to be significantly higher ($t(165) = 3.1$; $p = 0.0023$) for those participants who did not participate in the second wave of data collection. However, there were no differences between follow-up participants and non-responders on reported PTSD symptoms or the Impact of Event Scale score. Additionally, no differences were found on any of the demographic variables. Participants were recruited through fliers at neighborhood food stores, staff from various companies, and door to door contacts in a range of damaged areas from minimal to extreme damage.

The Hurricane Coping Self-Efficacy Measure was used to assess perceptions of CSE following the hurricane. This measure was developed with a panel of experts (members of the hurricane research group) and with actual hurricane victims (not included in this sample). The measure includes the primary situational recovery demands that hurricane victims were faced with such as the threat of looting, insurance company difficulties, obtaining shelter, and controlling their emotional reactions.

The conservation of resources-evaluation (COR-E) was developed from Hobfoll's conservation of resources model of stress (Hobfoll, 1989) and has been utilized in previous disaster studies (Freedy et al., 1992b; 1994). Within the disaster context, loss of resources (LOR) is used to assess the degree of loss (e.g., pets, sentimental possessions, time to do work, etc.) experienced by victims. In order to reduce the confounding nature of the initial measure utilized by Freedy, the list of resources utilized for this study included less items related to psychological distress and more focused on material resources (e.g., car, furniture, etc.). The SCL-90R (Derogotis, 1983) was utilized to assess psychological distress following the hurricane. This is a 90-item self-report measure designed to assess psychological distress in psychiatric and medical patients.

Coping behavior was assessed with a modified version of the COPE (Carver et al., 1989). The COPE is a 60-item measure of different coping behaviors.

Finding(s)

The longitudinal theoretical path model including loss of resources, CSE, and coping behaviors was the best fitted model. The nested χ^2 analysis, comparing Model B with the Full Model,

confirmed the value of including these variables in understanding acute and medium range psychological distress following this type of extreme stress. The directions of the path coefficients were all in the expected direction for these variables.

The longitudinal findings were also interesting for the acute factors and subsequent distress. Resource loss was related to subsequent psychological distress through active coping, CSE perceptions, and psychological distress at time 1. Resource loss due to Hurricane Andrew was severe. The effect of these losses on subsequent psychological distress appears to be linked with self-appraisals of restorative capabilities, the level of distress experienced in the first few weeks after the storm, and actual attempts at managing the on-going struggle to regain basic resources (e.g., water, electricity, etc.). These data suggest that active coping may provide more resolutions and improved functioning over time.

RRL- 0155

Title Psychological reactions in Icelandic earthquake survivors

Author(s) I. Bødvarsdóttir, A. Elklit

Scandinavian Journal of Psychology, 2004 ISN 45

Key theme(s) Natural disaster, earthquakes, posttraumatic stress disorder, traumatization, coping styles.

Abstract

The aim of this study was to explore the psychological consequences of two earthquakes in Iceland in two probability samples of subjects – residents in the exposed area and a control group from an unexposed area. The sample was composed of 52 adults exposed to the earthquakes and 29 adults in a control group. Three months after the earthquakes, both groups were approached with questions from a survey consisting of the Harvard Trauma Questionnaire (HTQ), the Trauma Symptom Checklist (TSC), the Coping Styles Questionnaire (CSQ), the World Assumption Scale (WAS), and the Crisis Support Scale (CSS). The results revealed that 24% in the exposed group had Posttraumatic Stress Disorder (PTSD), and none in the control group had PTSD. Earthquake-related anxiety, inability to express one's thoughts and feelings, and emotional coping predicted 81% of the HTQ variance for both groups. Previous life events, low self-worth, and luck attributions, together with numbing and the feeling of being let down, predicted 56% of the symptom variance for both groups. When degree of traumatization and emotional coping were added to the model, another 30% of the variance could be explained.

Research Objectives

- a. To explore the psychological effect of an earthquake in two probability samples, a highly exposed group and a control group.

- b. To explore the incidence of PTSD and other posttraumatic symptoms, together with the effects of social support, coping, and basic assumptions on the development of trauma symptoms.

Research Methodology

Two groups of subjects participated in the present study: The exposed group consisted of 150 adults chosen from five local government areas (LGAs) that were among those hardest hit by the earthquakes. The control group also consisted of 150 adults who were chosen from one LGA in western Iceland.

Stressors relating to earthquake.

The exposed group was asked a number of questions about their experience during the earthquake, how they were affected, and how they felt afterwards. Only three of those questions are included here: fear of minor tremors (yes/no); fear of a new major earthquake (Likert scale 1–4); and a question about life events experienced during the last year (yes/no). *The Crisis Support Scale* (CSS) was developed to measure received social support. *The Harvard Trauma Questionnaire* (HTQ) Part IV by Mollica, Caspi-Yavin, Bollini, Truong, Tor and Lavelle (1992) assess both DSM-III-R symptoms and culture-specific symptoms associated with PTSD. *The Trauma Symptom Checklist* (TSC) was originally developed by Briere & Runtz (1989) to assess the long-term impact of rape and child sexual abuse. As TSC-33 also is responsive to physical abuse, Briere & Runtz (1989) suggested that TSC-33 could be responsive to a variety of traumatic experiences. *The Coping Style Questionnaire* (CSQ) was developed by Roger, Jarvis and Najarian (1993). It consists of 60 questions, measured on a four-point Likert scale ranging from “never” (= 1) to “always” (= 4). *The World Assumption Scale* (WAS) was developed by Janoff-Bulman (1989) to measure the basic assumptions that people have about the world, themselves, and their surrounding world. These assumptions are supposed to be challenged by traumatic events.

Finding(s)

In the present study, 24% of the exposed adults fell under the PTSD criteria. Although low rates of extreme horror and terror were experienced, some people were clearly affected by the earthquake. An analysis of the subjects that fell under the PTSD criteria revealed that some variables seemed to have much effect in the development of posttraumatic symptoms. First, the majority of the PTSD subjects were women and half of these subjects had undergone some serious life experience in the year before the earthquake. This large proportion of women is in accordance with the findings of a study by Karanci and Rüstemli (1995) that examined the psychological consequences of the 1992 Ezincan earthquake in Turkey. In that study, affected females scored much higher than the rest of the subjects. Second, all of the PTSD subjects were greatly affected by the experience during the earthquake. This effect of exposure is reported in other studies (in Epstein, Fullerton & Ursano, 1998) and, although this subject is a debatable matter, the finding of the present study supports the view that level of exposure affects the development of posttraumatic symptoms.

Possibly the most important result in this study is the effect of coping style and of special types of social support. The use of emotional coping is closely associated with high traumatic scores and can alone explain a lot of the existing variance in the traumatic scores. Subjects that fulfilled the criteria of PTSD clearly used an emotion-focused coping style to cope with the

disaster, followed by the use of detached coping.

Regarding social support, some types of support are especially related to posttraumatic reactions. The ability to express feelings explains much of the existing variance in the traumatic scores; thus subjects reporting a great ability to express feelings and thoughts generally scored low on the traumatic scales. With this question, the PTSD subjects scored significantly lower than other subjects, and the difference did not disappear in their ratings of support three months post-disaster, but, on the contrary, it increased. It seems that people who met the PTSD criteria did not receive as much support as they wanted and needed. This is of concern, and some easy access to help should be organized for this group. As there was no difference between the groups on WAS, the subjects did not seem to have changed their basic assumptions about the world, themselves, and others. However, self-worth in the PTSD subjects was significantly lower than in other subjects. The effect of self-worth on traumatization would be an interesting topic for further investigation. The findings of the present study indicate that self-worth might be affected in people with PTSD.

RRL- 0156

Title

PTSD Symptoms in Children and Adolescents 28 Months After a Flood: Age and Gender Differences

Author

Anna Bokszczanin

Journal of Traumatic Stress, 2007 Vol 20 ISN 3

Key theme(s)

Mental Health and Disaster, PTSD, Poland, Floods, age, gender, trauma

Abstract

The present study examined the prevalence and predictors of posttraumatic stress disorder symptoms (PTSD) in a sample of 533 students (aged 11 to 21), 28 months after the 1997 Flood in southwestern Poland. The results show that 18% of the participants met all diagnostic criteria for PTSD. Based on hierarchical multiple regression analyses, PTSD criteria symptoms were positively correlated with the degree of exposure to trauma experienced during the disaster. A three-way interaction of trauma, age, and gender showed that more PTSD symptoms were observed among the younger participants and girls than among the older boys. The results confirm the need of research testing culturally sensitive implementation of mental health programs for young victims of disasters, taking into account their age and gender.

Research Question

What is the prevalence of symptoms relevant for the diagnosis of PTSD and to identify predictors of PTSD in children and adolescents 28 months after a natural disaster?

Research Methodology

The following two questions were addressed. What was the level of PTSD symptoms in the examined group of children and adolescents? Was the presence of the symptoms related to gender and age of the respondents?

Data were collected 28 months after the flood in elementary schools, gymnasiums (middle schools), and high schools located in the affected areas. The procedure lasted about 45 minutes. Of the 533 participants, 320 were girls and 213 boys, and 239 were younger adolescent students of elementary schools and gymnasiums (aged 11 to 15; $M=13.62$, $SD=1.13$). The older group included 293 high school students (aged 16 to 21; $M=17.82$, $SD=1.44$).

To assess PTSD, the Revised Civilian Mississippi PTSD Scale was used. To assess the experiences related to the flood, an instrument based on the scale originally created by Vernberg, La Greca, Silverman, and Prinstein (1996) was used.

Finding(s)

The first question considered in this research concerned the prevalence of all symptoms for diagnosing PTSD in the examined group. It was assumed that 28 months after the flood there would still be children and adolescents who could be diagnosed as having all the criteria for PTSD. The presence of all four criteria for *DSM-IV* (A, B, C, and D) was found in 17.7% of the participants in the study. Such a level of detrimental symptoms should be recognized as high.

The second aim of this study was to explore the function of age and gender in predicting postdisaster PTSD. The three-way interaction of trauma, age, and gender was statistically significant for all symptoms criteria. This result underscored the importance of assessing the impact of trauma in the specific context of gender and age of disaster victims (Green et al. 1991). A pattern of this three-way interaction consistently showed that 28 months after the flood children and adolescents who experienced traumatic events expressed a higher level of distress with the exception of older boys. This gender and age based pattern seems to be similar to the results reported by Chen et al. (2002). The authors suggested that the effect can have a universal character and is congruent with the social-cognitive approach (Norris, Foster, & Weishaar, 2002) maintaining that male adolescents tend to report better control of their feelings than female and younger adolescents. On the other hand, research examining coping with disasters documented that of all different coping strategies those aimed at active problem solving are usually most beneficial (Norris, Friedman, et al. 2002). Quite reasonably, the older boys were more directly involved in the postdisaster recovery activities and that involvement may have resulted in increases in self-esteem and feelings of control. These resources, of course, serve protective roles in coping with trauma. Anecdotal evidence supports this interpretation.

The hypothesis about the higher vulnerability in younger than older participants was only partly supported by presented analyses and concerned the group of boys. A different pattern emerged in the group of girls indicating that the older girls had more PTSD symptoms than the younger ones, which was also most clearly evidenced in the pattern of the three-way interactions.

RRL- 0157

Title Disability and post-traumatic psychopathology in Turkish elderly after major earthquake

Author(s) I. Cagri Yazgan, C. Dedeoglu, Y. Yazgan
International Psychogeriatrics, 2006 Vol 18

Key theme(s) Earthquake; Turkey; elderly; post traumatic stress; disability

Summary

An earthquake with a magnitude of 7,4 on the Richter scale left devastating effects in the Marmara region of Turkey in August 1999. The authors hypothesized that elderly people who experienced the earthquake at the epicenter would be psychologically affected more significantly than elderly people living at least 150 km away from the epicenter. This effect would be reflected as higher PTSD scores, more PTSD, or PTSD comorbid with depression diagnoses and higher disability levels in the affected population. The study showed that this was the case; showing a strong correlation between the proximity to the epicenter and the severity of trauma-related symptoms.

Research Question(s)

Are elderly people who experienced the earthquake at the epicenter psychologically affected more significantly than people living at least 150 km away from the epicenter?

Research Methodology

Compare PTSD scores, more PTSD, or PTSD comorbidity with depression diagnoses and higher disability levels in affected and non-affected population.

25 older adults from Adazapari and 22 elderly from Istanbul were compared.

Finding(s)

The study showed that older adults who experienced the earthquake at the epicenter had higher scores on symptom scales measuring psychological trauma, trauma-related grief and dissociation.

Being at the epicenter per se was not sufficient to produce a significant disability. Individuals from the epicenter group with diagnoses of major depression had higher levels of disability than the non-epicenter group with depression. This suggests that being at the epicenter has an additive effect on disability.

Therefore, special prevention and intervention programmes for elderly who were exposed directly to earthquakes should be developed.

RRL- 0158

Title Impact of the tsunami on psychosocial health and well-being

Author(s) Manuel Carballo, Bryan Heal, Gabriela Horbaty

International Review of Psychiatry, 2006 Vol 18 ISN 3

Key theme(s) Tsunami, psychosocial impact

Abstract

Natural and man-made disasters affect everyone in their path. Some people are nevertheless more vulnerable than others and suffer in different ways and to different extents. The tsunami highlighted a number of pre-existing factors that made some people especially vulnerable and it also brought out the ways in which other people became vulnerable as a result of disaster. Major social and demographic shifts occurred, and the social fabric of communities was severely eroded. Gender, age, extent of personal loss, personal experience in terms of how direct or indirect exposure emerged as key factors together with loss of place, problems of temporary and permanent housing, poor income generation and uncertainty about if and when it would be possible to return to original home sites and communities. Host communities were also affected, albeit indirectly. How and to what extent people were psychologically 'damaged' in, and by, the tsunami nevertheless remains poorly defined because of the paucity of real-time monitoring and the fact that in some countries there was little agreement on the nature and classification of psychosocial problems and morbidity.

Research Question(s)

- a. What is the impact of the tsunami on psychosocial health and well-being?
- b. Which factors made some people especially vulnerable to psychosocial "damages"?

Research Methodology

Literature review

Finding(s)

In one-way or another, natural and man-made disasters affect everyone in their path. Some people are nevertheless more vulnerable than others. Those with pre-existing problems (physical and/or psychosocial) and receiving care and treatment appear to be especially vulnerable if and when that care and treatment is interrupted. In addition, elderly people, pregnant women, mothers with young infants and people with disabilities, all of whom are less mobile and more dependent of other people, often feel more powerless when they are confronted by disasters. Disasters also create new types of vulnerability because they disorganize families and the social and economic support systems people have been used to.

Relatively little is known with precision about how and to what extent the tsunami affected the psychosocial health and well-being of people. There was little real-time monitoring of the situation, and many of the data that have emerged are not population-based or representative of the overall situation. Even if they had been, there is no evidence that standard procedures

for measuring the psychosocial impact of the disaster were available to national or international groups. Much more attention thus needs to be given to this if lessons are to be learned and preparedness planning made more technically situation and culture specific. More debate is also needed on the nature of 'trauma' and the type of support people need in different cultural settings, what the content of that help and care should be, and how and by whom it should be provided. There was a tendency on the part of many relief organizations to assume that the incidence of PTSD would be high and that relief operations would have to emphasize the treatment of this. In fact PTSD was diagnosed and reported with relative infrequency, whereas depression was reported far more.

RRL- 0159

Title Psychological consequences of the 1998 landslide in Sarno, Italy: a community study

Author(s) F. Catapano, R. Malafronte, F. Lepre, P. Cozzolino
Acta Psychiatrica Scandinavica, 2001 Vol 104

Key theme(s) natural disasters; post-traumatic stress; disorder; depression; social support

Abstract

Objective: This community study assessed the prevalence of posttraumatic stress disorder (PTSD) and the psychosocial consequences of the landslide which occurred in Sarno, Southern Italy, in May 1998.

Method: A random sample (n=272) of the population living in the highest risk area of Sarno, and a control group recruited in a small town situated near the disaster area, but not affected by the event, were assessed 1 year after the disaster by standardized instruments.

Results: Of the subjects recruited in Sarno, 27.6% met DSM-IV criteria for PTSD; 59% subjects recruited in Sarno and 35% of the control group were identified as 'probable cases' by the GHQ-30 ($P<0.0001$). Subjects recruited in Sarno had significantly higher scores on the four GHQ-30 subscales identified by factor analysis.

Conclusion: This study emphasizes the negative impact of a natural catastrophic event on mental health, and the need for preventive interventions.

RRL- 0160

Title Social Support and Psychological Symptomatology Following a Natural Disaster

Author(s) Jerome D. Cook, Leonard Bickmann

Journal of Traumatic Stress, 1990 Vol 3 ISN 4

Key theme(s) social support; natural disasters; longitudinal studies; symptoms; stress reactions; statistical correlation

Summary

The effects of perceived availability of social support on psychological symptomatology following a natural disaster were studied in a sample of victims of a major flood in Roanoke, Virginia. Ninety-six subjects were administered questionnaires that measured self-reported levels of depression, anxiety, and somatization 1 week after the disaster and four additional times within 6 months after the disaster. A questionnaire mailed 3 months after the disaster assessed perceived availability of social support. Results indicated that subjects experienced severe distress immediately following the disaster, that this distress decreased sharply 6 weeks after the flood, and decreased more gradually in the following months. Perceived availability of social support was not related to distress immediately following the disaster nor 5 months afterwards. Social support and symptomatology were significantly correlated during the intermediate period.

Research Objective

To study the effects of perceived availability of social support on psychological symptomatology following a natural disaster.

Research Methodology

A total of 96 subjects of 102 approached were recruited from the Assistance Centers to participate in the study. After completing the questionnaire at the Red Cross Assistance Centers, subjects were contacted at four additional times at 5-week intervals by telephone to respond to a brief questionnaire containing items related to psychological symptomatology. While repeated data collection may have been reactive, this is unlikely given the time period between calls (approximately 5 weeks) and the brevity of the interview (about 10 min). The questionnaire contained the Somatization, Depression, and Anxiety subscales of the Brief Symptom Inventory (BSI). The scores on the BSI subscales served as the measure of psychological symptomatology for the present study.

A questionnaire was mailed to subjects 3 months after the initial interview. The questionnaire contained items from the general population version of the Interpersonal Support Evaluation List (ISEL), a measure of perceived availability of social support.

Finding(s)

The results provide an illuminating picture of the course of psychological symptomatology following a natural disaster and the role of social support in buffering, or mitigating, the effects

of stress related to such a disaster. Subjects reported that they were suffering a high degree of distress, particularly in the form of anxiety and depression in the weeks immediately following severe flooding that had ravaged their community. These symptom levels displayed a downward trend over time. This study was expected to show that low levels of perceived availability of social support are related to high levels of self-reported psychological symptomatology for victims of a natural disaster, and that individuals with high levels of perceived availability of social support will be buffered or insulated against the stress resulting from a disaster, and therefore will report fewer psychological symptoms. The results tend to confirm this hypothesis for certain times at which symptomatology was measured. Two periods showed little or no relationship between perceived availability of social support and symptoms - the week following the flood and 5 months following the flood. In the week immediately following the flood, perceived availability of social support did not buffer or insulate subjects from the effects of stress, as evidenced by the fact that there was no significant correlation of support with symptoms immediately following the disaster. Subjects may have been overwhelmed by the stress in the first week following the flood. Instead of a buffering effect, the pattern of correlations suggests that perceived availability of social support served as a resource that enabled subjects to cope more quickly and effectively with the results of the flood in the first few months after the disaster, but that subjects reporting lower levels of social support recover to approximately the same level of other subjects 5 months after the disaster. This hypothesis also receives some support from the hierarchical regression analyses that indicate a significant contribution to the regression equation of total social support in predicting total psychological symptom levels at waves 2, 3, and 4.

RRL- 0161

Title Psychiatric Morbidity Following Hurricane Andrew

Author(s) Daniella David, Thomas A. Mellman, Lourdes M. Mendoza

Journal of Traumatic Stress, 1996 Vol 9 ISN 3

Key theme(s) posttraumatic stress disorder; disaster; hurricane.

Abstract

The nature of psychiatric morbidity in previously non-ill subjects from the area most affected by Hurricane Andrew was investigated at 6-12 months posthurricane. Preliminary associations of morbidity with personal and event-related risk factors were also determined. Fifty one percent (31161) met criteria for a new-onset disorders including posttraumatic stress disorder(PTSD) in 36%, major depression (MD) in 30%, and other anxiety disorders in 20%. Thirty four subjects (56%) had significant symptoms persisting beyond 6 months. Having sustained "severe damage" was the risk factor most strongly associated with outcome. Our

data underscore the range of psychiatric morbidity related to a natural disaster and suggest a relationship to chronic stressors.

Research Objectives

- a. To evaluate the nature and range of psychiatric morbidity following the hurricane
- b. to preliminarily assess associations of morbidity with risk categories representing factors related to the event and personal vulnerability.

Research Methodology

Subjects were recruited who lived in the areas most severely affected by Hurricane Andrew (south of Kendall Drive, Dade County), and were found to be free of psychiatric disorders in the preceding 6 months. The final sample ($N = 61$) included 47 women (77%) and 14 men (23%), with a mean age of 40.4 \pm 12.3 (range: 19-69 years), a mean education of 15.2 \pm 2.9 years (range: 8-20 years), and a mean income of 39,633 \pm 24,398.9 (range: \$35,000-100,000 per year).

Assessments were performed 6-12 months following the hurricane. Interviews were conducted by an investigator (DD, TAM, LMM, RKB) and included the Structured Clinical Interview for DSM-III-R (SCID, a detailed history of the hurricane experience and previous traumatic events that were incorporated into the PTSD section of the SCID, and a structured inquiry of family psychiatric history used in previous research. All subjects signed informed consent forms and were reimbursed \$25 for participating in the interview.

"Severe threat" was designated when subjects reported fear of death or injury to themselves or significant others, or experienced or witnessed actual injuries during the hurricane ($n = 22$, 36% of the sample). "Severe damage" was designated when subjects reported destruction of major structures in their homes (e.g., roof, walls), the need to relocate temporarily or permanently, and/or homes needing extensive repairs ($n = 27$, 44% of the sample). Factors related to pre-event vulnerability included past personal and family history of psychiatric illness, and previous exposure to the type of traumatic events listed in DSM-III-R, PTSD stressor criterion (assault, including rape, other natural disasters, war-related). Twenty-five subjects (41%), 49 (80%) and 22 (36%) were found to have past personal psychiatric histories, positive family psychiatric histories or prior histories of PTSD-type traumas, respectively. Associations between outcome categories and risk-factors were analyzed by Chi-square.

Finding(s)

We found new-onset psychiatric disorders in 51% of a mostly nonclinical, albeit nonepidemiological, sample of individuals with high levels of exposure to Hurricane Andrew. Posttraumatic stress disorder was the most prevalent condition, as found in previous studies, and was diagnosed in 36% of the subjects. Major depression and other anxiety disorders were also not uncommon, and accounted for almost a third of the overall morbidity. PTSD frequently co-occurred with major depression.

This prevalence of new-onset disorders or PTSD following Hurricane Andrew in our sample is not uncharacteristic of previous disaster studies. Norris and colleagues found a somewhat lower PTSD rate of 25%, diagnosed by a self-report instrument in a sample of 400 residents

from the high-impact neighborhoods six months following the Hurricane (Norris, personal communication). Morbidity, therefore, may be over-represented in our sample due to symptomatic subjects being more motivated to participate in a psychiatric assessment. However, the rate of prior lifetime psychiatric disorders of 41% in our subjects is comparable to the 48% rate for positive lifetime psychiatric morbidity reported in the National Comorbidity Survey (Kessler et al., 1994). Thus, while we have some evidence that our study population was not at increased pre-morbid risk compared to the general population, the size and nonepidemiological nature of the sample limit the generalizability of the findings. In this preliminary assessment of risk factors, "severe damage" was most significantly associated with outcome, possibly due to causing greater disruption of routines, persistence of disaster-related reminders, and lengthier and more difficult rebuilding processes. The sample size limits inferences regarding other possible relationships of risk factors and outcome.

In summary, it appears that following a disaster of the magnitude of Hurricane Andrew, psychiatric morbidity, including but not limited to PTSD, is common among individuals living in areas of high exposure, and those with extensive reminders and arduous rebuilding tasks appear to be most at risk.

RRL- 0162

Title Understanding Acute Psychological Distress Following Natural Disaster

Author(s) John R. Freedy, Michael E. Saladin, Dean G. Kilpatrick, Heidi S. Resnick
Journal of Traumatic Stress, 1994 Vol 7 ISN 2

Key theme(s) disaster; psychological distress; theory.

Abstract

A household probability sample of 229 adults was interviewed four to seven months after the Sierra Madre earthquake (June 28, 1991; Los Angeles County). The study predicted psychological distress from these variables: demographics, traumatic event history, low magnitude event history, earthquake related threat perceptions, and earthquake related resource loss. Based on the Conservation of Resources (COR) stress model, it was predicted that resource loss would be central in predicting psychological distress. Three major hypotheses were supported: (1) resource loss was positively associated with psychological distress; (2) resource loss predicted psychological distress when other predictors were statistically controlled; and (3) resource loss was associated with mild to moderate elevations in psychological distress. The findings support COR stress theory. Theoretical and practical implications are discussed.

Research Question

What is the link between a moderate sized natural disaster and psychological adjustment?

Research Methodology

The sample is a random subset of participants from a larger study concerning the psychological impact of the Sierra Madre earthquake. The parent sample (n = 404) is a household probability sample of adults impacted by the Sierra Madre earthquake. The current sample includes 229 adults who were interviewed regarding earthquake related resource loss.

The structured telephone interview contained sections designed to assess pre-earthquake (e.g., demographic variables, traumatic event history), within-earthquake (e.g., perception of life threat), and post-earthquake (e.g., psychological distress) characteristics. This report is restricted to factors relevant to current research questions.

Conservation of Resources (COR) stress theory provides an excellent model for quantifying the relationship between natural disaster experiences and psychological adjustment (Hobfoll, 1989). According to COR theory, individuals possess both internal and external resources. Internal resources include various personal characteristics (e.g., sense of control, self-efficacy). External resources include: possessions, social relationships, and energy resources (e.g., money, time, skills).

Finding(s)

This study confirmed three major hypotheses. First, resource loss was positively associated with the development of psychological distress. Second, when other predictors are statistically controlled resource loss remains of substantial importance in predicting current psychological distress. Third, higher levels of resource loss were associated with mild to moderate elevations in psychological distress. The COR model appears to be useful in understanding how adults adjust following exposure to natural disasters.

RRL- 0163

Title Factors in the Victim that Mediate Between Disaster and Psychopathology: A Review

Author Margaret S. Gibbs
Journal of Traumatic Stress, 1998 Vol 2 ISN 4

Key theme(s) victim; disaster; psychopathology; coping style; traumatic events.

Summary

A review of the research literature is provided regarding vulnerability and psychological resource characteristics of the victim that mediate between disaster and psychopathology. Common generalizations about the effect of vulnerability variables such as age, gender, and previous level of functioning are seldom supported. Coping styles appear promising predictive variables. Attitude variables deserve further attention. More complex designs are suggested to determine interaction effects between disaster and victim variables.

Research Objective

To briefly review the question of whether disaster impacts emotionally on victims, decide that there are emotional sequelae, and then review characteristics of the victim that mediate between disaster and its emotional impact.

Research Methodology

Literature review: although methodological problems abound in the area of disaster research, the variety of studies, with differing designs, on different populations who have experienced different types of disaster, provides some basis for generalization when findings concur. Of course, when findings conflict, methodological differences may often be responsible.

Finding(s)

The review indicates few consistent findings regarding factors within the individual leading to greater vulnerability to psychological problems following disaster. Findings regarding age were especially inconsistent. In some instances, greater age and experience implied greater adaptive capacity, in others, simply more experience of stress. Different types of disaster posed different amounts of stress on individuals of different ages, depending on issues like whether one owned one's home or had children who were affected. With regard to gender, women seem more likely to internalize their emotional reactions to disasters than men. Women may be more likely to experience stress from the demands of the support system; they may also be better able to obtain support from their environment. Males may have more opportunities in some disasters to pursue active coping styles that help reduce symptomatology.

Having more psychological problems before the disaster sometimes means that the victim will also have more psychological problems after the disaster, although there are exceptions to this finding. There are no studies that hold predisaster level of psychopathology constant and demonstrate that individuals with higher levels are more vulnerable to disaster effects. Hocking (1970) has argued that

preexisting level of adjustment is irrelevant to extreme stress, which will affect everyone.

Higher education and income have sometimes, but not always, been found to correlate with fewer psychological effects of the disaster. This finding must be viewed in the context that lower as compared to higher social class persons may well experience more stressors in a disaster. Victims' psychological resources have been approached in a number of often overlapping concepts. More internal locus of control scores have been consistently linked with lessened emotional effects of disaster. Active coping styles allow the individual more opportunity to change the situation, but may not always lead to less symptomatology. Active coping may be a function of internal locus of control or approach rather than avoidance as a personality style. Both approach and avoidance appear to have adaptive functions, depending on factors like which time period in the disaster reaction is involved, and how much change in the situation is possible. Including victims' perceptions of the stress leads to better prediction of later psychopathology, but we know little about the determinants of these perceptions.

RRL- 0164

Title Prospective Study of Posttraumatic Stress, Anxiety, and Depressive Reactions After Earthquake and Political Violence

Author(s) Armen K. Goenjian, Alan M. Steinberg, Louis M. Najarian, Lynn A. Fairbanks
American Journal of Psychiatry, 2000 Vol 157

Key theme(s) PTSD, prospective study, depression, earthquake, political violence

Summary

The authors sought to assess the severity and longitudinal course of posttraumatic stress, anxiety, and depressive reactions among two groups of adults differentially exposed to severe and mild earthquake trauma and a third group exposed to severe violence. They also examined interrelationships among these reactions and predictors of outcome and compared posttraumatic stress disorder (PTSD) symptom category profile and course between those exposed to earthquake and those exposed to violence.

The findings indicate that clinical evaluation of individuals exposed to earthquake or violence should include specific evaluation of posttraumatic stress, anxiety, and depressive reactions and that intervention strategies should address these coexisting symptoms. Early mental health intervention may serve to prevent the chronicity of these reactions among victims of extreme trauma. .

Research Objectives

- a. To assess the severity and longitudinal course of posttraumatic stress, anxiety, and depressive reactions among two groups of adults differentially exposed to severe and mild earthquake trauma and a third group exposed to severe violence.

- b. To examine interrelationships among these reactions and predictors of outcome and compared posttraumatic stress disorder (PTSD) symptom category profile and course between those exposed to earthquake and those exposed to violence.

Research Methodology

Seventy-eight non-treatment-seeking subjects were assessed with self-report instruments approximately 1.5 and 4.5 years after the 1988 Spitak earthquake in Armenia and the 1988 pogroms against Armenians in Azerbaijan.

Finding(s)

RESULTS: The two groups that had been exposed to severe trauma (earthquake or violence) had high initial and follow-up PTSD scores that did not remit over the 3-year interval. Overall, depressive symptoms subsided. Posttraumatic stress, anxiety, and depressive reactions were highly intercorrelated within and across both time intervals. No significant differences in PTSD severity, profile, or course were seen between subjects exposed to severe earthquake trauma versus those exposed to severe violence.

CONCLUSIONS: After exposure to severe trauma, either an earthquake or violence, adults are at high risk of developing severe and chronic posttraumatic stress reactions that are associated with chronic anxiety and depressive reactions. Clinical evaluation and therapeutic intervention should include specific attention to these reactions. Early mental health intervention is recommended to prevent their chronicity.

RRL- 0165

Title Risk Factors for PTSD

Author(s) Sarah L. Halligan, Rachel Yehuda
PTSD Research Quarterly, 2000 Vol 11 ISN 3

Key theme(s) PTSD – development – risk factors

Abstract

PTSD was originally conceptualized as a direct consequence of exposure to a traumatic event in otherwise normal individuals. As originally described, the emphasis was on establishing the primacy of the trauma as the etiologic agent, rather than individual vulnerability factors. Yet it was clear from the beginning that not all trauma survivors developed permanent disorder. In fact, many recovered. Thus, the search for risk factors that increase vulnerability to chronic PTSD occurred early in the history of the disorder.

Today, the study of risk factors has become increasingly popular, emphasizing environmental and demographic factors, personality and psychiatric history, dissociation, cognitive and biological systems, and genetic or familial risk (Yehuda, 1999a).

Research Objective

To determine risk factors for the development of PTSD.

Research Methodology

Literature Review

Finding(s)

Environmental Risk Factors

In addition to characteristics of stressor severity, a history of exposure *prior* to the focal trauma is also an important risk factor.

A history of prior exposure to trauma or to chronic stress is an extremely potent risk factor for PTSD (Davidson et al., 1991), particularly if it is experienced at a young age.

Demographic Risk Factors

Breslau et al. (1998) identified several demographic risk factors for the development of PTSD. Gender is an extremely salient risk factor, even controlling for differences in the type of events that are experienced by men compared to women.

Lower levels of education and income, and being divorced or widowed are risk factors PTSD. In addition, some studies have reported a higher risk for PTSD amongst ethnic minorities (Breslau et al., 1998).

Prior Psychiatric Disorders and Personality Dimensions.

A past history of behavioral or psychological problems has also been associated with the development of PTSD (McFarlane, 1989).

Dissociation

There is ambiguity regarding whether dissociation should be considered a stable personality trait or a state-related cognitive response to trauma. Nonetheless, peritraumatic dissociation appears to be an important risk factor for the development of PTSD (Koopman et al., 1994), and PTSD subjects show elevated scores on measures of dissociative symptoms (Bremner et al., 1992).

Cognitive Risk Factors

Lower intellectual functioning has been found to be a risk factor for the development of PTSD.

PTSD is also associated with specific impairments in explicit memory

Biological Factors:

Shalev et al. (1998a) assessed heart rate in 86 trauma survivors at the time of presentation to the ER.

Neurohormonal research has also uncovered a potential risk factor for the development of PTSD. Both combat-related and civilian PTSD are associated with chronically low levels of cortisol, a glucocorticoid secreted by the hypothalamic-pituitary-adrenal (HPA) axis.

Familial or "Genetic" Risk Factors?

Several lines of evidence demonstrate familial transmission of PTSD. Nevertheless, since all of the aforementioned studies confound genetic and environmental concordance, the extent which the findings are indicative of truly genetic phenomena is not yet clear.

RRL- 0166

Title A Conservation of Resources approach to a natural disaster: Sense of Coherence and Psychological Distress

Author(s) Kaiser, Charles F., Sattler, David N., Bellack, Daniel R., Dersin, Jennifer

Journal of Social Behavior & Personality, 1996 Vol 11 ISN 3

Key theme(s) Stress – PTSD - Depression – Natural disasters

Summary

This study applied Hobfoll's (1989) Conservation of Resources stress model to examine psychological functioning one month following Hurricane Hugo. Undergraduate students (69 men, 124 women) completed the Sense of Coherence Scale, Beck Depression Inventory, Multiscore Depression Inventory, Trait Anxiety scale of the State-Trait Anxiety Inventory, and a questionnaire assessing posttraumatic stress disorder related symptoms, somatic problems, and resource loss. The findings indirectly support the Conservation of Resources stress model. Resource loss and gender were positively associated with psychological distress. Sense of coherence was negatively associated with psychological distress, depression, and anxiety. Resource loss and depression were better predictors of psychological distress than sense of coherence and anxiety. Fifteen percent of the sample met the criteria for posttraumatic stress disorder. There was evidence of comorbidity between depression and posttraumatic stress disorder. Helping behavior was positively associated with sense of coherence. Implications for disaster intervention programs and future research directions are discussed.

Research Objective

To examine sense of coherence as a personal characteristic resource, and its relationship to psychological functioning following a major natural disaster.

Research Methodology

The participants were 193 introductory psychology students (69 men, 124 women). The average age was 19.54 years (SD = 3.36) with a range from 17 to 45 years. They received class credit for participating.

The participants completed the following instruments:

Sense of Coherence. Sense of coherence was assessed with the 29-item Orientation to Life Questionnaire (Antonovsky, 1987). Participants answered the questions on a 7-point scale with two anchoring phrases. Examples of the items include, "You anticipate that your personal life in the future will be: 1 = totally without meaning or purpose to 7 =full of meaning and purpose"; "When you face a difficult problem, the choice of a solution is: 1 = always confusing and hard to find to 7 = always completely clear." Based on Antonovsky's (1993) recommendation, the total score was used to assess sense of coherence. The instrument has good reliability and validity (Antonovsky, 1993).

Anxiety. Anxiety was assessed with the 20-item Trait Anxiety scale of the State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970). The inventory measures the tendency to

respond to situations perceived as threatening to self-esteem with feelings of tension, apprehension, and heightened autonomic activity. On each item, participants indicated how well the statements described the way they generally feel. Participants used a 4-point scale to answer the questions, where 1 = almost never to 4 = almost always.

Depression. Two depression instruments were used. First, participants completed the 21-item Beck Depression Inventory (BDI; Beck, 1967). It measures the affective, cognitive, behavioral, and somatic aspects of depression. For each item, participants indicated which of four statements best reflected how they feel.

Participants also completed the 118-item full-scale Multiscore Depression Inventory (MDI; Berndt, 1986). It provides a total depression score and scores on 10 subscales, including low energy, cognitive difficulty, guilt, low self-esteem, social introversion, pessimism, irritability, sad mood, instrumental helplessness, and learned helplessness. It is a true-false instrument and was designed and normed for a nonpsychiatric population. The MDI has adequate reliability and convergent validity with the BDI.

Psychological Distress and Somatic Symptoms. The authors designed a 31-item questionnaire to assess psychological distress and somatic symptoms. The items were based on the posttraumatic stress disorder symptoms indicated in the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R; American Psychiatric Association, 1987). The somatic symptom items asked about somatic problems and changes in health habits since the hurricane. Participants indicated which symptoms they had experienced since the hurricane with a "yes" or a "no."

This questionnaire was used for two purposes. First, we used the items to determine the percent of the sample experiencing posttraumatic stress disorder according to the DSM-III-R criteria for the exposure, intrusion, avoidance, and arousal categories. The second purpose was to develop a measure of psychological distress. Items were included in the psychological distress measure that correlated higher with the other posttraumatic stress disorder symptom items than with anxiety and depression. This measure consisted of 17 items. The psychological distress score was obtained by summing the 17 items. Table I presents the psychological distress and somatic symptom items.

Hurricane Questionnaire. The authors designed a 20-item questionnaire to assess the impact of the hurricane. Questions asked about location during the storm, property damage, loss of possessions, monetary loss, injuries, duration of loss of water and electric power, and job loss.

Finding(s)

In the univariate analysis, resource loss (encompassing object and condition resources) was positively associated with psychological distress, but not with either depression or general anxiety. The sense of coherence personal characteristic resource was negatively associated with psychological distress, depression, and general anxiety. However, when included in the multiple regression analysis, resource loss and depression accounted for the greatest portion of psychological distress variance. Sense of coherence and general anxiety did not account for any percentage of psychological distress variance.

Taken together, the findings support, in part, the Conservation of Resources stress model

(Hobfoll, 1989) and extend Freedy et al. (1992,1994). Our findings suggest that different forms of psychological distress may be associated with different types of resource loss.

Psychological distress was mildly positively correlated with low energy, cognitive difficulty, guilt, low self-esteem, pessimism, and sad mood subscales.

Almost two-thirds (65%) of the sample donated supplies or provided physical assistance to Hurricane Hugo victims. Providing help to others was weakly positively correlated with sense of coherence ($r = .17, p < .05$), and weakly negatively correlated with the MDI full scale score ($r = -.19, p < .05$).

RRL- 0167

Title Post-traumatic stress disorder in children and adolescents one year after a super-cyclone in Orissa, India: exploring cross-cultural validity and vulnerability factors

Author(s) Nilamadhab Kar, Prasanta K Mohapatra, Kailash C Nayak, Pratiti Pattanaik

Key theme(s) Children; PTSD; Natural Disasters

Abstract

Background

It has been asserted that psychological responses to disasters in children and adolescents vary widely across cultures, but this has rarely been investigated. The objectives of the study were to clinically evaluate the construct of traumatic stress symptoms and disorder in children and adolescents after a super-cyclone in Orissa, India; to find out the prevalence at one year; compare the effect in high and low exposure areas and study the factors associated with it.

Methods

Clinical examination of children and adolescents ($n = 447$) was done, supplemented by a symptoms checklist based on International Classification of Mental and Behavioural Disorders, Diagnostic Criteria for Research and a semi-structured questionnaire for disaster related experiences.

Results

Majority of children had post-traumatic symptoms. Parents or teachers reported mental health concerns in 7.2% subjects, who were a minor proportion (12.8%) of subjects with any syndromal diagnosis ($n = 196$). Significantly more children in high exposure areas had PTSD than in low exposure areas. Depression was significantly associated with PTSD. Binary logistic regression analysis indicated that high exposure, lower educational level and middle socioeconomic status significantly predicted the outcome of PTSD. Extreme fear and perceived threat to life during the disaster, death in family, damage to home, or staying in shelters were

not significantly associated with PTSD.

Conclusion

Following natural disaster PTSD is a valid clinical construct in children and adolescents in Indian set up; and though highly prevalent it may be missed without clinical screening. Its manifestation and associated factors resembled those in other cultures.

Research Objective

To find out the prevalence of post-traumatic stress symptoms and disorder, associated other symptoms and trauma related risk factors in children and adolescents following the 1999 super-cyclone in Orissa, India.

Research Methodology

The study was undertaken in the most affected Jagatsinghpur district and two other districts (Bhadrak and Kendrapara) out of 12 affected. The sea-side areas of Jagatsinghpur which were submerged in the seawater and experienced maximum impact of the cyclone with heavy loss of life and property were considered to be high exposure areas (HEA). Other districts which were hit by the super-cyclone but did not get swept away by sea water were considered low exposure areas (LEA).

Following stratification to HEA and LEA, the subjects were selected in clusters. In Jagatsinghpur district four schools from the most affected Erasama block were chosen. In the other districts one block per district was selected. The study was carried out on two schools of Kendrapara and one school in Bhadrak District. The classes in schools were selected randomly. All students in the selected classes were taken up as subjects for the study. Efforts were made to contact the children and adolescents who were absent in the class, for enrolment to the study. Some evaluations were done in their homes in villages. The sample was thus ensured to be representative of the children and adolescents of the two strata. The teachers were briefed about the study beforehand. The children were interviewed in their schools and villages in the months of November and December 2000, one year after the super-cyclone.

The questionnaire included the symptoms of PTSD and provided the translated version in the local language Oriya. In addition to PTSD symptomatology, we specifically assessed for depressive, anxiety and somatic symptoms using a semi-structured format.

Socio-demographic variables and disaster related experiences e.g. damage to house, displacement and living in shelters, death in family and extreme degree of fear during disaster with perceived threat to life were noted. Socioeconomic status (SES) was determined based on per capita family income per month, which was supplemented by the assessment of household income, employment status, type of housing, profile of the land owned, indebtedness and financial capability to buy food. The SES groups were categorized as 'below poverty line', lower, lower middle, upper middle and upper. Parents and teachers were asked to report any mental health concern with onset following super-cyclone in any child or adolescent. The study protocol was approved by the ethics committee of Quality of Life Research and Development Foundation.

The statistical tests were done by SPSS package. The categorical data were analyzed by using chi-square tests and the continuous variables were compared by two-tailed t-tests. Binary logistic analysis was used to determine the impact of independent variables on the diagnosis of PTSD as outcome. Statistical significance was defined at the standard 0.05 level.

Finding(s)

The sample consisted of 447 children and adolescents with an age range of 7–17 years (mean age \pm SD: 12.9 \pm 1.83 years).

Less than half of the children and adolescents studied said that they had prior information regarding the arrival of the super-cyclone (HEA 44.0% vs. LEA 38.0%). Significantly more number of subjects from HEA reported complete damage to home (89.9% vs. 77.1%, χ^2 :13.7, p: 0.000), displacement due to super-cyclone and having to stay in shelters (83.6% vs. 69.3%, χ^2 :12.7, p: 0.000), extreme degree of fear during the disaster with life threat (91.8% vs. 79.3%, χ^2 :14.5, p: 0.000) and death in family in super-cyclone (6.3% vs. 0.0%, χ^2 : 11.8, p: 0.001) compared to subjects in LEA suggesting the experience in HEA to be more traumatic.

After one year of the disaster, PTSD was diagnosed in 137 (30.6%) children and adolescents. It was observed that an additional 61 (13.6%) subjects could be categorised as sub-syndromal PTSD. They had number of symptoms needed to fulfil the criteria for PTSD, but the symptoms were occasional, fleeting, lacked persistence and severity to justify syndromal PTSD diagnosis clinically. Mean age of subjects with PTSD was 12.6 \pm 1.69 compared to 13.2 \pm 1.86 years of others. More children from age category of 11–13 years had PTSD. Children up to the class 5 were more vulnerable (mean age 10.5 years) than those in higher classes. Higher exposure and middle socioeconomic status were significantly associated with PTSD.

Parents and teachers reported mental health concerns in 32 (7.2%) subjects, amongst whom 17 (53.1%) had PTSD (χ^2 : 8.2, p: 0.004). Diagnostic breakdown of these 32 children and adolescents were: no syndromal diagnosis in 7 (21.9%), only depression in 8 (25.0%), only PTSD in 9 (28.1%) and both diagnoses in 8 (25.0%). The ones without syndromal diagnosis had post-traumatic stress symptoms and other associated symptoms but those did not amount to syndromal clinical diagnosis. While 25 (78.1%) children and adolescents out of 32 reported by parents had syndromal diagnosis, they were only 12.8% of the 196 subjects who had any diagnosis.

There are various other symptoms which were significantly associated with subjects having PTSD (table 3). Suicidal ideas were there in 4.9% and ideas of worthlessness in 6.7%. There were 106 (23.7%) subjects with syndromal depression based on ICD-10-DCR. As a comorbid condition depression was found in 47 (34.3%) children and adolescents with PTSD, compared to 59 (19.0%) subjects without PTSD (χ^2 :12.3, p: 0.000). This highlighted that most of the children with PTSD did not have comorbid depression; and more than half (55.7%) of depressed children did not have PTSD. There were 196 (43.8%) children and adolescents who had any syndromal diagnosis, either PTSD or depression or both. There was no disruptive behaviour, conduct problem or oppositional behaviour noted or reported by the parents or teachers.

Prevalence of many associated symptoms also differed significantly in high and low exposure areas. Continuing fear that the cyclone may come again was more frequent in HEA (60.4%) vs.

that in LEA (23.5%) (χ^2 : 59.1, p: 0.000). It was particularly important as most children reported fear and reliving of experiences with slight wind and rain. Depressive symptoms were also prominent; and the following significantly differentiated subjects in HEA and LEA: depressed mood (HEA 37.3% vs. LEA 14.5%, χ^2 : 27.5, p: 0.000), hopelessness (HEA 38.1% vs. LEA 10.1%, χ^2 : 42.8, p: 0.000), decreased interest in pleasurable activity (HEA 49.6% vs. LEA 5.0%, χ^2 : 98.4, p: 0.000) and decreased social interaction (HEA 28.4% vs. LEA 4.5%, χ^2 : 40.1, p: 0.000).

Prevalence of many associated symptoms also differed significantly in high and low exposure areas. Continuing fear that the cyclone may come again was more frequent in HEA (60.4%) vs. that in LEA (23.5%) (χ^2 : 59.1, p: 0.000). It was particularly important as most children reported fear and reliving of experiences with slight wind and rain. Depressive symptoms were also prominent; and the following significantly differentiated subjects in HEA and LEA: depressed mood (HEA 37.3% vs. LEA 14.5%, χ^2 : 27.5, p: 0.000), hopelessness (HEA 38.1% vs. LEA 10.1%, χ^2 : 42.8, p: 0.000), decreased interest in pleasurable activity (HEA 49.6% vs. LEA 5.0%, χ^2 : 98.4, p: 0.000) and decreased social interaction (HEA 28.4% vs. LEA 4.5%, χ^2 : 40.1, p: 0.000).

RRL- 0168

Title Post-traumatic stress disorder, depression and generalised anxiety disorder in adolescents after a natural disaster: a study of comorbidity

Author(s) Nilamadhab Kar, Binaya Kumar Bastia

Clinical Practice & Epidemiology in Mental Health, 2006 Vol 17 ISN 2

Key theme(s) Mental Health and Disaster

Abstract

Background

Information on mental health sequel in adolescents following natural disasters from developing countries is scant.

Method

Around one year after a super-cyclone, proportion of adolescents exhibiting post-traumatic psychiatric symptoms, prevalence of post-traumatic stress disorder (PTSD), major depression and generalized anxiety disorder, comorbidity and impairment of performance in school were studied in Orissa, India. Mini International Neuropsychiatric Interview for children and adolescents was used for evaluation and diagnosis. The criteria for diagnoses were based on Diagnostic and Statistical Manual of Mental Disorders – IV.

Conclusion.

A considerable proportion of adolescents suffered from stress related symptoms and had syndromal psychiatric diagnoses, around one year after the super-cyclone. Overlap of symptoms and comorbidity of diagnoses were high, suggesting that post-disaster presentation

is often a conglomeration of PTSD, depression and anxiety symptoms. As victims continue to suffer from trauma related psychiatric disorders, long after the disaster, the need for screening and intervention continues to be there especially so when the mental health care has not been in place from the beginning along with other disaster related support.

Research Objectives

- a. To find proportion of adolescents exhibiting post-traumatic psychiatric symptoms
- b. To examine prevalence of PTSD, major depressive disorder (MDD), and generalized anxiety disorders (GAD),
- c. To find prevalence of comorbidity in a group of adolescent students in rural areas, 14 months after the super-cyclone of Orissa

Research Methodology

All the students studying in standard nine and ten of two high schools in the most severely affected Jagatsinghpur district were taken as subjects of the study. Mini International Neuropsychiatric Interview for children and adolescents (MINI-KID) was used for evaluation of symptoms and diagnosis of MDD, PTSD and GAD. English is taught in schools to all high school students; however we provided a translated version of the scale in the vernacular Oriya along with the English version. This was considered appropriate considering regional variance in expression of symptoms and understanding the essence of the concept. MINI-KID allows for the explanation of words and concepts in the questions if the child or adolescent does not understand a particular symptom. The process of preparation of Oriya version involved translation to Oriya and retranslation to English. It was piloted before the study.

The diagnoses were based on the Diagnostic and Statistical Manual of Mental Disorders – Fourth edition (DSM-IV) criteria. Family structure (nuclear or joint), socioeconomic status (SES) following local guidelines, educational background of the parents and main earning source for the family were noted. Information on failures in examination and report of difficulties in studies were collected.

Data collection was done 14 months after the super-cyclone. Adolescents, their teachers and parents were briefed about the study. Informed consent was collected from parents or the responsible guardian. The adolescents were evaluated in their school. A parent or teacher was present during the clinical evaluation. The questionnaire was administered individually by one of the authors (BB). The study protocol was approved by the school managements and the ethics committee of Quality of Life Research and Development Foundation. Chi-square test was used to test association between categorical variables. Significance value was set at 0.05.

Finding(s)

Post-disaster psychiatric presentation in adolescents was a conglomeration of PTSD, depression and anxiety symptoms. The prevalences of PTSD, major depressive disorder and generalised anxiety disorder were 26.9%, 17.6% and 12.0% respectively. Proportion of adolescents with any diagnosis was 37.9%. Comorbidity was found in 39.0% of adolescents with a psychiatric diagnosis. Adolescents from middle socioeconomic status were more affected. There were gender differences in the presentation of the symptoms rather than on the prevalence of diagnoses. Prolonged periods of helplessness and lack of adequate post-

disaster psychological support were perceived as probable influencing factors, as well as the severity of the disaster.

The findings of the study highlight the continuing need for identification and intervention for post-disaster psychiatric morbidities in adolescent victims in developing countries.

RRL- 0169

Title Overview of the Psychosocial Impact of Disasters

Author Gloria R. Leon
Prehospital and Disaster Medicine, 2004 Vol 19 ISN 1

Key theme(s) natural disasters; psychosocial sequelae; technological disasters; terrorism

Abstract

The psychosocial sequelae can be intense and of long duration in the aftermath of natural and technological disasters, as well as terrorist attacks. Posttraumatic stress symptoms and full syndrome disorder, depression, anxiety, somatic complaints, and excessive alcohol use have been demonstrated consistently, particularly following large-scale disasters. This paper examines the psychological research conducted at various intervals after extensive natural disasters, the Three Mile Island and Chernobyl technological accidents, and recent terrorist events in the United States. Factors predictive of the emergence of emotional distress and psychological and physical problems following a disaster also are discussed.

Research Objective

To examine the psychological research conducted at various intervals after extensive natural disasters, the Three Mile Island and Chernobyl technological accidents, and recent terrorist events in the United States.

Research Methodology

Literature review

Finding(s)

A number of factors are predictive of differences in emotional distress and the emergence of psychological and physical health problems following a disaster. Such circumstances include the extent of exposure to the traumatic event, amount of devastation, loss or injury of family, relatives, and co-workers, and the overall impact on one's usual life activities. Individual personality traits such as resilience in the face of stress and effective coping skills also appear to be important. The research literature suggests that these risk factors override issues such as

the differential psychological meaning of natural vs. human-made disasters. The strong documentation over numerous studies of the often profound and long-lasting psychological effects of disasters points to the need for continued efforts to provide more effective psychological services to the general population affected, including disaster response personnel.

RRL- 0170

Title Recovery from post-earthquake psychological morbidity: who suffers and who recovers?

Author(s) Terry J. Lewin, Vaughan J. Carr, Rosemary A. Webster

Australian and New Zealand Journal of Psychiatry, 1998 Vol 32

Key theme(s) exposure factors, Newcastle earthquake, psychological morbidity; recovery, sociodemographic characteristics, vulnerability factors

Abstract

Objective: We sought to identify the psychosocial characteristics of high earthquake exposure subjects that were associated with the development of post-disaster morbidity and with recovery.

Method: Data reported are from 515 participants in a longitudinal study of the psychosocial effects of the 1989 Newcastle (Australia) earthquake. Subjects were allocated to three subgroups (low morbidity; recovered; and persistent morbidity) on the basis of their Impact of Event Scale scores across the four phases of the study. Differences between these subgroups were examined on a broad range of variables.

Results: Several background, dispositional, coping style and exposure-related factors characterised those who developed psychological morbidity, only a small subset of which differentiated between those who recovered and those with persistent morbidity.

Conclusions: Post-earthquake morbidity persists longer in those who are older, have a history of emotional problems, have higher neuroticism, use more neurotic defenses, and report higher levels of post-disaster life events.

Research Question

Who suffers and who recovers from post-earthquake psychological morbidity?

Research Methodology

There were 845 participants (429 females, 416 males) in the longitudinal component of the QIS, comprising a stratified sample of 539 (64%) from the local community and 306 (36%) drawn from groups of special interest, including the injured, the displaced, owners of damaged small

businesses, and helpers in threat and non-threat situations. The instruments of specific relevance here are: the Impact of Event Scale (IES) [81] and the 12-item General Health Questionnaire (GHQ-12), which were used in all four surveys; Billings and Moos coping strategies scale, which was included at phase I and which provides scores on three Method of Coping factors (active-cognitive, active-behavioural and avoidance); and three dispositional measures which were administered on two occasions each (the short Eysenck Personality Inventory (EPI), which measures neuroticism and extraversion, a measure of personal hopefulness (HOPES) and a revised version of the Defense Style Questionnaire (DSQ- 40), which measures the maturity of ego defense mechanisms).

Finding(s)

Differences between the low morbidity subgroup (LM) and the remaining two subgroups (R, PM) indicate "who suffers" from psychological morbidity among those who were exposed. Relative to the low morbidity subgroup, those 'who suffered' were: more likely to have used tablets for emotional problems and to have reported major life events during the 6 months before the earthquake; had experienced higher threat exposure; had higher neuroticism and lower personal hopefulness scores; used more immature defences and avoidance coping strategies; and reported a higher level of ongoing disruptions and life events post earthquake. Reflecting their higher (IES) morbidity status, they also had significantly higher general psychological morbidity at phases I and 4. and were more likely to have been counselled or used tablets for emotional problems post earthquake, in addition, relative to the low morbidity subgroup, those with persistent morbidity were: older; more likely to be female; had lower levels of education; were more introverted; used more neurotic defenses; and were more likely to use active-behavioural coping strategies. There were no analyses in which the low morbidity subgroup differed significantly from the recovered subgroup which did not also involve significant differences (in the same direction) between the low and persistent morbidity subgroups. Therefore, it is problematic to attempt to describe the unique characteristics of those 'who recovered' and easier to characterise those in whom morbidity persisted. Relative to the recovered subgroup, those with persistent morbidity were: older; more likely to have used tablets for emotional problems during the 6 months before the earthquake; had higher neuroticism scores; used more neurotic defences; and reported a higher level of life events during the first 2 years post earthquake. Again, reflecting their persistent (IES) morbidity status, they also had significantly higher general psychological morbidity at phases I and 4 and were more likely to have used tablets for emotional problems post earthquake.

RRL- 0171

Title The Psychological Impact of Exposure to Floods

Author(s) V. Mason, H. Andrews, D. Upton

Psychological, Health and Medicine, 2010 Vol 15 ISN 1

Key theme(s) Natural disasters; PTSD; depression; anxiety.

Abstract

A number of studies have shown a range of symptoms resulting from exposure to natural disasters such as flooding. Among these consequences, individuals may experience symptoms of post-traumatic stress disorder (PTSD), depression and anxiety. The aim of this study was to examine the psychological impact of flooding in the UK. A cross-sectional survey was used to investigate the psychological symptoms associated with the aftermath of the flood amongst adults living in the affected communities. A questionnaire battery including the Harvard Trauma Questionnaire (trauma and symptoms associated with PTSD), Hopkins Symptom Checklist (anxiety and depression), Coping Strategies Questionnaire and a range of questions addressing sociodemographic characteristics and factors relating to the flood was administered to households in flood-affected areas. Four hundred and forty four completed questionnaires were returned. 27.9% of participants met criteria for symptoms associated with PTSD, 24.5% for anxiety and 35.1% for depression. Females had higher mean scores on PTSD, anxiety and depression than males. Most frequently reported coping strategies were rational, detached and avoidant, with the least frequent being emotional coping. Having to vacate home following flood, previous experience of flooding and poor health were associated with greater psychological distress. Detached coping appeared to be related to less distress. Although it is not possible to determine whether the symptoms were a direct consequence of the flood, symptoms of distress are a significant issue amongst communities affected by environmental events warranting further attention to prevent chronic distress.

RRL- 0172

Title What Parts of PTSD Are Normal: Intrusion, Avoidance, or Arousal? Data from the Northridge, California, Earthquake

Author(s) J. Curtis McMillen, Carol S. North, Elizabeth M. Smith

Journal of Traumatic Stress, 2000 Vol 13 ISN 1

Key theme(s) PTSD; disaster; symptom criteria; comorbidity

Abstract

The incidence and comorbidity of posttraumatic stress disorder (PTSD) are addressed in a study of 130 Northridge, California, earthquake survivors interviewed 3 months postdisaster. Only 13% of the sample met full PTSD criteria, but 48% met both the reexperiencing and the arousal symptom criteria, without meeting the avoidance and numbing symptom criterion. Psychiatric comorbidity was associated mostly with avoidance and numbing symptoms. For moderately severe traumatic events, reexperiencing and arousal symptoms may be the most "normal," and survivors with a history of psychiatric problems may be those most likely to develop full PTSD. A system that considers people who meet all three symptom criteria to have a psychiatric disorder yet recognizes the distress of other symptomatic survivors may best serve traumatized populations.

Research Objective

To examine whether both the low incidence of PTSD after some traumatic events and the psychiatric comorbidity seen in those with PTSD may reflect the stringency of PTSD symptom criterion C, the effortful avoidance and numbing criterion, in the DSM-III-R and -IV classification systems.

Research Methodology

Five hundred residences were selected from the local telephone company's criss-cross directory (every tenth residence excluding nursing home and dormitory residences). One hundred thirty earthquake survivors responded and were interviewed. Participants were interviewed about their psychiatric and social status with the Diagnostic Interview Schedule/Disaster Supplement. In addition to eliciting information about survivors' earthquake experiences, it probed for recency, onset, and duration of the symptoms of seven DSM-III-R diagnoses.

Interviews were conducted by the second and third authors, two psychiatry residents, a clinical psychologist, and four professional interviewers who had several years of experience in structured interviews with various clinical populations.

Finding(s)

The patterns of posttraumatic phenomena observed in survivors of the Northridge, California, earthquake in the acute postdisaster period may help clarify the question of "normality" of PTSD and PTSD symptoms and suggest possible refinements in the psychiatric categorization of

posttraumatic responses. Thirteen percent of the sample, mostly women, met full diagnostic criteria for PTSD related to the earthquake. As in previous studies, criterion C (the avoidance and numbing symptom criterion) was critical to the diagnosis. All respondents meeting criterion C also met criterion B (reexperiencing) and criterion D (arousal). A substantial minority of survivors (48%) met both criteria B and D but not criterion C. If the number of symptoms required to meet criterion C was reduced from three to two, still substantially fewer people would meet criterion C than would meet both criteria B and D. Many B and D criteria symptoms were quite prevalent: Most survivors experienced unwanted memories, sleep disturbance, and exaggerated startle response. More than 40% reported reexperiencing the event, being upset after encountering reminders of the event, and trouble concentrating. Each of the other hyperarousal symptoms and two criterion C symptoms (avoids thinking about the earthquake and loss of interest in activities) were experienced by more than 30% of the sample. Criterion C symptoms were the least frequently endorsed. While those without diagnosable PTSD were not totally devoid of criterion C symptoms, the generally low rates of many of the symptoms made fulfillment of the C criterion unlikely.

RRL- 0173

Title Mediating Effects of Intrapersonal and Social Support on Mental Health 1 and 3 Years After a Natural Disaster

Author(s) Shirley A. Murphy
Journal of Traumatic Stress, 1988 Vol 1 ISN 2

Key theme(s) disaster; traumatic stress; self-efficacy; social support.

Abstract

Knowledge regarding social support has increased exponentially in the last decade; however, it remains unclear how support prevents or relieves stress and whether persons experiencing different kinds of stress need different kinds of support. This paper explores these issues. First, some of the stressful encounters reported by disaster victims are identified. Next, alternative schools of thought regarding how social support is conceptualized and measured is discussed. Finally, a longitudinal disaster study conducted by the author in which two rival hypotheses (self-efficacy and social support) were tested in mediating the relationship between stress and health is reported. Recommendations for future study are suggested in light of current methodological issues and study findings.

Research Objective

The current study aimed to examine the ability of self-efficacy and social support to mediate the effects of disaster stress on health 1 and 3 years following the volcanic eruption of Mt. St. Helens in southwestern Washington in 1980.

Research Methodology

A total of 155 persons participated in 1981 and represented five magnitudes of loss. Measures of stress were the Life Experiences Survey (Sarason *et al.*, 1978), the Hassles Scale (Lazarus and Cohen, 1977), and investigator-developed items. The mental health measures were the Global Severity Index, and the Depression and Somatization subscales of the Symptom Checklist 90-R. The physical health and recovery measures were investigator-developed. Measures of intrapersonal and interpersonal support were the Self-Efficacy Scale and the Index of Social Support (Coppel, 1980).

Self-efficacy was defined as the stated intrapersonal expectation that one's behavior can produce a desired outcome. *Social support* was defined as the stated interpersonal resources that lead to the belief that one is valued, getting evaluative feedback, and concrete information and aid that assist in problem resolution or sense of alleviation from hardship. *Mental health status* was defined as the self-reported absence or degree of severity of 90 clinical symptoms commonly associated with postdisaster mental distress.

Finding(s)

The study hypothesis that self-efficacy and social support would mediate disaster stress was partially supported. Self-efficacy was a significant predictor of all three health outcomes whereas social support was not. Study participants relied more heavily on self-reliant behaviors than on help-seeking behaviors.

As expected, the victims of the volcanic eruption exhibited greater evidence of stress and mental distress at both one and three years postdisaster, when compared with control group participants.

RRL- 0174

Title The Effect of Relocation After a Natural Disaster

Author(s) Louis M. Najarian, Armen K. Goenjian, David Pelcovitz, Francine Mandel
Journal of Traumatic Stress, 2001 Vol 14 ISN 3

Key theme(s) disaster; posttraumatic stress disorder; depression

Summary

Twenty-five women remaining in a city devastated by an earthquake were compared with 24 relocated survivors and 25 comparison women. The women were administered a structured PTSD interview, the Hamilton Depression Scale, and SCL-90-R. The women in both exposed groups showed significantly more symptoms of avoidance, arousal, and total PTSD than the comparison group. The women in the relocated city had significantly higher depression scores than the women in the earthquake city. On the SCL-90-R, relocated women were most symptomatic and comparison group women were least symptomatic. Relocation after a disaster appears to be associated more with risk for depression than with PTSD in situations where recovery is delayed following the trauma.

Research Objective

To assess whether systematically relocation facilitates the process of psychological recovery from the trauma of disaster.

Research Methodology

The families witnessing the earthquake were selected from Gumri. This study was based on interviews with 74 mothers and their children. The first group of women ($n = 25$) remained in Gumri after the earthquake and lived with their families, initially in tents and later trailers or reconstructed homes. The second group consisted of relocated women ($n = 24$) who left Gumri immediately after the earthquake because their homes were destroyed. They moved with their families to hotels and sanitariums that were emptied to receive the homeless in Yerevan. Yerevan is the capital of Armenia with a population of 1.3 million people.

The PTSD section of the third revised edition of the *Diagnostic and Statistical Manual (DSM-III-R*: American Psychiatric Association, 1987) was administered to each woman. The Hamilton Depression Scale (HDS: Hamilton, 1960), a widely used measure of adult depression, was administered to all participants. The HDS is a 21-item self-report questionnaire, which measures depression in adults. The Symptom Checklist-90-R (SCL-90-R: Derogatis, 1983) was also administered to all participants. The SCL-90-R is a 90-item self-report symptom inventory developed to reflect primarily symptom patterns of psychiatric patients.

Finding(s)

Relocation did not diminish the prevalence of PTSD in the adults who witnessed the earthquake and were displaced to Yerevan. Presumably, the severity of the trauma

outweighed the benefit of living in an intact city. Contrary to those who suggest remaining in the disaster area minimizes PTSD symptomatology, the women who relocated were no worse than those who remained in the disaster city. Our hypothesis that the adults who relocated would be less symptomatic than those who remained in the earthquake city was not substantiated. The finding that 92% of the women remaining in the earthquake city and 89% of the relocated women met criteria for PTSD 21/2 years after the disaster is not surprising in light of the trauma suffered in the earthquake. It is now well known that natural disasters that involve threat to one's life, and the lives of family members, are associated with very high risk for PTSD (Pynoos et al., 1987; Vogel & Vernberg, 1993). The finding that in both cities only approximately 10% of the women were not diagnosed with PTSD testifies to the extremely high risk women face for experiencing this disorder when they do not receive treatment after a disaster of such magnitude. Galante suggests that remaining at the site of the disaster is associated with quicker recovery and healing (Galante & Foa, 1986), but our finding that 92% of the women who remained in Gumri continued to have PTSD, highlights the difficulty of recovering from the effects of a trauma when a city remains in disrepair, and no psychiatric treatment for the effects of the trauma is available.

Our results regarding the differential levels of depression in the three cities consistently indicate that the relocated women were experiencing significantly higher levels of depression. This was the case in terms of total depression scores. Although almost three quarters of the women who remained in the earthquake city reported only relatively minor symptoms of depression, almost half of the women who were relocated, reported significant difficulty with depression.

RRL- 0175

Title Post-tsunami Stress: A Study of Posttraumatic Stress Disorder in Children Living in Three Severely Affected Regions in Sri Lanka

Author(s) Frank Neuner, Elisabeth Schauer, Claudia Catani, Martina Ruf

Journal of Traumatic Stress, 2006 Vol 19 ISN 3

Key theme(s) Tsunami, Sri Lanka, PTSD, children

Summary

At 3 to 4 weeks after the December 2004 tsunami disaster we assessed symptoms of posttraumatic stress disorder (PTSD) in 264 children who lived in severely affected coastal communities in Manadkadu (northern coast), Kosgoda (western coast), and Galle (southern coast) in Sri Lanka. The prevalence rate of tsunami-related posttraumatic stress disorder (PTSD) (ignoring the time criterion) ranged between 14% and 39% and an additional 5% to 8% had PTSD unrelated to the tsunami. The PTSD symptoms were explained by the severity of the trauma exposure and family loss, as well as previous traumatic events. The results confirm the relevance of the individual history of traumatic events for the genesis of PTSD and indicate a

high need of mental health assistance among the tsunami-affected children in Sri Lanka.

Research Question

Do children who lived in severely affected communities experience symptoms of PTSD?

Research Methodology

The interviews were conducted between January 15 and January 23, 2005 in three severely affected communities that were accessible at that time. The study population were children living in the affected areas in the age range of 8 to 14 years

Posttraumatic stress disorder. The University of California at Los Angeles (UCLA) PTSD Reaction Index (PTSD-RI) for children was used as the main instrument for the assessment of PTSD symptoms. The PTSD-RI is probably the most widely used PTSD instrument for children and adolescents, has proven good psychometric properties, and has been used in a wide variety of cultural settings (for a review see Steinberg, Brymer, Decker, & Pynoos, 2004). In a previous study (Elbert et al., 2006) this instrument had been translated into Tamil by following standard principles of instrument translation. Rather than relying on a cutoff criterion, we established the diagnosis of PTSD according to the fulfilment of the DSM-IV criteria assessed through the corresponding items (see also La Greca, Silverman, Vernberg, & Prinstein, 1996). For this purpose, we added five items related to problems in functioning in different areas of children's life. A previous validation study showed a high agreement in the PTSD diagnosis (79%) between the PTSD-RI as administered by the counselors and expert interviews (Elbert et al., 2006). A Sinhalese translation of the instrument was constructed by following the same principles as part of the training of the Sinhalese-speaking counselors.

Objective tsunami exposure. Four items related to the tsunami experience were added to the instrument. The four questions were answered yes or no. The score for objective tsunami exposure was the number of yes answers. In addition, the children were asked whether they had lost their father or mother in the tsunami and asked about the number of their siblings who had died through this event. The score for family loss was calculated as the number of core family members lost in the tsunami.

Subjective event experience. The PTSD-RI contains 10 items related to the subjective features of the worst traumatic event (e.g., Did you feel that what you saw was disgusting or gross? and Did you feel very confused?). The subjective event experience score was calculated as the sum of yes responses to these items.

Previous traumatic exposure. The score for previous traumatic exposure was calculated as the sum of yes responses to the non-tsunami-related items of the PTSD-RI event checklist.

Finding(s)

At 3 to 4 weeks after the tsunami disaster we examined PTSD in children living in three severely affected communities. Across all communities, 87% of the children reported one or more traumatic events before the tsunami.

Previous traumatic exposure was high in the Tamil region, which had been affected by the civil war, as well as in the Sinhalese regions that had been peaceful in recent years. Depending on location, between 4.6% and 8.5% of children had PTSD unrelated to the tsunami. An additional 13.9% to 38.8% of children fulfilled the preliminary diagnosis of tsunami-related PTSD. Posttraumatic stress symptoms were mainly predicted by variables comprising the severity of traumatic exposure including the loss of family members, both for all events and for the tsunami. In a regression analysis, the objective severity of the tsunami experience lost its impact because it was highly correlated with the subjective experience that mediated the effect of the objective features. It is noteworthy that the influence of previous traumatic exposure and tsunami exposure was almost equivalent for the calculation including all traumatic events and the analysis restricted to tsunami stress. This finding suggests that the life-threatening tsunami experience may have caused an aggravation of symptoms related to previous experiences. At the same time, the previously experienced traumatic events have probably increased the vulnerability for posttraumatic symptoms related to the tsunami. The finding that previous traumatic exposure is a significant predictor for the development of disaster-related PTSD supports a general dose-effect model of PTSD (Neuner et al., 2004) and might help to explain why PTSD rates after disaster are higher in developing countries, which are often characterized by high levels of violence.

Although we could not achieve a representative sampling of children soon after the tsunami, the study indicates that PTSD is a highly prevalent mental health problem for children living in the affected areas in Sri Lanka.

RRL- 0176

Title Psychological consequences of disasters

Author(s) Fran H. Norris
PTSD Research Quarterly, 2002 Vol 13 ISN 2

Key theme(s) Disasters; PTSD; mental health

Summary

The aim of this article is to provide a new synthesis of the empirical research on the psychosocial consequences of disasters.

Research Question(s)

- a. How large are the effects of disasters on mental health, generally?
- b. What types of events have the strongest effects, on average?
- c. For whom are they most stressful, usually?

Research Methodology

Literature review

Finding(s)

On average, disasters of mass violence have greater impact on mental health than either natural or technological events. When destruction, harm, and death are intentional, they are particularly difficult for survivors to make sense of. Parallely, profound trauma and bereavement may occur when natural disasters strike areas of the world where housing, warning systems, and resources for recovery are poor.

Even within samples that have experienced the same disaster, individuals vary greatly in their outcomes. Severity of exposure is nearly always predictive of postdisaster symptoms. Very often such effects are described as “dose-response” functions, meaning simply that as the severity of exposure increases, either mean symptom level or probability of disorder increases in a regular pattern.

Survivors’ characteristics, such as their gender and age, predisaster mental health and personality traits, and postdisaster psychosocial resources, also influence their outcomes.

Findings for age are complex. On average, samples composed of school-aged children show greater psychological impairment after disasters than do samples of adults.

Regardless of whether they are assessed retrospectively or prospectively, predisaster symptoms are almost always among the strongest predictors of postdisaster symptoms.

RRL- 0177

Title 60.000 Disaster Victims Speak, Part I, An empirical review of the empirical literature

Author(s) F. Norris, M.J. Friedman, P.J. Watson, C.M. Byrne
Psychiatry, 2002 Vol 65 ISN 3

Key theme(s) Disaster, psychological consequence, risk factors

Summary

The authors conducted an empirical review of the empirical research that has been published over the past two decades on disasters and mental health in order to update understanding of this evolving research base. They summarized around 250 articles and draw conclusions from the research base that have implications for practice in disaster mental health. The authors found out that samples were more likely to be impaired if they were composed of young rather than adults, were from developing rather than developed countries or experienced mass

violence rather than natural disasters.

Research Objectives

- a. To determine what is known about the potential range, magnitude, and duration of a disaster's effects on the mental health of a community.
- b. To determine the experiential, demographic, and psychosocial factors that influence who within a community is likely to be adversely affected.

Research Methodology

Literature research. Results for 160 samples of disaster victims were coded as to sample type, disaster type, disaster location, outcomes and risk factors observed, and overall severity of impairment.

Finding(s)

In order of frequency, outcomes included specific psychological problems, nonspecific distress, health problems, chronic problems in living, resource loss, and problems specific to youth. Regression analyses showed that samples were more likely to be impaired if they were composed of youth rather than adults, were from developing countries rather than developed countries, or experienced mass violence (eg terrorism, shooting sprees) rather than natural or technological disasters. Most samples of rescue and recovery workers showed remarkable resilience. Within adult samples, more severe exposure, female gender, middle age, ethnic minority status, secondary stressors, prior psychiatric problems, and weak or deteriorating psychosocial resources most consistently increased the likelihood of adverse outcomes. Among youth, family factors were primary.

RRL- 0178

Title Postdisaster PTSD Over Four Waves of a Panel Study of Mexico's 1999 Flood

Author(s) Fran H. Norris, Arthur D. Murphy, Charlene K. Baker, Julia L. Perilla
Journal of Traumatic Stress, 2004 Vol 17 ISN 4

Key theme(s) disaster; PTSD; depression; Mexico; longitudinal studies

Abstract

Samples of adults representative of Tezuitl'an, Puebla and Villahermosa, Tabasco (combined $N = 561$), were interviewed 6, 12, 18, and 24 months after the devastating 1999 floods and mudslides in Mexico. Current *DSM-IV* PTSD and major depressive disorder (MDD) were assessed with the Composite International Diagnostic Interview. At Wave 1, PTSD was highly prevalent (24% combined), especially in Tezuitl'an (46%), which had experienced mass casualties and displacement. Both linear and quadratic effects of time emerged, as PTSD symptoms initially declined but subsequently stabilized. Differences between cities lessened as time passed. Comorbidity between PTSD and MDD was substantial. The findings demonstrate that the international health community needs to be prepared for epidemics of PTSD when disasters strike developing areas of the world.

Research Objective

To examine the stability of PTSD symptoms over four waves of a panel study conducted after the Mexican flood of 1999.

Research Methodology

Visits to the two selected communities revealed that identical sampling procedures would not be possible. In Villahermosa, the flood damage was extensive, and victims were dispersed across a large sector of the city. The context necessitated a probability sampling design to draw a sample of adults representative of the afflicted population. In Tezuitl'an, the stricken hillside communities were condemned, and all families were relocated to a new community outside of the original city. The size of the community did not necessitate sampling, and all households were included in the sampling frame. Despite the difference in approach, both strategies provided samples that were highly representative of the populations and settings. The initial interviews were conducted 6 months postdisaster, in April 2000. From affected census tracts in Villahermosa, 653 households were sampled randomly in proportion to the tracts' population sizes. Of the 601 eligible households (noneligible units were vacant lots or businesses), 530 were successfully contacted and the adult who answered the door was asked to provide a sociodemographic interview about the household. Of these households, 470 agreed to complete this initial interview. One adult resident was then randomly selected from each participating household and asked to participate in an indepth psychological interview. Of these, 461 completed the psychological interview, for a final Wave 1 response rate of 77% of those assessed as eligible and 87% of those actually contacted.

Finding(s)

Six months postevent, the prevalence of current disaster-specific PTSD was strikingly high. One in four adults with PTSD also suffered from MDD, and 28% of the combined sample exhibited one disorder or, the other or both.

The high rates of PTSD documented here should not be altogether surprising because high proportions of participants were displaced, bereaved, injured, or endangered by the floods and mudslides of 1999.

The present study also demonstrated that the same event may have very different consequences when communities experience the event in different ways. In Tezuatlán, the prevalence of PTSD at 6 months postevent (46%) was over three times higher than the prevalence observed in Villahermosa (14%), which was itself far from trivial. Current MDD was also higher in Tezuatlán (15%) than in Villahermosa (7%).

Consistent with most previous longitudinal studies of disasters, the prevalence of current PTSD declined over time. By the end of the study, rates of current PTSD had declined from 14 to 8% in Villahermosa and from 46 to 19% in Tezuatlán. Even at 2 years postevent, however, the prevalence of PTSD remained high enough to be of public health concern and much higher than the base-rate of current PTSD in Mexico (2%).

RRL- 0179

Title The Course of PTSD, Major Depression, Substance Abuse, and Somatization After a Natural Disaster

Author(s) Carol S. North, Aya Kawasaki, Edward L. Spitznagel, Barry A. Hong
The Journal of Nervous and Mental Disease, 2004 Vol 193 ISN 12

Key theme(s) PTSD, major depression, substance abuse, somatization, disaster, floods

Summary

Flood research has used a variety of methods, yielding inconsistent findings. Universal definitions of illness are paramount to the science of psychiatric epidemiology of disasters. St. Louis area survivors ($N = 162$) of the Great Midwestern Floods of 1993 received a structured diagnostic assessment at 4 and 16 months postdisaster, with 88% follow-up. The purpose of the assessment was to examine predisaster and postdisaster rates of disorders and symptoms. Flood-related posttraumatic stress disorder was diagnosed in 22% and 16% at index and follow-up, respectively. Comorbidity with major depression determined whether the posttraumatic stress disorder would have remitted by 1 year later. Nearly one half of the men in the sample had a pre-existing alcohol use disorder. Virtually no new substance abuse followed the floods, and hence, substance abuse did not develop in response to the disaster or as part of coping with its aftermath. Somatization disorder was not observed; new somatoform

symptoms represented a fraction of postflood somatic complaints. Findings are inconsistent with causal attribution of floods in the etiology of alcohol abuse and somatization. Methodological differences may account for much of the apparent discrepancy of these findings, with recent reports of increased alcohol use and somatic symptoms observed after other disasters.

Research Methodology

From the combined areas of flooding, random sampling selected 500 addresses to receive letters inviting one adult from each household to participate in the study. The number of potentially eligible subjects who received the intended mailing is unknown, but this recruitment procedure yielded a total of 162 face-to-face interviews. Index and follow-up interviews used the DSM-III-R Diagnostic Interview Schedule/Disaster Supplement (DISIII- R) and included sections covering seven disorders: posttraumatic stress disorder (PTSD), major depression, panic disorder, generalized anxiety disorder, somatization disorder, alcohol use disorder, and drug use disorder. Onset and recency information was obtained for all disorders. Symptoms from the somatization section provided retrospective data on preflood and postflood report of medically unexplained symptoms and lifetime report of all somatic (physical) symptoms regardless of origin as reported by study participants.

Finding(s)

This study found PTSD rates of 22% early and 16% at follow-up in the St. Louis flood survivors: New alcohol abuse/dependence and somatization disorders were not observed sequelae of the floods. The results of this study may seem difficult to reconcile with more recent reports of disasters indicating increased alcohol use and the development of somatic symptoms observed after other disastrous events. Physical symptoms were quite prevalent after the floods. However, closer examination revealed that the majority of symptoms either had been present before the floods or were a legitimate part of a medical condition. The low incidence of somatoform symptoms in this study agrees with findings of low rates reported in the Times Beach (Smith et al., 1986) and Puerto Rico (Bravo et al., 1990; Canino et al., 1990; Escobar et al., 1992) flood studies.

RRL- 0180

Title Psychological Symptoms of Turkish Children and Adolescents After the 1999 Earthquake: Exposure, Gender, Location, and Time Duration

Author(s) Nesrin Hisli Sahin, Aysegül Durak Batıgün, Banu Yılmaz

Journal of Traumatic Stress, 2007 Vol 20 ISN 3

Key theme(s) PTSD: children, Turkey, Earthquake

Abstract / Summary

The authors describe their study of posttraumatic stress symptoms of children and adolescents after the 1999 earthquakes in Turkey. The rate of possible PTSD cases is also presented. The findings are reported as the results of two different studies. Location had a main effect on almost all of the dependent variables for both samples. The posttraumatic stress symptom scores for both groups significantly decreased 3 months after the initial assessment. The best predictors of the perceived posttraumatic stress symptoms for both children and adolescents were found to be perceived negative school performance and exposure.

Research Question(s)

What are of posttraumatic stress symptoms of children and adolescents after the 1999 earthquakes in Turkey?

Research Methodology

The baseline data were collected in the beginning of April 2000, a little over 5 months after the second earthquake (8 months after the first earthquake), from 9 different cities, and 13 schools in the earthquake region. Care was taken to ensure that all of the data (for children and adolescents as well) were collected at about the same time, so that the time factor would be controlled for (the process took one week). The follow-up data were also collected in one week, in the middle of June 2000, 3 months after the first data collection. The data from the adolescents (12–16 years old) were collected through self-report measures. However, parental reports were used to collect data for the 6- to 11-yearold children. The baseline and follow-up samples of both studies were samples of convenience. During the baseline and follow-up assessment, the subjects wrote their names on the scales, so that the batteries could be matched to measure the effects of time on a person-to-person basis. Participation in the study was voluntary.

Finding(s)

The results of these two studies in general, revealed that the earthquake had a very strong impact on both the children and the adolescents.

The results of the two studies are comparable to the results of previous studies investigating the effects of proximity (Blanchard et al., 2003; Bradburn, 1991; Goenjian et al., 1995). The children and adolescents of the epicentre had higher scores on impact, posttraumatic stress, and negative school performance measures. The disadvantaged position of female adolescents

in terms of their R-IES, BSI, and future expectation scores seems to be a replication of the findings in the related literature supporting the significant role of gender (Shannon et al., 1994). This difference among males and females, also observed in the adult trauma literature, can be attributed to the internalization of the symptoms to a greater frequency by females (Vogel & Vernberg, 1993) or to the differences in the defensive and coping styles, the availability and use of social support, and expectations for response and recovery (Pfefferbaum, 1997). Males may be more vulnerable during early and middle childhood; the reverse is true for females in adolescence (Smith & Carlson, 1997). The best predictor variable for the posttraumatic stress symptoms of the children and adolescents in all regions was negative school performance. This is an interesting finding because it highlights the importance of schools after disasters (Gordon et al., 1999). Observing students' behavior in these settings can be very crucial to select those who could be in need of immediate psychological support. The additional predicting variables were also similar: exposure for the moderately hit region; exposure, gender, losses and injuries for the epicenter. Similar findings are mentioned in the related literature (La Greca, Silverman & Wasserstein, 1998; Vogel & Vernberg, 1993).

For both groups, the symptoms decreased between the first and second assessment. Keeping in mind that statistical regression towards the mean is always a possible explanation; there is also the possibility for a positive effect of time (Pynoos et al., 1987; Saigh et al., 1999). For both groups, the figures for possible PTSD rates at follow-up were similar and in parallel to the findings of Giaconia et al.'s (1995) study of a group of late adolescents with various traumas.

According to the findings of this study (taking into consideration the limitations of the method of diagnosis), the criteria of 3 months or more of symptom duration for a diagnosis of child and adolescent PTSD (APA, 1994; Friedman, 2000), may need to be reconsidered for traumatic disasters like earthquakes. The recurring after-shocks are always a possibility, and they can be a confounding variable for such a diagnosis. In addition, there is always a possibility for the positive effect of time (Pynoos et al., 1987; Saigh et al. 1999). As it is observed in these two studies (Tables 3 and 6), the posttraumatic stress symptoms significantly decreased for both the children and the adolescents in 3 months. On the other hand, new cases might develop (delayed onset) even after 12 months (APA, 1994).

RRL- 0181

Title El Salvador Earthquakes: Relationships Among Acute Stress Disorder Symptoms, Depression, Traumatic Event Exposure, and Resource Loss

Author(s) David N. Sattler, Ana Maria Glower de Alvarado, Norma Blandon de Castro, Robert Van Male

Journal of Traumatic Stress, 2006 Vol 19 ISN 6

Key theme(s) Earthquake; El Salvador; ASD; trauma; depression

Abstract / Summary

Four and seven weeks after powerful earthquakes in El Salvador, the authors examined the relationships among demographics, traumatic event exposure, social support, resource loss, acute stress disorder (ASD) symptoms, depression, and posttraumatic growth. Participants were 253 college students (Study 1) and 83 people in the community (Study 2). In Study 1, female gender, traumatic event exposure, low social support, and loss of personal characteristic, condition, and energy resources contributed to ASD symptoms and depression. In Study 2, damage to home and loss of personal characteristic and object resources contributed to ASD symptoms and depression. Posttraumatic growth was not associated with ASD symptoms or depression. Findings support the conservation of resources stress theory (Hobfoll, 1998). Resource loss spirals, excessive demands on coping, and exposure to multiple disasters are discussed.

Research Objective

TO examine psychological distress during the acute stage of recovery, as well as the variables that are associated with acute stress disorder symptoms and depression following multiple earthquakes.

Research Methodology

Study 1: The participants were 253 (89 men, 164 women) students at the University of El Salvador in San Salvador. The average age was 23 years ($SD=5$). Most were single (89%) and lived with about five other people. Participants lived in their city for an average of 19 years ($SD=7$). Most had experienced another natural disaster (66%) and were moderately to very religious (74%). Almost one half of the participants reported being exposed to at least one traumatic event (46% reported being attacked) and having a life stressor during the previous year (41% reported death of a close family member).

Study 2: There were 83 participants (31 men, 52 women) from three communities within 25 miles of San Salvador. The average age was 35 years ($SD=11$). Most were married (54%) or single (33%) and in a household averaging five members. Participants lived in their city for 22 years on average ($SD=14$). Most had experienced a prior natural disaster (54%) and were moderately to very religious (73%). Almost one half of the participants reported being exposed to at least one traumatic event (47% reported being attacked) and more than one third reported having a life stressor during the previous year (39% reported death of a close family member).

Finding(s)

The findings show that for the college student sample, being female, experiencing traumatic events prior to the earthquakes, low social support, and loss of personal characteristic, condition, and energy resources contributed to both ASD symptoms and depression. For the community sample, damage to home and loss of personal and object resources contributed to both ASD symptoms and depression. The variables accounting for the greatest portion of variance in both ASD symptoms and depression were personal characteristic and energy resource loss for the college student sample, and personal characteristic and object resource loss for the community sample.

RRL- 0182

Title Risk Factors for Adolescent Alcohol Use Following a Natural Disaster

Author(s) Janine M. Schroeder, Melissa A. Polusny
Prehospital and Disaster Medicine, 2004 Vol 19 ISN 1

Key theme(s) adolescents; alcohol use; natural disaster; post-traumatic stress; risk factors

Abstract

Introduction: On 29 March 1998, a series of category F-3 and F-4 tornadoes caused widespread destruction in four rural southern Minnesota counties in the United States. Extensive research has examined the impact of disaster exposure on adults' psychological functioning, including alcohol use. However, there has been little research on potential risk factors for adolescents' alcohol use following disaster exposure.

Hypothesis: It was hypothesized that demographic variables such as age and gender, prior drinking involvement, extent of prior trauma history, level of disaster exposure, and current disaster-related post-traumatic stress disorder (PTSD) symptomatology would predict alcohol use among adolescents.

Methods: Six months following a natural disaster, survey data were collected from 256 adolescents assessing these factors. Risk factors for adolescents alcohol use were identified using hierarchical, multiple regression and logistic regression analyses.

Results: Greater age, prior drinking involvement, and the extent of prior trauma history were significantly associated with higher levels of binge drinking. Prior trauma history and current levels of disaster-related PTSD symptomatology were significant risk factors for adolescents' report of increases in their alcohol consumption since the tornado.

Conclusion: In general, the extent of trauma exposure was associated with greater binge drinking among adolescents. Similar to adults, post-traumatic stress symptoms experienced in the aftermath of a disaster can lead to increased alcohol consumption among adolescents.

Research Question(s)

What are potential risk factors for alcohol use in an adolescent sample exposed to a natural disaster.

Research Methodology

As part of a larger cross-sectional survey of 1,368 children and their parents who were exposed to a severe natural disaster, data from 256 adolescents in grades 10–12 collected six months post-event were examined. Younger children who participated in the larger study were excluded from this study because they did not complete measures of alcohol consumption and alcohol-related problems. The overall sample represents a 30% response rate, which is slightly lower than the response rates obtained in studies of adults exposed to similar events.¹² Fifty-nine percent of the adolescents who responded to the survey were female; the mean age was 16.5 years ($SD = 1.14$; range = 15–19). The majority of the participants were Caucasian (99%). Adolescents were not asked about their racial background because doing so would compromise the anonymity of minority participants within this predominantly Caucasian, rural community. Parental reports are not included in this report, however, it should be noted that parental self-report data on race indicated that 99% of parents were Caucasian.

Finding(s)

Among disaster-exposed adolescents. Despite the widespread destruction and disruption posed by disaster to this community, it is important to note that most adolescents refrained from drinking. However, a number of risk factors were identified that appear to contribute to adolescents' alcohol use. Specifically, we found that age, prior alcohol-related negative consequences, and the extent of adolescents' prior trauma history significantly predicted binge drinking following this natural disaster. Adolescents who reported increased alcohol use following the tornado had a greater likelihood of having a more extensive prior trauma history and greater disaster-related post-traumatic symptomatology.

RRL- 0183

Title Psychosocial Resource Loss as a Mediator of the Effects of Flood Exposure on Psychological Distress and Physical Symptoms

Author(s) Bruce W. Smith, John R. Freedy
Journal of Traumatic Stress, 2003 Vol 13 ISN 2

Key theme(s) Psychosocial resource loss; flood; prevention

Abstract

This study used the Conservation of Resources stress model to examine the role of psychosocial resource loss in the aftermath of Midwest Flooding. Questionnaires were distributed through churches and completed by 131 adults in flood-affected communities 6 weeks and 6 months after the flood's crest. Frequent psychosocial losses included losses of routine, sense of control, sense of optimism, accomplishing goals, and time with loved ones. Path analysis revealed that psychosocial resource loss mediated the effects of flood exposure on both psychological distress and physical symptoms at 6 months postflood. The findings suggest that interventions designed to prevent psychosocial resource loss may reduce the long-term effects of disasters.

Research Objectives

- a. To examine the specific effects of psychosocial resource loss.
- b. To develop a separate measure of disaster exposure and assess the strength of the relationship between flood exposure and psychosocial resource loss.
- c. To see if psychosocial resource loss mediated the relationship between disaster exposure and measures of psychological distress and physical symptoms.

Research Methodology

Three weeks after the crest of the flood, churches in flood-affected communities were contacted to find representatives to assist in collecting data. Churches were chosen to gain ready access to a broad sample of flooded communities. They were randomly selected in eight flood-affected communities by using local phone books. The first author consulted with the leaders of each church to choose a representative to distribute the initial questionnaire. These representatives were selected on the basis of their involvement in community-wide flood relief efforts.

One month after the flood, initial questionnaires were mailed to each representative to distribute to adults affected by the flood. Approximately 490 questionnaires were distributed and 209 were returned for a rate of 42.7%. A second questionnaire was mailed to 200 of the original participants and 131 were returned for a rate of 65.5%. The nine original participants that were not mailed the second questionnaire did not give permission to be recontacted. The first questionnaire was completed at 6 weeks postflood (Time 1) and the second questionnaire was completed at 6 months postflood (Time 2).

Finding(s)

All three of the hypotheses were supported: (1) flood exposure was related to psychosocial resource loss, (2) psychosocial resource loss was related to psychological distress and physical symptoms, and (3) psychosocial resource loss mediated the effects of flood exposure on psychological distress and physical symptoms. In addition, frequent losses included loss of routine, sense of control, sense of optimism, accomplishing goals, and time with loved ones. This study represents an extension of earlier research regarding resource loss and natural disasters (Freedy et al. 1992; Freedy, Saladin, et al., 1994). First, this study specifically examined psychosocial resource loss. Second, there was a link found between psychosocial resource loss and both psychological distress and physical symptoms. Third, these links were found after controlling for previous levels of distress and symptoms. Psychosocial resource loss appears to have been important even in an event in which financial and material losses were prominent.

To our knowledge, this is the first study to examine the association between disaster exposure and resource loss. Previous disaster researchers have assumed (Sa'Idin, et al., 1994). Our results demonstrated a moderately strong link between flood exposure and psychosocial resource loss. However, the correlation between flood exposure and resource loss suggests that a substantial portion of the variance in resource loss was not explained by flood exposure. Future disaster research may benefit by distinguishing between resource loss that is and is not related to disaster exposure.

Most important, our findings suggest that psychosocial resource loss fully mediated the relationship between flood exposure and measures of distress and symptoms at 6 months. This is especially striking because special care was taken to ensure that there was minimal item overlap between measures. The implication is that interventions may reduce the lasting effects of disasters by targeting the psychosocial resources that may be lost following disasters. Thus, the interventions being developed by Hobfoll(1998) to increase psychological and social resources may prove fruitful in the context of disasters.

RRL- 0184

Title Early post-traumatic stress disorder in relation to acute stress reaction: An ICD-10 study among help seekers following an earthquake

Author(s) Constantin R. Soldatos, Thomas J. Paparrigopoulos, Dimitra A. Pappa, George N. Christodoulou

Psychiatry Research, 226 Vol 143

Key theme(s) Disaster research; Earthquakes; Early post-traumatic stress disorder; Acute stress reaction; ICD-10

Abstract

Disaster research related to earthquakes has almost exclusively dealt with their long-term psychosocial impact; besides, diagnoses were previously based only on DSM criteria. Therefore, it is pertinent to assess stress-related reactions of earthquake victims during the early post-disaster period through the application of ICD-10 criteria. For the first 3 weeks following an earthquake, 102 help-seekers were assessed based on a checklist of sociodemographic variables and a semi-structured interview for the detection of acute stress reaction (ASR) and posttraumatic stress disorder (PTSD) according to ICD-10. Forty-four subjects (43%) fulfilled the ICD-10 criteria for PTSD; all but one of them had suffered ASR. Moreover, among a series of potential predictors for PTSD, ASR was found to be the only significant one; this indicates a definite association between ASR and early development of PTSD. Logistic regression to predict group membership (PTSD/no PTSD) based on specific ASR symptoms showed that accelerated heart rate and feelings of derealization were the only significant predictors for early PTSD. Individuals who fulfill the ICD-10 diagnostic criteria for ASR following an earthquake are at high risk for subsequent occurrence of early PTSD. Increased heart rate and feelings of derealization within the first 48 h after the traumatic event appear to be the principal factors associated with the development of early PTSD. In addition to their potential value for timely prevention and treatment, these findings raise important nosological issues pertaining to the current diagnostic classification of stress-related disorders (ICD-10 versus DSM-IV).

Research Question

What are the psychopathological manifestations during a 3-week period immediately following the first 2 days, i.e. the early post-traumatic stress disorder (PTSD) of the victims.

Research Methodology

The earthquake, which struck the Athens Metropolitan Area on the 7th of September 1999, had a magnitude of 5.9 on the Richter scale and was the second strongest over the last 20 years.

The mean interval between the catastrophic event and the time of each subject's assessment was 8.2F4.4 days (range: 3–22 days). For logistic or other reasons, 57 subjects had a rather brief contact with the PSU personnel not allowing an assessment thorough enough for the needs of our study. Thus, only 102 subjects were clinically investigated through a checklist of sociodemographic variables and a psychiatric interview focused on the detection of acute stress reaction (ASR) and posttraumatic stress disorder (PTSD). After complete description of

the study to the subjects, their informed consent was obtained as appropriate.

Finding(s)

The main finding of the present study in a sample of help-seekers following an earthquake is that individuals who fulfill the ICD-10 diagnostic criteria for ASR have a significantly higher risk for the subsequent occurrence of early PTSD compared with those who do not fulfill these criteria. Moreover, among the symptoms of ASR, reported, increased heart rate and feelings of derealization within the first 48 h following the traumatic event were identified as the principal factors associated with the development of early PTSD. Given the predictive value of these early clinical manifestations, these symptoms could provide an opportunity for early case identification and intervention to prevent the development of PTSD. Finally, this study emphasizes the importance of certain nosological issues pertaining to the current diagnostic classification of stress-related disorders in ICD-10 vis à vis those in DSM-IV that need to be systematically addressed in future research.

RRL- 0185

Title Mental Health Effects of Natural and Human Made Disasters

Author(s) Susan D. Solomon, Bonnie L. Green
PTSD Research Quarterly, 1992 Vol 3 ISN 1
The National Center for PTSD

Key theme(s) Natural disasters; health effects; risk factors;

Summary

The purpose of this article is to determine the effects of natural and human-made disasters on mental health effect. Mental health studies of disasters typically have been designed to answer three basic questions: What kinds of mental health problems, if any, result from exposure to disaster? Which groups of people are at highest risk for negative effects? And, what factors modify the impact of exposure to disaster (i.e., *why* are some people at particularly high risk)? In this review the authors include abstracts and citations of studies that address one or more of these questions.

Research Question(s)

- a. What kinds of mental health problems, if any, result from exposure to disaster?
- b. Which groups of people are at highest risk for negative effects?
- c. What factors modify the impact of exposure to disaster (i.e., *why* are some people at particularly high risk)?

Research Methodology

Literature Review.

All research reviewed in this issue relates to mental health studies of adult and child survivors of natural and human-made disasters. To avoid overlap with previous issues of the *PTSD Research Quarterly* (Weisæth & Eitinger, Volume 2, Numbers 2 & 3) the authors have restricted our focus to studies conducted in the United States. We also have excluded studies that focus on emergency workers, and on victims of torture, terrorism, and other interpersonal violence, since we regard these as topics worthy of separate attention in the *Quarterly*. And while our abstracts are limited to studies published since 1978, we have included a few citations of classic early work in the field of disaster research.

Finding(s)

Question 1: One early but continuing controversy in the field is whether disasters do in fact cause psychological problems.

Though this literature on the whole seems to suggest that disasters do result in, at the very least, stress reactions, if not full-blown psychiatric disorder, a question still outstanding is whether these effects are transient or lasting (i.e., persisting longer than several weeks post-event).

Question 2: Several studies of disaster are designed to determine which populations are at greatest psychological risk. Some of these studies examine aspects of the disaster experience (the stressor) that cause the most negative consequences. Other studies examine qualities of the people (individual vulnerability) that put them at potentially higher risk. The experiences which have received the most systematic study are bereavement, property loss, and threat to life.

Question 3: Research suggests that inadequate social support relates to severity of PTSD and related symptoms (Bromet et al., 1982, 1984; Green et al., 1985); however, the cause and effect of this relationship is unclear.

RRL- 0186

Title of article Mental Health Status of Vulnerable Tsunami-Affected Communities: A Survey in Aceh Province, Indonesia

Author(s) Renato Souza, Sasha Bernatsky, Rosalie Reyes, Kaz de Jong

Journal of Traumatic Stress, 2007 Vol 20 ISN 3

Key theme(s) Emotional distress; depression: armed conflict, Tsunami, Banda Aceh.

Summary

The authors determined the prevalence of severe emotional distress and depressive symptoms using the Hopkins Symptoms Checklist-25 (HSCL; Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974) in tsunami-affected communities that had experienced armed conflict arising from the ongoing independence movement in Aceh Province, Indonesia. We also evaluated determinants of severe emotional distress. The data were collected for the purposes of a mental health assessment. In our sample (N =262), 83.6% demonstrated severe emotional distress, and 77.1% demonstrated depressive symptoms. In multivariate regression models, severe emotional distress was positively associated with the number of tsunami-related deaths among household members. Our data suggests a need for effective interventions in this vulnerable population.

Research Question

What is the prevalence of depressive symptoms and severe emotional distress among vulnerable individuals in tsunami-affected communities, focusing on those that had been known to have experienced significant conflict related to the ongoing Aceh independence movement.

Research Methodology

These survey activities were funded completely by MSFHolland (Amsterdam, The Netherlands), an independent humanitarian medical aid agency providing assistance to populations regardless of race, religion, politics, or sex. Approval to use the previously collected data for the purposes of a peer-reviewed journal article was provided by the McGill University Institutional Review Board.

We completed a survey of psychologically vulnerable tsunami-affected individuals on the North Coast of Aceh Province in July 2005. The data were collected for the purposes of a mental health assessment in this region. The definition of psychological vulnerability included the following criteria: participants had to be living in displaced persons camps or barracks, originally from coastal villages where the impact of the tsunami had been greatest, and highly likely to have significant preexisting psychosocial stress from conflict (based on the location of their original villages within conflict-affected zones). Our calculations indicated that a participant pool of about 260 individuals would afford enough power to enable us to calculate the prevalence of severe distress with a 95% confidence interval of less than 12 percentage points, if the prevalence of distress was 60% or higher (Newcombe, Wilson, 1927; 1998). The

study population was comprised of the 10 barracks and 3 camps¹ serviced by Médecins Sans Frontières (MSF) in Aceh Utara, Lhokseumawe, and Bireuen. At each of these 13 locations, 20 persons were interviewed, representing approximately a 10–15% sample of the population of interest. At each site, a member of our team met with the chief (head² of the village where the people had originated from) explained our purpose, and asked where the center of the settlement (camp or barrack) was. Following techniques developed for surveys within the setting of a large displaced population (Brown, Moren, & Paquet, 1999), we randomly chose the first dwelling and subsequently interviewed the members of each second dwelling until the total number of interviews for that location was obtained. This resulted in a convenience sample of 262, allowing calculation of our estimates with acceptable precision. Within the dwelling, trained interviewers went to the first room of the dwelling and inquired about those living there. Because our study could (for security reasons) only be conducted during daylight hours (and this was when men were likely to be away from home), our sample was populated by more women than by men. Within a dwelling, we also asked if an old person lived in the dwelling, and gave preference to that individual person. Participants not eligible for inclusion were those less than 16 years of age.

Finding(s)

No individuals refused participation in our survey. Three quarters of the 262 participants were women ($n = 199$, 75.9%). Detailed demographics are presented in Table 1. In the sample, the mean age was 40.3 years ($SD = 14.1$, median age 38 years). Those aged over 55 years numbered 43 (16.4%). Years of education were similar for men ($M = 4.9$, $SD = 3.7$) and women ($M = 5.1$, $SD = 3.8$). The majority (96.5%) of individuals identified themselves as currently working; the occupations most commonly listed by these individuals were housewife ($n = 150$, 73.2%), retail ($n = 21$, 10.2%), fishing ($n = 20$, 9.8%), and farming ($n = 14$, 10.2%). Many ($n = 105$, or 40.1% of the entire sample) were still dependent on donations for their livelihood. Dependency on donations was most common for women and older individuals (data not shown). Over a third (34.4%) of the participants had lost at least one first-degree relative in the tsunami, with the range for number of deaths being 0 to 9. Using the cut-off of 1.75 for the average total score, 83.6% of our sample (95% confidence interval [CI] = 78.6–87.6) were identified as being severely emotional distressed, and 77.1% (95% CI = 71.8–81.8) were identified as being depressed. With a more conservative cut-off of 2.00, the percentage with important emotional distress was 69.8% (43.9% if the definition was >2.50), and the percentage with depression was 60.3% (40.1% if the definition was >2.50). In our logistic regression models, the prevalence of severe emotional distress was positively associated with number of tsunami-related deaths among household, odds ratio (OR) = 1.68 (95% CI = 1.02–2.80). Younger individuals were more likely to have severe distress than older individuals; the OR for increasing age was 0.97 (95% CI = 0.95–0.99). The secondary analyses using the total distress scores in linear regressions showed similar findings, with the number of deaths being a significant predictor of total distress, rate ratio = 1.09 (95% CI = 1.01–1.16).

RRL- 0187

Title Supercyclone in Orissa: An Assessment of Psychological Status of Survivors

Author(s) Damodar Suar, Manas K. Mandal, R. Khuntia
Journal of Traumatic Stress, 2002 Vol 15 ISN 4

Key theme(s) natural disaster; posttraumatic stress; external control; loss; social support

Summary

The study assessed the impact of the Orissa supercyclone on survivors' locus of control, anxiety, depression, and posttraumatic stress. The study was conducted in structured interview sessions 3 months after the supercyclone. The affected people ($n = 65$) who were close to the epicenter of supercyclone and lost their family members, relatives, and property, experienced more anxiety, depression, and posttraumatic stress than the unaffected ($n = 65$) who were away from the epicenter of supercyclone and had not experienced any loss. Effects of exposure remained significant with the effects of sex and neuroticism controlled. External support reduced anxiety and depression, and the amount of loss experienced by the survivors significantly increased external locus of control and anxiety.

Research Question

Are there aspects of Indian culture that might complicate recovery from a major disaster?

Research Methodology

The affected people were from three coastal districts, close to the epicenter of the supercyclone. All were residing at the temporary camps organized by governmental and nongovernmental organizations. When these people gathered in groups of as low as 3 to as high as 10 outside the camps, a trained psychologist took the opportunity to interact with the affected people. The affected people were allowed to narrate the catastrophe in an informal discussion following which they were briefed about the purpose of the study and consent was sought for their participation in the study. Persons below 18 years or with a history of psychiatric or organic disorder were excluded from the sample. Sixty-five affected people (male, $n = 45$, female, $n = 20$; M age $D = 38.0$ years, $SD = 14.1$; M education $D = 9.5$ years, $SD = 5.2$) of the supercyclone from five semiurban areas and an identical number of unaffected people (male, $n = 32$, female, $n = 33$; M age $D = 35.5$ years, $SD = 11.9$; M education $D = 10.6$ years, $SD = 5.0$) from the state of Orissa (India) were included in the sample. The representativeness of the affected females was somewhat low as very few female survivors agreed to participate in the study. In this culture, women in a joint family structure rarely come forward to interact with an outsider when male family members are available. The affected people mostly belonged to joint families (M family members $D = 8.7$; $SD = 4.9$) as compared to the unaffected people (M family members $D = 6.0$; $SD = 2.14$; $t(128) = 4.17$; $p < .01$). Groups differed neither for age, $t(128) = 1.11$, nor education, $t(128) = 1.10$. The affected people all lived within 10 kms of the actual area of devastation. The unaffected people were those who (a) stayed 40 kms away or more from the epicentre of supercyclone, and (b) reported no loss of human lives, crops, livestock, houses, or other properties of their families following supercyclone and received no

external support for such purposes. Both groups were exposed to supercyclone but the unaffected people were from the areas which were least affected.

The interview included measures of neuroticism (Maudsley Personality Inventory; Eysenck, 1959), locus of control (Internal–External Locus of Control Scale; Rotter, 1966), anxiety (STAI Form X-2; Spielberger, Gorsuch, & Lushene, 1970), depression (Depression Inventory; Beck, 1967), posttraumatic stress disorder (*DSM-IV*; American Psychiatric Association, 1994), loss, and social/economic support. Some standardized scales/ inventories were shortened to reduce the length of the interview session. Item reduction was done based on the judgment of three psychologists who examined the salience and situational suitability of test items. The items in the inventory/scale were translated into the vernacular Oriya language and were back-translated to English to ensure the validity of the Oriya translation by the dual-language experts.

Finding(s)

In the affected sample, 32% of the interviewees' families (21 out of 65) had lost their family members. The loss varied from as low as 1 to as high as 5. Out of the total livestock population ($n = 723$) of the respondents' families, 72% were either dead or washed away. The houses of 97% of the families were fully destroyed. Of the affected families, 71% had land under crops and the rest were landless. Of the total families who had land under crops, 85% lost their crops fully and 15% partially. The average loss was 6.60 acres per family. In contrast, the unaffected sample had not experienced any such loss. Table 1 shows the samples' means and standard deviations for scores on neuroticism, external locus of control, trait anxiety, depression, and posttraumatic stress disorder symptoms. The differences between groups in locus of control, anxiety, depression, and posttraumatic stress were tested by using multiple regression, as shown in Table 2. In the regression equation, group was coded as a dummy variable (*affected* $D = 1$; *unaffected* $D = 0$). In the first step of regression analysis (by forced entry method), the unstandardized beta coefficients revealed the average difference by which the affected group differed from the unaffected group on psychological outcomes. All such coefficients were positive, indicating that the scores of affected people were higher than those of the unaffected people. These effects were statistically significant for anxiety, depression, and posttraumatic stress but not for locus of control. When posttraumatic stress was scored dichotomously according to *DSM-IV* criteria, 89% of the affected people (58 out of 65) were diagnosed to have PTSD compared to 11% (7 out of 65) of the unaffected people. In the second step of the regression analysis, sex (*female* $D = 1$; *male* $D = 0$) and neuroticism were entered to control for preexisting differences between groups in their gender distribution and neuroticism. The beta coefficients for sex indicated that the average difference between women and men across groups was not significant on psychological variables except for anxiety. Women experienced more anxiety than men. General emotional instability predicted greater externality, anxiety, and depression. After partialling out the confounding effects of sex and neuroticism, the differences between affected and unaffected groups obtained in the first step of regression analysis were heightened, and the effect of group on locus of control (affected more external) reached statistical significance. In the third step of the regression analysis, total loss, and social and economic support were further added to the list of independent variables. Because these variables were not applicable to the unaffected group, its members were assigned scores equivalent to the means of the affected group on these variables. Thus their effects apply only to effects within the affected group. As predicted, not only was the affected group more

symptomatic overall than the unaffected group, the psychological status of these survivors varied according to the magnitude of their losses: the higher the losses, the more external the orientation and the greater the anxiety. Received support reduced anxiety and depression, but did not protect survivors from external control or posttraumatic stress.

RRL- 0188

Title Impact of a natural disaster of preschool children: Adjustment 14 months after a Hurricane

Author(s) C. C. Swenson, C. F. Saylor, M. Paige Powell, S. J. Stokes

American Journal of Orthopsychiatry, 1996 Vol 66 ISN 1

Key theme(s) South Carolina, Hurricane, children behavior

Summary

Fourteen months after a hurricane in South Carolina, young children who had experienced the storm showed significantly higher anxiety and withdrawal and more behavior problems than did children who had not. Behavioral problems decreased steadily over the six month following the storm. Mothers' distress in the hurricane's aftermath was associated with the longevity of their children's emotional and behavioral difficulties.

Research Question(s)

- a. What are the general behavioural problems and trauma-related emotional symptoms among pre-school aged children 14 months after hurricane Hugo?
- b. What is the duration of emotional and behavioral problems?
- c. What are factors which predict longevity of these problems?

Research Methodology

Mothers' rating of 331 children from three sites provided the data for this study. The 21-items Pediatric Emotional Distress Scale assessed the presence of specific behavioral problems and trauma-related symptoms. A hurricane related experience questionnaire was developed specifically for this study.

The occurrence of life stressors in the 14 months period following the hurricane was assessed on another questionnaire developed for this study, as a longevity of symptoms scale.

Finding(s)

In the Hurricane group, children showed significantly greater difficulties on nine types of behavior such as whining, refusing to sleep alone or trouble falling asleep.

Only one variable, significant distress of the mother due to the hurricane aftermath, was a significant predictor of behavioral difficulties.

While 38 percent of children showed emotional and behavioral problems immediately after the hurricane, the number decreased with the time and 6 percent still showed such problems one year after the hurricane.

Life stressors following the hurricane and significant property loss were both significant predictors of longevity of the problems. Mothers' sadness, depression, denial for what happened and feeling shocked were further variables predicting longer lasting problems.

RRL- 0189

Title The psychosocial impact of an earthquake on the elderly

Author(s) S. Ticehurst, R.A. Webster, V.J. Carr, T.J. Lewin

International Journal of Geriatric Psychiatry, 1996 Vol 11

Key theme(s) post-traumatic stress; earthquake; elderly; disaster; psychosocial

Summary

The psychosocial effects of an earthquake which occurred in Newcastle, Australia in 1989 are the focus of the Quake Impact Study, a four-phase community survey conducted over 2 years. Comparisons were made between adults aged less than 65 years ($N= 2371$) and those aged 65 years and older ($N= 636$). Results revealed that older subjects reported fewer threat and disruption experiences and used fewer general and disaster-related support services.

However, older subjects reported higher overall levels of post-traumatic stress symptoms on the Impact of Event Scale (IES) compared with younger subjects. On both the IES and a general measure of morbidity (General Health Questionnaire: GHQ-12) the effects of earthquake exposure were more marked among the elderly. Within the older group, subjects who had high levels of post-traumatic stress symptoms ($IES > 25$, $N = 117$) were more likely to be female, report higher levels of exposure and use behavioural and avoidance coping styles. Although psychological distress declined with time, post-traumatic stress symptoms remained higher for the high exposure group throughout the study. We conclude that older people may be more at risk for experiencing post-traumatic stress reactions despite having fewer disaster-related experiences. They may also underutilize support services following a disaster. Older women in particular and people with an avoidance coping style appear to be most vulnerable.

Research Objective

This study attempts to overcome some of the methodological difficulties previously reported in the literature relating to the effects of disasters on the elderly.

Research Methodology

There were 5000 adults selected from the community at phase one of whom 3007 participated in the QIS. Subjects completed a screening survey in phase one of the QIS. This survey contained sociodemographic questions as well as questions about where they were, what they were doing and what they thought had happened at the time of the earthquake, use of welfare support services and frequency of visits to a doctor post-earthquake. The largest component of the survey contained questions about earthquake experiences and reactions, responses to which were used to develop two weighted indices of exposure. The first was an index of threat experiences and measured exposure to injury or the possibility of injury and the second was an index of disruption and measured experiences of property damage, other losses and displacement from one's usual place of living.

Finding(s)

Subjects over the age of 65 years were more likely to be living alone in their own home and have a lower educational standard. They were less likely to be currently married than younger persons. They reported fewer threat and/or disruption experiences than younger subjects but scored higher on the IES. They reported a higher number of visits to a doctor since the earthquake but used fewer other general support services or disaster-related services. The elderly were more likely to use cognitive coping styles and less likely to use avoidance and behavioural coping styles than younger persons.

There were significant main effects for gender, age and exposure on the IES, as well as a significant exposure by age interaction. Overall, women, the elderly and those who were more exposed to the earthquake scored higher on the IES. Furthermore, the effects of exposure were more marked among the elderly. With respect to the GHQ-12, there were significant main effects for gender and exposure and three significant interactions. There were no main effects for age on the GHQ-12, in contrast to the findings with respect to the IES. Overall, women and those who were more exposed to the earthquake scored higher on the GHQ-12. The effect of exposure was more marked in women and the elderly, while elderly women in particular had higher levels of general psychological distress.

A supplementary item analysis of differences in the patterns of exposure revealed that elderly subjects reported significantly less exposure on all of the items in our disruption index (eg damage to house, disruptions to employment, participation as helpers and having relatives who were disrupted) and less exposure on all but one of the items in our threat index (eg threat of injury, likelihood of being trapped and concerns about another earthquake).

This study suggests that elderly persons are less likely to use disaster-specific services for counselling and other support. This may be in part related to their relatively diminished mobility and age-related differences in help-seeking behaviour. The implication is that, in order to provide services to the elderly postdisaster and to access those at risk for psychological morbidity, elderly persons should be specifically targeted postdisaster. Perhaps the elderly are suspicious of or unwilling to adjust to new services and therefore an alternative would be to augment traditional agencies of community support for the elderly postdisaster.

RRL- 0190

Title Psychological Consequences of the 1999 Earthquake in Turkey

Author(s) Umit Tural, Bülent Coskun, Emin Önder, Aytül Corapcioglu
Journal of Traumatic Stress, 2004 Vol 17 ISN 6

Key theme(s) posttraumatic stress disorder natural disasters; predictor; prevalence.

Summary

The authors explored the prevalence of posttraumatic stress disorder (PTSD) and its relation to demographic characteristics and other risk factors for developing PTSD in a large sample ($N = 910$) of earthquake survivors living in tent city. Twenty-five percent of the sample met *DSM-IV* criteria for PTSD assessed with the Posttraumatic Stress Disorder Self Test (PTSD-S). Peritraumatic factors explained the most variance when the risk factors were grouped as demographics, pretraumatic, peritraumatic, and posttraumatic. The study emphasized that PTSD among the earthquake victims was as prevalent in Turkey as after disasters in other developing countries but higher than usually found after disasters in developed countries, and there was a relation between some factors-mostly peritraumatic-and PTSD.

Research Question(s)

- a. What is the prevalence of PTSD in a selected population exposed to the earthquake that demolished Kocaeli, north-western Turkey, in August 1999?
- b. What are risk factors for PTSD?

Research Methodology

This study was conducted after the Marmara Earthquake (between December 1999 and August 2000) at the Mehmetgik tent city. A thousand persons were selected randomly from approximately 5,000 inhabitants. Research teams visited every tent in the Mehmetgik tent city one by one and explained the aims of the study. A potential participant between the ages of 16 and 65 within the residents of tent (household), who were present at the time of visit by research team, was selected on the basis of birth date. The one whose birthday was closest to the date of interview was selected as potential participant. After a presentation of the study, oral consent was obtained. If, for some reason, that person was unable to be interviewed or she/he refused to participate, the person with the next closest birthday was selected and invited to participate in the study. All steps of participation were voluntary and participants were free to stop the interview at any time. Interviewers were the authors who were assistant Doctors of Psychiatry and known by residents of the tent city. Participants filled in the forms in a single session. Participants who had difficulty in understanding the written material or had low educational levels were helped to complete the survey by staff. Ninety households refused to participate. The response rate was 91%, and totally 910 persons between the ages 16 and 65 participated in the study and filled in the "earthquake inquiry" form.

The assessment included a 1-hr paper and pencil survey that measured survivors' background characteristics, certain risk factors and *DSM-N* criteria for PTSD. The "earthquake inquiry" form

was designed by the investigators and consisted of items including: demographic variables; psychological and psychosocial consequences of the trauma; and PTSD-Self Test (PTSD-S).

Finding(s)

Following the 1999 earthquake in Turkey the rate of PTSD was found to be 25.4% in the survivors living in a tent city 1 year postdisaster.

Many of the well-known risk factors belonging to the personal background and pretraumatic period characteristics also predicted PTSD in the present study. The present study revealed that the rate of PTSD was bivariately associated with both perceived severity of life threat and actual physical effects of trauma. We found higher rates of PTSD in persons who had higher levels of perceived life threat, who had been injured, or who had been trapped under rubble in the earthquake.

There is some evidence that certain features of the posttraumatic period have a significant influence on improving or worsening of PTSD symptoms. We found that the rate of PTSD was significantly lower in participants who declared that they had social support after the traumatic event.

RRL- 0191

Title Evaluation of the psychological consequences of environmental catastrophes : a feasibility study based on the 1992 floods in the Vaucluse (France)

Author(s) P. Verger, M. Rotily, E. Baruffol, N. Boulanger
Cahiers d'études et de recherches francophones /
Santé, 1999 Vol 9 ISN 5

Key theme(s) Flooding; psychological consequences; Vaucluse; France

Summary

Scientific studies of environmental disasters, whether human or natural in origin, have shown that the psychological impact of such events may be considerable and long-lasting. Several natural disasters have occurred in France, but their impact on public psychological health has not been assessed. In September 1992, there was a major flood in southeast France (Vaucluse), which caused 38 deaths.

This pilot study shows that a cross-sectional study of the long-term psychological consequences of an environmental disaster could be carried out several years after the event but that the feasibility of such a study depends ultimately on its acceptance by the public and the relevant authorities. It underlines the need to collect exposure data immediately after the

event and enabled us to identify and to adapt the tools required for this kind of evaluation. It should encourage public health decision-makers to support such evaluation and to improve the psychological and social support available to people exposed to floods.

Research Methodology

Four years after the flooding, the authors performed a pilot cross-sectional study to assess the feasibility of a larger epidemiological study to assess the psychological impact of this flood. Two affected towns were chosen for this study: Vaison-la-Romaine (VLR), where the flood was very sudden and 29 people were killed, and Bédarrides, where the water level rose more slowly. In Bédarrides, households were randomly selected from a list of victims ($n = 100$) and in Vaison-la-Romaine, households were randomly selected from the telephone directory ($n = 140$).

Exposure to the flood was assessed by a series of questions, the answers to which were used to calculate an exposure score. The questionnaire also included psychometric scales for post-traumatic stress disorder (QE-PTSD), anxiety (Spielberger State-Trait Anxiety Inventory) and depression (Beck Depression Inventory). In Bédarrides, the participation rate was high: 69% of the selected households were successfully contacted and found to be eligible for inclusion and 74% agreed to a face-to-face interview. In Vaison-la-Romaine, 51% of the selected households were contacted and eligible and 50% agreed to the face-to-face interview.

Finding(s)

The survey showed that exposure was multidimensional and that it was possible to calculate an exposure score suitable for the analysis of exposure-effect relationships. The PTSD scale was completed well by the interviewees, several of whom did not fill in the depression and anxiety scales correctly. However, analysis of the responses obtained showed that these tools had a high level of internal consistency. Cross-correlations between the various psychological scales used in this study were highly significant ($p < 10^{-4}$). There was some degree of association between some psychometric scales and exposure.

RRL- 0192

Title Assessment of exposure to a flood disaster in a mental-health study

Author(s) P. Verger, M. Rotily, C. Hunault, J. Brenot

Journal of Exposure Analysis and Environmental Epidemiology, 2003 Vol 13

Key theme(s) Natural disasters, exposure assessment, mental health, cumulated stress, risk perception, Conservation of Resources theory.

Abstract / Summary

The lasting psychological consequences of disasters are an important public health issue, especially for determining the support needed by victims. One important question in evaluating psychological consequences remains the assessment of individual disaster-related experiences or stressors. This article proposes two approaches towards the construction of cumulative exposure indicators (CEIs) for a disaster and discusses their relevance for other Disasters. In 1997, we carried out a cross-sectional study of the association between the severity of exposure to a 1992 flood in southeastern France and the prevalence of psychological symptoms 5 years later. We interviewed 500 randomly selected subjects residing in one of the most affected municipalities and constructed two CEIs: one based on relevant articles in the literature and the second based on the results of a principal component analysis (PCA) of all the items exploring exposure to the flood. We compared these CEIs with a map of flood damage and tested the association between these indicators and a score of post-traumatic stress symptoms. Most of the subjects (79.1%) had been exposed to at least one stressor besides physical presence. The two CEIs were significantly correlated with one another; comparisons with the map showed that both had good ability to discriminate between mild and severe exposure. Multiple regression analyses showed a significant exposure–effect relation, of the same level of magnitude and significance, between the posttraumatic stress disorder score and each CEI. Our results show the appropriateness of such indicators in assessing the effect of cumulative stress from natural disasters. Guidelines should be developed to improve the comparability of instruments and help standardize methods for evaluating cumulative stress from disasters insofar as possible. Further research is nonetheless necessary to assess the consistency and reproducibility of the data collected.

Research Objective

To propose two approaches to the evaluation of self-reported cumulative stress to a natural disaster (cumulative exposure indicator, CEI) and to the assessment of its psychological impact.

Research Methodology

The survey took place from 28 June through 16 July 1997 at Bédarrides (Provence, southeastern France), one of the municipalities most affected by the disaster. The households were randomly drawn from the 1997 telephone directory. A questionnaire was drafted in accordance with published. The 30-item section about disaster-related experiences or stressors was based on a review of articles published on natural disaster. The flood damage was mapped in 1992 by the Vaucluse Agricultural and Forest Department. Two zones were distinguished: one flooded, the other not. The 1997 place of residence of all the households in the data base was located in relation to the flood zone before the random selection and was considered an external exposure indicator.

CEIs Exposure to stressors was constructed by grouping together the 30 items exploring similar experiences or stressors. For each stressor type, an exposure score was calculated. A score of cumulative exposure to stressors (CEI1) was established by summing the scores for each stressor. A “simpler” indicator (CEI2) was constructed from a limited number of items.

Finding(s)

At the moment of the flood, 479 subjects (95.8%) were present in the village and 379 (79.1%) reported exposure to at least one stressor besides physical presence (Table 1). Of the 21 subjects away at the moment of the flood, nine (42.6%) were also affected by the flood. The most common stressor besides physical presence was property damage, which affected 327 subjects (65.4%). In all, 18 subjects (3.6%) reported the death of a close friend or relative. In all, 31 of the interviewees (6.2%) reported undergoing treatment for a medical problem related to the flood: these included traumas, fractures or wounds (seven cases), otorhinolaryngological, respiratory, or digestive disorders (17 cases), skin disorders (four cases) and cardiac problems (six cases) (multiple responses were possible). Only two people were hospitalized because of the flood. There was good consistency between the responses to the items “damage to home” and “monetary value of property damage”, recoded dichotomously ($k=0.70$). The agreement between the subjects’ reports of damage to their homes and the mapping carried out in 1992 was moderate ($k=0.55$). All stressor types, except “endangerment”, were significantly more frequent and more severe in the flooded areas.

The PTSD score was significantly higher in women, in the 35–54 and 54+ years age categories, in the category with the lowest incomes, in those with a psychiatric history than in the other respective categories. It was significantly associated with CEI1 and with CEI2.

RRL- 0193

Title Social Support and Depressive Symptoms Among Displaced Older Adults Following the 1999 Taiwan Earthquake

Author(s) Chie Watanabe, Junko Okumura, Tai-Yuan Chiu, Susumu Wakai

Journal of Traumatic Stress, 2004 Vol 17 ISN 1

Key theme(s) Older adults; displaced people; depression; natural disaster; Taiwan.

Summary

This longitudinal study examines changes in depressive symptoms among displaced older Taiwanese adults (*N* D 54, *M* D 68 years), and the impact of various social supports for them at between 6 and 12 months after an earthquake. The average depression score between 6 and 12 months following the earthquake was unchanged and kept high score. Child and extended family support levels related to depressive symptoms after 6 months. In contrast, after 12 months, significant factors associated with a lessening of the depressive symptoms were social support from the extended family and neighbors, and social participation. Intervention to promote increased social networks and social participation, within their new environment in a temporary community, is highly recommended for older adults.

Research Question(s)

What is the impact of varied sources of postdisaster social support on depression, longitudinally, among displaced old adults in an Oriental society?

Research Methodology

Ju-Shan town situated in Nan-Tou county (central Taiwan), was selected as the study site. The city was selected because it was severely damaged by the earthquake and the proportion of elderly population was relatively high compared with other areas. There was a 0.18% mortality rate attributed to the earthquake in this community (Department of Accounting and Statistics, 2000). For the following 2 months in Ju-Shan, 125 temporary houses were built for those who lost their homes following the earthquake. One year later, 312 displaced people were still living in them.

The participants were all individuals over 55 years old who had been evacuated and were living in temporary housing (displaced group). A comparison group of similarly-aged adults was randomly selected from the area adjacent to the temporary housing. Questionnaires were developed in Mandarin Chinese. Face-to-face interviews following a structured questionnaire were carried out in participants' homes. The interviews were done by one of the authors and one local interviewer who was trained a day prior to the survey. In April 2000, 6 months postearthquake; data were collected from 56 displaced older adults and 48 nondisplaced ones. The second phase of data collection was conducted during September and October, 12 months postearthquake.

Finding(s)

Depressive Symptoms and Social Support by Phase

In phase 1, the data confirmed that the displaced group had significantly higher depressive symptoms than the nondisplaced group ($M D 41.4, SD D 7.64$ vs. $M D 35.5; SD D 7.90$), $t(102) D 3.8, p < .001$. The mean depressive scores of the displaced group at phases 1 and 2 were not significantly different from each other, $t(53) < 1$. At phase 2, the mean score of social support by neighbours was significantly higher than at phase 1 ($Z D 4.25, p < .001$), although other levels of social supports did not change.

Relation Between Conditions Affected by the Earthquake and Depressive Symptoms

Of the resource loss variables, only personal loss was associated with a higher level of depressive symptoms and this was true only at phase 1, $t(52) D 2.22, p < .05$.

Relation Between Social Support and Depressive

Symptoms by Phase

Table 2 shows the correlations between the social support measures and depressive symptoms. At phase 1, correlations were adjusted for age and personal loss. Family supports, received from child living with participant, child living separately, and extended family were each negatively associated with depressive symptoms: the higher the level of family support, the lower the level of depressive symptoms. At phase 2, correlations were also adjusted for the phase 1 depressive score. Levels of social support received from extended family and neighbours and social participation were each negatively associated with the level of depressive symptoms. Contrary to the result at phase 1, support received from children was unrelated to the level of depressive symptoms.

RRL- 0194

Title	The psychosocial impact of Hurricane Katrina: Contextual differences in psychological symptoms, social support, and discrimination
Author(s)	Carl F. Weems, Sarah E. Watts, Monica A. Marsee, Leslie K. Taylor Behaviour Research and Therapy, 2007 Vol 45
Key theme(s)	Traumatic stress; Discrimination; Social support; Emotional symptoms
Summary	

This study tested a contextual model of disaster reaction by examining regional differences in the psychosocial impact of Hurricane Katrina. A total of 386 individuals participated in this study. All were recruited in the primary areas affected by Hurricane Katrina and included residents of metropolitan New Orleans (Orleans Parish, Louisiana), Greater New Orleans (i.e., Metairie, Kenner, Gretna), and the Mississippi Gulf Coast (i.e., cities along the coast from

Waveland to Ocean Springs, Mississippi). Participants were assessed for posttraumatic stress disorder (PTSD) symptoms, other psychological symptoms, perceptions of discrimination, perceptions of social support, evacuation distance, and the extent to which they experienced hurricane-related stressful events. Results were consistent with previous research on the impact of disasters on mental health symptoms. Findings extended research on individual differences in the response to trauma and indicated that regional context predicted unique variance in the experience of discrimination, social support, and emotional symptoms consistent with the theoretical model presented.

Research Question(s)

- a. In addition to exposure does regional context impact response and what besides PTSD and other psychological symptoms constitute a disaster Reaction?
- b. What other social systems are impacted (e.g., discrimination, social support) and how does context influence this?

Research Methodology

A total of 401 individuals aged 18–86 years (59% female, mean age 33 years) were surveyed for this study. Fifteen individuals either failed to report residence or reported residing in an area outside the three regions of interest and thus were not included in the final sample (N = 386). All participants were recruited in areas affected by Hurricane Katrina and the recruitment strategy aimed to include a representative sample from each of the communities (i.e., those with or without resources would have an equally likely chance to be recruited).

Measures:

- Survey of exposure to hurricanes and their aftermath
- Perceived discrimination
- Brief symptom inventory-18
- Posttraumatic stress disorder checklist
- Family support scale

Finding(s)

Does context predict psychological symptoms, discrimination, and social support?

A series of hierarchical regression 2 analyses were conducted to test whether context predicted psychological symptoms, discrimination, and social support. In the first model predicting PTSD symptoms, demographic variables [age, sex (coded 1 = female, 2 = male), minority status (coded 1 = majority, 2 = minority), income and time (i.e., data collection date)] were entered in the first step and produced a significant change in R² with sex (being female) associated with greater PTSD symptoms.

Proximity (evacuation distance) and total number of events experienced were entered in the second step and also produced a significant change in R² with the number of events predicting more PTSD symptoms. Geographic region was entered in the last step and also produced a significant change in R². Interpretation of the standardized betas indicated that residing in Mississippi was associated with a greater number of PTSD symptoms. In the second model predicting BSI symptoms, demographic variables and time were again entered in the first step and produced a significant change in R² (being female was associated with greater BSI symptoms). Proximity (evacuation distance) and total number of events experienced were

entered in the second step with events predicting more BSI symptoms. Geographic region was entered in the last step and also produced a significant change in R2. Interpretation of the standardized betas was somewhat ambiguous due to nonsignificant betas for the variables in this step but indicated that regional context predicted significant variance in BSI symptoms.

In the third model predicting perceptions of discrimination, demographic variables and time were again entered in the first step and produced a significant change in R2. In this model, age, female sex, minority status, and income were associated with greater perceptions of discrimination. Number of exposure events in the second step predicted greater discrimination and geographic region in the last step also produced a significant change in R2. Interpretation of the standardized betas indicated that residing in metropolitan New Orleans was associated with greater perceptions of discrimination.

In the final model predicting social support, demographic variables and time were entered in the first step and produced a significant change in R2. In this model, age, minority status, and income were associated with greater social support. Proximity (evacuation distance) and total number of exposure events were entered in the second step and did not produced a significant change in R2. Geographic region was entered in the last step and produced a significant change in R2. Interpretation of the standardized betas indicated that residing in Mississippi was associated with greater social support.

Epidemiological Issues of Disasters

RRL- 0195

Title of article Global Health Impacts of Floods: Epidemiologic Evidence

Author(s) Mike Ahern, R. Sari Kovats, Paul Wilkinson, Roger Few
Epidemiologic Reviews, 2005 Vol 27
Oxford Journals, Journals Customer Service Department
Oxford University Press, Great Clarendon Street Oxford

Key theme(s) Global Epidemiological Issues

Summary

Floods are the most common natural disaster in both developed and developing countries, and they are occasionally of devastating impact, as the floods in China in 1959 and Bangladesh in 1974 and the tsunami in Southeast Asia in December 2004 show (1). Their impacts on health vary between populations for reasons relating to population vulnerability and type of flood event (2–5). Under future climate change, altered patterns of precipitation and sea level rise are expected to increase the frequency and intensity of floods in many regions of the world (6).

In this paper, we review the epidemiologic evidence of flood-related health impacts.

Research Question(s)

- a. To summarize and critically appraise evidence of published studies, covering flood events in all regions of the world
- b. To identify knowledge gaps relevant to the reduction of public health impact

Research Methodology

We developed a search algorithm to identify the published literature concerning the health impacts of flood events. A search was made of the BIDS (Bath Information and Data Services, Bath, United Kingdom), CAB Abstracts (Commonwealth Agricultural Bureau International, Wallingford, Oxfordshire, United Kingdom), PsychInfo (American Psychological Association, Washington, DC), Embase (Elsevier B. V., Amsterdam, the Netherlands), and Medline/ PubMed (National Library of Medicine, Bethesda, Maryland) reference databases using combinations of terms for flooding and selected health outcomes as terms in the title, keywords, or abstract (figure 1). Terms from Medical Subject Headings (MeSH; National Library of Medicine) were used where relevant. We excluded papers that addressed only population displacement, economic losses, and disruption of food supplies. The search found 3,833 references, of which 212 were identified as epidemiologic studies from review of the abstract and/or title. The scientific quality of these papers was assessed on a case-by-case basis. In drawing inferences, we made no exclusions from these 212, but we gave greatest weight to studies based on epidemiologic designs with controlled comparisons. We report and reference the main findings in this review.

Floods are classifiable according to cause (high rainfall, tidal extremes, structural failure) and nature (e.g., regularity, speed of onset, velocity and depth of water, spatial and temporal scale), but in this review we discuss impacts according to health outcome. The influence of flood characteristics on health impacts is discussed where appropriate.

Finding(s)

Mortality

The most readily identified flood deaths are those that occur acutely from drowning or trauma, such as being hit by objects in fast-flowing waters. The number of such deaths is determined by the characteristics of the flood, including its speed of onset (flash floods are more hazardous than slow-onset ones), depth, and extent (3). Many drownings occur when vehicles are swept away by floodwaters (12, 14, 15, 17). Evidence relating to flash floods in high-income countries suggests that most deaths are due to drowning and, particularly in the United States, are vehicle related (9, 22). Information on risk factors for flood-related death remains limited, but men appear more at risk than women (22). Those drowning in their own homes are largely the elderly. Inconclusive evidence for diarrheal deaths has been reported from several studies of floods in low-income countries.

Injuries

Flood-related injuries may occur as individuals attempt to remove themselves, their family, or valued possessions from danger. There is also potential for injuries when people return to their

homes and businesses and begin the clean-up operation (e.g., from unstable buildings and electrical power cables). Typical reported injuries are sprains/strains, lacerations, “other injuries”, and abrasions/contusions (23). Surprisingly little information is available on the frequency of nonfatal flood injuries, as they are mostly not routinely reported or identified as flood related.

Fecal-oral disease

- 1) In flood conditions, there is potential for increased fecaloral transmission of disease, especially in areas where the population does not have access to clean water and sanitation.
- 2) In high-income countries, the risk of diarrheal illness appears to be low

Vector-borne disease

The relation between flooding and vector-borne disease is complex. Many important infections are transmitted by mosquitoes, which breed in, or close to, stagnant or slowmoving water (puddles, ponds). Floodwaters can wash away breeding sites and, hence, lower mosquito-borne transmission (41). On the other hand, the collection of stagnant water due to the blocking of drains, especially in urban settings, can also be associated with increases in transmission.

Rodent-borne disease

Diseases transmitted by rodents may also increase during heavy rainfall and flooding because of altered patterns of contact.

Mental health

The World Health Organization recognizes that the mental health consequences of floods “have not been fully addressed by those in the field of disaster preparedness or service delivery,” although it is generally accepted that natural disasters, such as earthquakes, floods, and hurricanes, “take a heavy toll on the mental health of the people involved, most of whom live in developing countries, where [the] capacity to take care of these problems is extremely limited” (78, p. 43). Here, the main evidence relates to common mental disorder, posttraumatic stress syndrome, and suicide.

Other health outcomes

In addition to the health outcomes detailed above, our review identified reports of other flood-related health impacts, including *Acanthamoeba* keratitis (104), epilepsy (105), leukemia, lymphoma, spontaneous abortion (106), melioidosis (107), effects of chemical contamination (108, 109), infection from soil helminths (110), and schistosomiasis (111–113). Most were isolated reports or provided only weak evidence of a possible flood link.

Conclusion

There is a surprisingly limited evidence base about the health effects of floods, particularly in

relation to morbidity.

The following knowledge gaps were identified:

- the mental health impacts of flooding, especially the longterm impacts, and their principal causes, which have been inadequately researched even in high-income settings;
- the nature and magnitude of mortality risks in the period after flooding; quantification of the risks of infectious and vector-borne diseases following floods;
- the effectiveness of warning systems and public health measures in reducing flood-related health burdens;
- the health-related costs of flooding that are often given littleweight in decisions about specific interventions; and
- quantification of the degree to which climate and landuse change will contribute to flood risk and associated health burdens in different settings.

RRL- 0196

Title Climatic Factors associated with Epidemic Dengue in Palembang, Indonesia: Implications of Short-term Meteorological Events on Virus Transmission

Author(s) Michael J Bangs, Ria P Larasati, Andrew L Corwin, Suharyono Wuryadi

The *Southeast Asian Journal of Tropical Medicine and Public Health*, 2006 Vol 37 ISN 6

Key theme(s) Global Epidemiological Issues

Summary

An extensive outbreak of dengue fever and dengue hemorrhagic fever occurred in the city of Palembang, South Sumatra, Indonesia from late 1997 through March/April 1998. All surveyed administrative areas (*kelurahan*) in Palembang were found to be 'permissive' for dengue virus transmission; and all areas that had *Aedes* (subgenus *Stegomyia*) larval mosquitoes in abundance experienced increased cases of DHF during the epidemic. The *Aedes* House Index (HI) for combined *Aedes aegypti* and *Aedes albopictus* was recorded every 3 months before, during, and after the epidemic. Ten surveyed sentinel sites (October-December 1997) immediately preceding the epidemic peak had a combined HI of 25% (range 10-50.8%). Entomological surveys during the peak epidemic period (January-April) showed a combined HI of 23.7% (range: 7.6-43.8%). Kelurahan with the highest numbers of reported dengue cases had an HI exceeding 25%; however, there was no discernable relationship between elevated HI and increased risk of DHF incidence. Despite the unusual climatic conditions during late 1997 created throughout the region by the El Niño Southern Oscillation (ENSO), the house indices during both wet and dry months remained above 23% for the 4 quarterly (3-month) periods surveyed in the second half of 1997 and first half of 1998. Rainfall returned to near normal monthly levels shortly before the reported increase in human cases. However, mean ambient

air temperatures continued above normal (+0.6 to 1.2°C) and were sustained over the months leading up to and during the epidemic. Evidence suggests that an ENSO-driven increase in ambient temperature had a marked influence on increased virus transmission by the vector population. We explore the apparent associations of entomological and climatic effects that precipitated the epidemic before the influx of reported human cases.

Research Question

What are the possible epidemiological influence of the temporary, yet dramatic, climatic events on dengue transmission in Palembang during late 1997 and early 1998?

Research Methodology

Aedes vector surveillance data were provided by the local Palembang Department of Health (DoH) from summarized periodic mosquito vector surveys, premise inspections and vector control activities (DoH 1997-1998, unpublished). Before and during the epidemic period, inspections in and immediately around homes for *Aedes* larvae were conducted approximately once every 3 months in 10 sentinel sites within designated *kelurahans* (administrative units), each representing between 5,000-6,000 houses. The 10 monitored sites represented approximately 10% of available *kelurahans* within the administrative authority of Palembang. Shortly after the dengue epidemic began, the number of sentinel areas was reduced to 5 *kelurahans*, with only 2 of the 10 original sites retained from the previous 1997-1998 quarterly survey cycles. Entomological information was restricted to the *Aedes* (*Stegomyia*) House Index (HI), a summarized measure of the percentage of inspected houses found infested with *Aedes* mosquito larvae, ie, *Aedes* (*Stegomyia*) *aegypti* (L.), *Aedes albopictus* (Skuse). Containers were only recorded for presence of *Aedes* larvae and were rarely sampled for species identification on the assumption that most infestations were *Ae. aegypti*. Other standard surveillance measures (Chan, 1985a), including the Container Index (percentage of sampled water-holding containers infested with *Aedes* larvae) and the Breteau Index (number of positive containers per 100 houses inspected) were not routinely recorded. Indoor resting and adult mosquito human-landing collections were not performed during these periods. Monthly weather data (based on maximum, minimum, and average daily temperatures, relative humidity, and precipitation) were compiled from government statistics for the months immediately before, during and after the dengue epidemic and compared to previous years' records (1984-1996 for temperature and 1952-1996 for rainfall).

Finding(s)

Quarterly *Aedes* mosquito surveillance and control activities between April 1997 and September 1998, found variable combined HI measures ranging from 58% (April-June 1997) to 12.9% (July-September 1998) (Fig 3). Generally, less than 50% of houses in any particular survey area were inspected during each quarter. An accurate comparison of house indices between all quarterly surveys was not possible as the number of *kelurahans* inspected differed between I-IV quarters, April 1997-May 1998 and I-II quarters, April-September 1998. Subsequently, the number of houses surveyed each quarter also varied from 19,071 to 9,535. Peak survey activities occurred during the height of the reported dengue case period (January-March 1998), resulting in a combined 10-locality HI of 23.7% (7.6- 43.8%). *Kelurahans* with the highest number of reported dengue cases had an HI > 25%. The October-December 1997

quarter immediately preceding the epidemic peak had a combined mean HI of 25% (10-50.8%). Vector control activities during the preceding inter-epidemic period in Palembang were limited to outdoor ground dispersed ultra- low-volume (ULV) insecticide spraying using malathion, or occasionally cyfluthrin, at approximately 6-month intervals. All school grounds were space sprayed once every 6 months and general communities were targeted for ULV applications several months (August-October) before periods of expected increases of dengue cases (October-April). As standard procedure, thermal fogging applications of insecticides occurred within a 200 m radius of all reported DHF index cases (Husni, 1998). Routine larval monitoring activities also included application of temephos (Abate® 1% treated sand granules) or methoprene (Altosid® insect growth regulator) to all larvapositive containers. Temephos was also distributed to households in dengue endemic areas by health department staff or community volunteers with instructions for owners to apply measured amounts to all water storage containers approximately every 3 months. In response to rising cases and public expectations, the frequency and area coverage by ULV and thermal fogging spraying activities increased approximately two-fold (>2 rounds/ month) during the epidemic, especially in those areas reporting high numbers of DHF cases. A distinct period of diminished rainfall was noted from June - November 1997, compared to mean monthly rainfall for the same periods from 1952 through 1996. Above average rainfall occurred in December 1997 through May 1998, compared to the same periods the previous years (Fig 3). The HI dropped from 58% in April-June 1997 to 23.7% in January-April 1998; however, there was no strong association between the HI and rainfall patterns, likely reflecting regular water storage practices in households or insensitive surveillance activities. Despite unusually prolonged drying effects caused by the 1997-1998 ENSO, the quarterly composite house index for wet and dry months remained above 23% for all 4 epidemic quarter periods. The average ambient temperatures were above normal (+0.6-0.9°C) for the pre-epidemic months of August to November 1997, and remained above normal (+0.7-1.2°C) from December 1997 to April 1998, compared to the previous 13 years of mean monthly temperatures (Fig 4).

RRL - 0197

Title

Prevalence, Characteristics, and Long-Term Sequelae of Natural Disaster Exposure in the General Population

Author(s)

John Briere, Diana Elliott

In *Journal of Traumatic stress*, 2000 Vol 13 ISN 4

Key theme(s)

Global Epidemiological Issues

Summary

A sample of 935 participants from the general population completed a mail-out questionnaire containing the Trauma Symptom Inventory (J. Briere, 1992) and the Traumatic Events Survey (D. M. Elliott, 1992). The lifetime self-reported prevalence of natural disasters in this sample was 22%. Although time from the last disaster to involvement in the study was an average of 13 years, previous disaster was associated with significantly higher scores on 6 of 10 symptom scales. Disaster characteristics (especially the presence of physical injury, fear of death, and property loss) were better predictors of symptomatology than was disaster type. Disaster exposure continued to predict symptomatology after controlling for interpersonal violence history, although interpersonal violence accounted for more overall symptom variance.

Research Question(s)

What is the Prevalence, Characteristics, and Long-Term Sequelae of Natural Disaster Exposure in the General Population of the USA?

Research Methodology

Participants: A national sampling service generated a random sample of 1,442 potential participants with deliverable addresses, stratified to accurately reflect geographical representation of registered owners of automobiles and individuals with listed telephones in the United States Surveys.

Instruments: The Traumatic Events Survey (TES; Elliott, 1992) evaluates a wide range of childhood and adult traumas. Of the 30 interpersonal and environmental traumas examined by the TES, 20 address adult events and 10 are devoted to childhood events. Adult traumas listed in the TES include natural disasters, sexual and physical assault, torture, war, auto accidents, and witnessing a murder. Specific natural disasters examined by the TES are earthquakes, fires, floods, hurricanes, and tornados, each of which is evaluated in terms of a variety of characteristics, including age at the time of the disaster, how upsetting it was perceived to be, and whether the respondent feared for his/her life, lost possessions, experienced serious injury, or witnessed serious injury or death in someone close to them.

The Trauma Symptom Inventory (TSI; Briere, 1995) is a 100-item test of posttraumatic stress and other psychological sequelae of traumatic events. It has 3 validity scales and 10 clinical scales, although only the clinical scale results are reported for this study. The latter are Anxious Arousal, depression, Anger-Irritability, Intrusive Experiences, Defensive Avoidance, Dissociation,

Sexual Concerns, Dysfunctional Sexual Behavior, Impaired Self Reference, and Tension Reduction Behavior.

Finding(s)

Prevalence, Characteristics, and Definitional Issues

In general agreement with Green and Solomon (1995), exposure to earthquakes, hurricanes, tornados, floods, or fires was reported by 22% of general population participants in the current study. The least common natural disaster was hurricanes (4%) and the most common was earthquakes (8%). The two most common geographic regions for these events were the South and the West, although no region was free of disaster. Well over half of those exposed to disaster reported fearing for their lives (64%) or having lost possessions (57%). If only those natural stressors that induced a significant amount of fear of death, actual injury, or property loss among exposed individuals were to be considered "disasters," the prevalence rates cited in this and other studies would decrease significantly. The majority of reported events in this study were associated with significant negative characteristics. If, as indicated ahead, exposure to such events is associated with subsequent psychological symptoms, the relatively high prevalence of disasters in the general population may represent a significant mental health risk factor.

Psychological Impacts

Although the mean period of time from last disaster exposure to involvement in the present study was 13 years, previous disaster was associated with current elevations on 6 of 10 TSI scores: Anxious Arousal, Depression, Intrusive Experiences, Defensive Avoidance, Dissociation, Impaired Self Reference. Interestingly, the type of disaster (e.g., hurricanes vs. floods) did not appear to determine symptomatology as much as did exposure to specific disaster characteristics—especially physical injury, fear of death, or property loss. In fact, participants who were exposed to all three of these disaster characteristics produced TSI scores that were at clinical levels ($T \geq 65$) for most scales, whereas those exposed to disasters where none or only one of these characteristics were present had TSI T-scores lower than or equivalent to the normative sample. Probably apropos of the importance of disaster characteristics in symptom outcome, multiple regression analyses indicated that when disaster type and characteristics were entered simultaneously, several disaster types (most notably earthquakes, but also tornadoes, hurricanes, and fires) were associated with negative beta weights despite their positive univariate relationship to symptoms. Such findings suggest that removing variance associated with severity characteristics such as fear, loss, and injury in the relationship between disaster and symptomatology produces statistical anomalies by virtue of the greater predictive power of the former relative to the latter. In the current context, it is likely that controlling for disaster severity characteristics in the disaster-symptom relationship is "partialing the relation out of itself" (Briere, 1988, p. 83; Gordon, 1968): a phenomenon known to result in suppressor relationships or uninterpretable beta weights (Briere & Elliott, 1993; Pedhazur, 1982). The fact that characteristics of a given potential disaster predict symptoms more than does specific disaster type may be a noteworthy finding. Although the presence or absence of these characteristics may be considered a gross indicator of disaster severity, *per se*, the findings of increased symptomatology for those experiencing traumas that include

physical injury or fear of death has been shown for other, nondisaster-related stressors (Foy, Resnick, Sippelle, & Carroll, 1987; Heltzer, Robins, & McEnvoy, 1987; Kilpatrick & Resnick, 1993; Ursano, Fullerton, & McCaughey, 1994). In this regard, it may be that a natural stressor is traumagenic primarily to the extent that it contains those characteristics generally known to produce lasting distress, as opposed to merely involving shaking earth, very high winds, flooding, etc. The present study also examined whether disaster-symptom relationships remained when controlling for other, nondisaster traumas-specifically, exposure to interpersonal violence. Findings suggest that symptoms of posttraumatic stress (Anxious Arousal, Intrusive Experiences, and Defensive Avoidance) remain even after other trauma exposure is taken into account. Further, this analysis indicated that although disaster exposure accounted for significant symptom variance, far more variance was accounted for by exposure to interpersonal violence.

Persistence Over Time

A relatively unexpected finding was the apparent persistence of disaster effects over time. Current symptom reports of participants exposed to more recent disasters were not significantly greater than those of participants whose exposure was considerably farther in the past. In fact, the only TSI scale found to lessen as a function of time since disaster was Intrusive Experiences. The present study found that this symptom persistence effect did not vary as a function of the severity of the disaster. This potential interaction was examined because events that might be considered merely environmental stressors (i.e. involving one or no severity characteristics described earlier) were not associated with significant symptomatology, and thus provided little symptom variance for meaningful reductions over time. In contrast, those events more obviously disaster-like (i.e., containing two or three severity characteristics) were associated with significant symptomatology and therefore were a better test of symptom persistence. Yet, high severity disaster symptoms were no more likely to abate with time than those associated with lower-level events. These results are in relative contradistinction to studies that find time-related decrements in disaster effects (Adams & Adams, 1984; Johnsen et al., 1997; Murphey, 1986; Shore et al., 1986). They are more in agreement with studies that report persistence of at least some, if not all, symptoms following disaster. Perhaps the best comparison to the present study is Grace, Green, Lindy, and Leonard's 14-year follow-up (Grace, Green, Lindy, & Leonard, 1993) of the Buffalo Creek Dam disaster. Grace et al. found that the prevalence of PTSD was 44% at the time of the dam collapse, and 28% 14 years later. These data support the notion that disaster effects can persist over the long-term, albeit at a somewhat reduced level. Because the current study used a continuous measure of symptomatology (the TSI), as opposed to PTSD diagnosis, the results of these two studies cannot be directly compared. It is likely, however, that the decrease in intrusive posttraumatic symptoms found in the present study would correspond to a somewhat decreased rate of PTSD for these participants over time.

RRL- 0198

Title Assessing disaster-attributed mortality: development and application of a definition and classification matrix

Author(s) DL Combs, LE Quenemoen, RG Parrish, JH Davis
International Journal of Epidemiology, 1999 Vol 28.

Key theme(s) Global Epidemiological Issues

Research Question(s)

How to classify the relationship between disasters and mortality?

Research Methodology

We present a method for ascertaining and classifying disaster- attributed mortality which includes a case definition, flow chart, and matrix. The matrix is used for coding, reporting, and evaluating information about manner, cause, and circumstance of disaster- attributed deaths and geographical location and time of the disaster. To illustrate its use, two readers determine and classify deaths attributed to Hurricane Andrew (1992, USA).

Finding(s)

RESULTS: Of 322 deaths investigated by the Dade County Medical Examiner's Office, our readers showed 97% (313/322) agreement on case status and 83% (35/42) agreement on case classification.

CONCLUSIONS: Our definition allows for a liberal interpretation of what constitutes disaster-related circumstances and the conditions or diseases that might arise from these circumstances. The inclusion of the flow chart and matrix provides a framework for consistent case classification and reporting. It also provides information about relationships between exposures and health effects, thereby identifying prevention policy needs.

RRL- 0199

Title Communicable Diseases in Complex Emergencies: Impact and Challenges

Author(s) Máire A Connolly, Michelle Gayer, Michael J Ryan, Peter Salama
The Lancet, 2004 Vol 364. Elsevier Inc. Journals Customer Service

Key theme(s) Global Epidemiological Issues

Abstract / Summary

Communicable diseases, alone or in combination with malnutrition, account for most deaths in complex emergencies. Factors promoting disease transmission interact synergistically leading to high incidence rates of diarrhoea, respiratory infection, malaria, and measles. This excess morbidity and mortality is avoidable as effective interventions are available. Adequate shelter, water, food, and sanitation linked to effective case management, immunisation, health education, and disease surveillance are crucial. However, delivery mechanisms are often compromised by loss of health staff, damage to infrastructure, insecurity, and poor co-ordination. Although progress has been made in the control of specific communicable diseases in camp settings, complex emergencies affecting large geographical areas or entire countries pose a greater challenge. Available interventions need to be implemented more systematically in complex emergencies with higher levels of coordination between governments, UN agencies, and non-governmental organisations. In addition, further research is needed to adapt and simplify interventions, and to explore novel diagnostics, vaccines, and therapies.

Research Question(s)

How to avoid excess morbidity and mortality in emergency situations?

Research Methodology

The authors undertook full searches of original research reports and reviews, using MEDLINE, PubMed, EMBASE, and WHO databases. Keywords were communicable disease, refugees, population displacement, epidemics, emergencies, immunisation, vector control, shelter, and specific diseases. The authors also used unpublished data from several WHO programmes and from their own expertise and experiences with communicable disease control in complex emergencies.

Finding(s)

Much of the high excess morbidity and mortality due to communicable diseases that occur in populations in complex emergencies is avoidable. Effective interventions are available but are often poorly implemented, especially in non-camp settings where large geographical areas or entire countries are affected. Available interventions need to be implemented in a more systematic and coordinated manner by governments, UN agencies, and nongovernmental agencies. Additionally, further research is needed to adapt and simplify interventions as well as exploring new ones.

RRL- 0200

Title Disaster Myths That Just Won't Die

Author(s) Donna Eberwine
Perspectives in Health, 2005 Vol 10 ISN 1.

Key theme(s) Global Epidemiological Issues

Abstract / Summary

"Dead bodies cause epidemics." "Any aid is better than none." When it comes to disasters, these and other popular misconceptions abound. Relief experts say these myths not only are misguided but also can lead to actions that add to the suffering of survivors.

Research Question(s)

Do popular misconceptions still prevail regarding the epidemiologic risk of dead bodies following natural disasters?

Research Methodology

Interview with scientists and literature review.

Finding(s)

The notion that dead bodies pose an urgent health threat in the aftermath of a disaster is one of several enduring myths about disasters and relief efforts that the Pan American Health Organization (PAHO) and the World Health Organization (WHO) have been trying to counter for nearly two decades. In 1986, PAHO produced a video titled "Myths and Realities of Natural Disasters" that debunked some of the most common misconceptions and explained how they exacerbate problems following a disaster. Yet 19 years later, many of these myths persist (see sidebar at the end of the page).

Oliver Morgan, an environmental epidemiologist at the London School of Hygiene and Tropical Medicine, reviewed the scientific evidence on the issue in a recent article in the Pan American Journal of Public Health (May 2004, p. 307).

The microorganisms that are involved in decomposition are not the kind that cause disease. And most viruses and bacteria that do cause disease cannot survive more than a few hours in a dead body. An apparent exception is the human immunodeficiency virus, HIV, which has been shown to live up to 16 days in a corpse under refrigeration.

Survivors have a strong psychological need to identify lost loved ones and to grieve for them in customary ways, says Jorge Rodríguez, a mental health specialist in PAHO's Panama office. "Societies all have funeral rituals that have developed over many generations to help people cope with death and loss. Denying survivors the right to carry out those rituals can add significantly to mental health problems that occur after a disaster."

RRL - 0201

Title Dead bodies do not pose health risk in natural disasters

Author(s) S. Gottlieb

British Medical Journal, 2004 Vol 328.

Key theme(s) Global Epidemiological Issues

Abstract / Summary

Short article in the BMJ: Fears about the dangers that dead bodies pose to the survivors of natural disasters are mistaken—and may be compounding health problems in Haiti and the Dominican Republic, the two Caribbean countries where recent flooding has caused hundreds of deaths.

Research Question

Are fears about the danger of dead bodies after natural disaster justified?

Finding(s)

Fears about the dangers that dead bodies pose to the survivors of natural disasters are mistaken—and may be compounding health problems in Haiti and the Dominican Republic (pictured above), the two Caribbean countries where recent flooding has caused hundreds of deaths. "People are reacting to the misguided fear that bodies will spread disease," says Dr Jean-Luc Poncelet, who directs the Emergency Preparedness and Disaster Relief programme of the Pan American Health Organization. "This misconception is very common, and the same reaction has occurred in many other countries around the world." His comments follow publication of a study that reviewed what dangers dead bodies pose to survivors of natural disasters. Using the PubMed online databases of the US National Library of Medicine, Dr Oliver Morgan of the public and environmental health research unit at London School of Hygiene and Tropical Medicine searched for relevant literature on the infection risks for public safety workers and funeral workers as well as for guidelines for the management of the dead and prevention of infection. A small but important literature was also reviewed regarding the disposal of the dead and the contamination of groundwater by cemeteries (*Revista Panamericana de Salud Publica* 2004;15:307).

RRL - 0202

Title Infectious diseases of severe weather-related and flood-related natural disasters

Author(s) Louise C. Ivers, Edward T. Ryan
Current Opinion in Infectious Diseases, 2006 Vol 19.

Key theme(s) Global Epidemiological Issues

Research Question(s)

- a. Which infections are associated with floods and the destruction of infrastructure?
- b. What are possible infectious disease consequences of disastrous natural phenomena and severe weather?

Summary of Finding(s)

Natural phenomena such as tsunamis after earthquakes can similarly result in flooding and destruction of critical infrastructure. Such events can increase the risk of soft tissue, respiratory, diarrheal, and vector-borne infectious diseases as a result of the direct inoculation of pathogenic organisms (tetanus, wound infections, aspiration pneumonia). Crowding in evacuation centers increases the risk of getting influenza, measles, meningitis, tuberculosis. On the one hand, the lack of potable water can lead to people drinking from unsafe water sources thereby increasing the likelihood of them getting sick with shigella and cholera. Malaria, dengue, arboviral encephalitis can also increase due to altered vector breeding grounds or zoonotic reservoirs. Such natural disasters can also have long-term and secondary effects, such as those caused by the disruption of vaccine, maternal-child health, and tuberculosis public health programmes.

The degree to which such epidemics occur, however, is associated with the regional endemicity of specific diseases, the nature and scope of the disaster, the level of public health infrastructure in place both before and after the event, and the level and efficacy of disaster response. In resource-rich countries with adequate public health infrastructure, posthurricane and postflood infectious disease surveillance has only occasionally detected relatively small increases in lifethreatening infectious diseases after natural disasters. In comparison, in resource-poor nations, larger outbreaks of infectious diseases, including cholera, typhoid, acute respiratory infections, and leptospirosis, after disasters are not infrequent.

The risk of infectious diseases after weather or flood-related natural disasters is often specific to the event itself, and is dependent on a number of factors including the endemicity of specific pathogens in the affected region before the disaster, the type of disaster itself, the impact of the disaster on water and sanitation systems, the availability of shelter, the congregating of displaced individuals, the functionality of the surviving public health infrastructure, the availability of healthcare services, and the rapidity, extent, and sustainability of the response after the disaster. Weather events and floods may also impact disease vectors and animal hosts in a complex system. The numbers of resultant human infections may thus be increased or decreased. Considering the effects of short-term changes in weather, long-term climatic changes would be predicted to have a substantial impact on the risk of infectious diseases among humans.

RRL - 0203

Title of article Mother Nature's Disasters and Their Health Effects: A Literature Review

Author(s) Joan Jones

Nursing Forum, Vol 41 ISN 2

Key theme(s) Global Epidemiological Issues

Abstract / Summary

Each year global warming and climate changes are affecting Mother Nature, causing extreme weather events to occur (Patz & Khaliq, 2002). The impact of these disasters uproots populations, causes massive infrastructure destruction, and sets the stage for an increase of population mortality and morbidity. Before, during, and after the disaster, nurses provide health care to those in need. Nurses should be aware of the anticipated diseases, traumas, and short- and long-term illnesses that occur following the different types of natural disasters. The purpose of this article is to review existing data and alert nurses to the potential threats they may face following a natural disaster.

Research Question

The purpose of this article is to review existing data and alert nurses to the potential threats they may face following a natural disaster

Research Methodology

Review of various studies in order to to recognize the effect of natural disasters on health and to improve outcomes in those affected, surveillance data from hospitals.

Finding(s)

Coping with earthquakes, floods, hurricanes, tornadoes, volcanic eruptions, and tsunamis has been a challenge on many levels, social, political, economic, and health. Volcanic ash can affect people and equipment hundreds of miles away from the cone of the volcano. Flooding is the most common type of disaster worldwide, accounting for an estimated 40% of all natural disasters.

Public educational programs on signs, symptoms, treatment, etc., for asthma and respiratory conditions are needed on a long-term basis to improve patient There is a need for effective triage in providing for the management of inpatient transfers. Staff and patients who are at high risk following the earthquake for posttraumatic stress disorder, depression, and suicide should be offered counselling. Long-term monitoring of the elderly, children, and chronic disease populations should continue following disasters.

A limitation of this study was due to the fact that not all hospitals provided surveillance data. The lack of data not being provided was attributed to severe damage suffered by some of the hospitals and their need to provide care and services.

RRL - 0204

Title Infectious disease risks from dead bodies following natural disasters

Author(s) Oliver Morgan

Revista Panamericana de Salud Publica/Pan American Journal of Public

Key theme(s) Global Epidemiological Issues

Abstract / Summary

Concern that dead bodies are infectious can be considered a “natural” reaction by persons wanting to protect themselves from disease. However, clear information about the risks is needed so that responsible local authorities ensure that the bodies of disaster victims are handled appropriately and with due respect. This paper provides a source of information for those who are in the unfortunate position of managing those bodies.

Research Question(s)

To review existing literature to assess the risks of infection from dead bodies after a natural disaster occurs, including who is most at risk, what precautions should be taken, and how to safely dispose of the bodies.

Research Methodology

Disease transmission requires the presence of an infectious agent, exposure to that agent, and a susceptible host. These elements were considered to characterize the infectious disease risk from dead bodies. Using the PubMed on-line databases of the National Library of Medicine of the United States of America, searching was done for relevant literature on the infection risks for public safety workers and funeral workers as well as for guidelines for the management of the dead and prevention of infection. A small but significant literature was also reviewed regarding the disposal of the dead and the contamination of groundwater by cemeteries.

Finding(s)

Victims of natural disasters usually die from trauma and are unlikely to have acute or “epidemic-causing” infections. This indicates that the risk that dead bodies pose for the public is extremely small. However, persons who are involved in close contact with the dead—such as military personnel, rescue workers, volunteers, and others—may be exposed to chronic infectious hazards, including hepatitis B virus, hepatitis C virus, HIV, enteric pathogens, and Mycobacterium tuberculosis. Suitable precautions for these persons include training, use of body bags and disposable gloves, good hygiene practice, and vaccination for hepatitis B and tuberculosis. Disposal of bodies should respect local custom and practice where possible. When there are large numbers of victims, burial is likely to be the most appropriate method of disposal. There is little evidence of microbiological contamination of groundwater from burial.

RRL- 0205

Title The influence of a disaster on the health of rescue workers: a longitudinal study

Author(s) M. Morren, A.J.E. Dirkzwager, F.J.M. Kessels, C. Joris Yzermans

Published in *Canadian Medical Association Journal*, 2007 Vol 176 ISN 9

Key theme(s) Global Epidemiological Issues

Abstract / Summary

Rescue workers strive, after disasters, to help victims and restrict damage, often in dangerous circumstances. The authors examined the effect of a disaster on the physical and psychological health of rescue workers (firefighters, police officers and medical emergency services personnel) who provided assistance after the explosion of a fireworks depot in the Netherlands in May 2000.

The authors found out that many health problems arise immediately after a disaster and may persist for years. Health care workers should realize, however, that some disaster-related effects may not emerge until a year or more after the event.

Research Question(s)

To examine the effect of a disaster on the physical and psychological health of rescue workers who provided assistance after the explosion of a fireworks depot in the Netherlands in May 2000.

Research Methodology

A 4-year longitudinal study of 1403 rescue workers employed in or near the affected neighbourhood (the study group) and a control group of 1650 uninvolved rescue workers (from another city of similar size and urbanization). Health outcomes were measured as prevalence, incidence (both measured as the percent of workers who took sick leave), frequency of the absences and number of sick days (both per 100 workers), and duration (mean length of sickness absences, in days).

Finding(s)

Sick leave among the study workers increased substantially during the 18 months after the explosion. In comparison with controls, immediate increases occurred in musculoskeletal, psychological, respiratory and nonspecific ill health (e.g., malaise, fatigue) during the first year postdisaster. Rates of sick leave for musculoskeletal and respiratory reasons remained elevated until 3 years after the disaster, whereas leave for psychological problems and other ill health had returned to predisaster levels by then. Neurological problems increased after a 1-year delay. No significant increase in gastrointestinal problems was observed among the study workers, in comparison with controls.

RRL- 0206

Title Occurrence and overlap of natural disasters, complex emergencies and epidemics during the past decade (1995–2004)

Author(s) Paul B Spiegel, Phuoc Le, Mija-Tesse Ververs, Peter Salama

Conflict and Health, Vol 1 ISN 2.

Key theme(s) Global Epidemiological Issues

Abstract

Background: The fields of expertise of natural disasters and complex emergencies (CEs) are quite distinct, with different tools for mitigation and response as well as different types of competent organizations and qualified professionals who respond. However, natural disasters and CEs can occur concurrently in the same geographic location, and epidemics can occur during or following either event. The occurrence and overlap of these three types of events have not been well studied.

Methods: All natural disasters, CEs and epidemics occurring within the past decade (1995–2004) that met the inclusion criteria were included. The largest 30 events in each category were based on the total number of deaths recorded. The main databases used were the Emergency Events Database for natural disasters, the Uppsala Conflict Database Program for CEs and the World Health Organization outbreaks archive for epidemics.

Analysis: During the past decade, 63% of the largest CEs had ≥ 1 epidemic compared with 23% of the largest natural disasters. Twenty-seven percent of the largest natural disasters occurred in areas with ≥ 1 ongoing CE while 87% of the largest CEs had ≥ 1 natural disaster.

Conclusion: Epidemics commonly occur during CEs. The data presented in this article do not support the often-repeated assertion that epidemics, especially large-scale epidemics, commonly occur following large-scale natural disasters. This observation has important policy and programmatic implications when preparing and responding to epidemics. There is an important and previously unrecognized overlap between natural disasters and CEs. Training and tools are needed to help bridge the gap between the different type of organizations and professionals who respond to natural disasters and CEs to ensure an integrated and coordinated response.

Morbidity and Mortality of Floods

RRL- 0207

Title Analysis of Human Rotavirus Strains Prevailing in Bangladesh in Relation to Nationwide Floods Brought by the 1988 Monsoon

Author(s) M. U. Ahmed, S. Urasawa, K. Taniguchi, T. Urasawa,
Journal of Clinical Microbiology, N1991 Vol 20 ISN 10.

Key theme(s) Morbidity, Mortality and Floods, Rotavirus – floods - Bangladesh

Abstract / Summary

The virologic character of human rotavirus strains prevailing in Bangladesh was investigated in relation to the devastating nationwide floods brought by the 1988 monsoon. Human rotaviruses contained in stool specimens that were collected from inpatients with infantile and adult diarrhea in two hospitals in Mymensingh over a 13-month period (January 1988 to January 1989) and in one hospital in Dhaka over a 3-month period (February to April 1988) were examined for their subgroup, VP7 serotype, and RNA electropherotype. In concurrence with the spread of the flood (from the middle of August 1988), the number of infantile and adult diarrhea patients increased greatly. At the same time, the proportion of rotavirus-positive specimens in all diarrhea cases also increased remarkably, reaching 54 and 45% in September and October, respectively. The results suggest that sudden environmental change caused by the devastating floods seriously affected the epidemiology of rotavirus infections by increasing the opportunity of transmission of the virus and by reducing the resistance of the host to infection. In both pediatric and adult patient groups, serotypes 1 and 2 were the most frequent ones detected, followed by serotype 4. Serotype 3 was detected in a single specimen of the 99 specimens whose serotypes were determined.

Research Question(s)

Virologic character of human rotavirus strains prevailing in Bangladesh in relation to the devastating nationwide floods

Research Methodology

Virus specimens. Stool specimens were obtained in three hospitals in Bangladesh (1). Specimens of pediatric and adult patients with diarrhea were collected from the Mymensingh Medical College (MMC) and SK hospitals, respectively, in Mymensingh between January 1988 and January 1989. Specimens from pediatric patients were also obtained from the Dhaka Medical College (DMC) hospital in Dhaka between January and June 1988.

Stool suspensions of about 10% were prepared in phosphate-buffered saline, clarified, and transported to the Department of Hygiene and Epidemiology, Sapporo Medical College, Sapporo, Japan. All specimens were screened for the presence of group A rotavirus by an ELISA with the monoclonal antibodies YO-156 (reacting with the group A common antigenic epitope

in the inner capsid protein VP6) and YO-2C2 (reacting with the crossreactive neutralization epitope in the outer capsid protein VP4) (35). Specimens that reacted with either of the two antibodies were designated as containing group A rotavirus. Subgrouping and serotyping were carried out by using an ELISA with subgroup I- and II specific monoclonal antibodies (S2-37 and YO-5, respectively) directed at VP6 and serotype 1-, 2-, 3-, and 4-specific monoclonal antibodies (KU-4, S2-2G10, YO-1E2, and ST- 2G7, respectively) directed at the major outer capsid glycoprotein VP7. The color reaction of peroxidase with its substrate (o-phenylenediamine dihydrochloride) was measured as A492. The criteria for determining serotype were as follows: a virus was assigned to a specific serotype when the optical density value for the reaction with the monoclonal antibody corresponding to that serotype exceeded 0.2 per well and in addition, when the optical density value for the reaction corresponding to that serotype was greater than twice the value corresponding to any other serotype.

Polyacrylamide gel electrophoresis. Electropherotyping of viral RNA was carried out in 10% polyacrylamide slab gels, and silver staining was performed.

Virus isolation and serotype determination of isolates. Virus isolation from selected stool specimens was carried out by using primary green monkey kidney cell cultures. Virus was passaged at least four times in cell culture for isolation. The serotypes of the isolates were determined by a fluorescence focus reduction neutralization test with hyperimmune serum as well as by the ELISA.

Meteorological data. The weather records for Mymensingh for the year 1988 were obtained from the Department of Irrigation and Water Management, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Finding(s)

In concurrence with the spread of the flood (from the middle of August 1988), the number of infantile and adult diarrhea patients increased greatly. At the same time, the proportion of rotavirus-positive specimens in all diarrhea cases also increased remarkably, reaching 54 and 45% in September and October, respectively. An electrophoretic analysis of viral RNA revealed 17 distinct patterns of viral RNA (14 long and 3 short electropherotypes) and a considerable number of mixed electropherotypes, suggesting the simultaneous infection of some patients with more than two rotavirus strains. It was noteworthy that electropherotypes of rotavirus strains prevailing in the community changed considerably after the spreading of the flood and that the frequency of virus specimens showing mixed electropherotypes increased significantly during the flood period. These results suggest that sudden environmental change caused by the devastating floods seriously affected the epidemiology of rotavirus infections by increasing the opportunity of transmission of the virus and by reducing the resistance of the host to infection. In both pediatric and adult patient groups, serotypes 1 and 2 were the most frequent ones detected, followed by serotype 4. Serotype 3 was detected in a single specimen of the 99 specimens whose serotypes were determined.

RRL- 0208

Title The place behind the case: leptospirosis risks and associated environmental conditions in a flood-related outbreak in Rio de Janeiro

Author(s) Christovam Barcellos, Paulo Chagastelles Sabroza

Cadernos de Saúde Pública, 2001 ISN 17

Key themes Morbidity, Mortality and Floods, Leptospirosis; Spatial Analysis; Geographical Information Systems; Disease Outbreaks; Sanitation

Summary

The environmental context in which a leptospirosis outbreak took place during the summer of 1996 in the Rio de Janeiro Western Region was examined by using spatial analysis of leptospirosis cases merged with socio-demographic data using Geographic Information System (GIS).

Risk areas were mapped based on flood and solid waste accumulation information for the region. Incidence rates were calculated for each area by the division of number of cases per total population in the specific areas. Higher rates were observed for census tracts inside the flood risk area and in the vicinities of waste accumulation sites. These findings are in agreement with the expected risk of leptospirosis, evidencing the role of environmental and collective factors in the determination of the disease.

Research Methodology

Geographic Information System (GIS) was used to gather and analyze socio-environmental and epidemiological data, constituting specific information layers in the system. Leptospirosis cases were diagnosed clinically, reported, and investigated by the local health authority.

A sample of some 30% of suspected cases was submitted to serologic microscopic agglutination test. The prevailing serovar of cases occurring after the flood was *Leptospira interrogans*, although a gamut of other serovar may be found under other conditions, mainly during non-epidemic periods. A total of 87 leptospirosis cases were located in the western region between the 8th and 14th epidemiological weeks of 1996. This period corresponds to 10 to 54 days after the heavy rainfall starting on February 13. Coordinates for reported case residences were obtained by interpolation of street segments. This procedure allowed for the location of 73 residences. Flood risk areas constitute a second information layer, obtained by digitizing polygons in which low terrain slope and rain water convergence increase flood occurrence probability. These spatial data were disposed on and merged to the basis of the 276 census tract (CT) polygons. Census data for 1991 and 1996 were obtained from the Brazilian Census Bureau (IBGE, 2000) and associated with CT polygons using a common code. Solid waste accumulation is an important factor for urban rodent feeding and sheltering strategies. Due to the absence of reliable data on rodent distribution in the city, waste accumulation was used as an indicator of probable rat presence in the region. These data were gathered by the overlay of different layers containing relevant information for this study: CT, represented by polygons associated with socio-demographic data; flood areas, represented by polygons; and points representing leptospirosis case residences. Sectors presenting a waste accumulation rate greater than 10 ton.km².year⁻¹ or inside flooded areas were considered risk

areas for leptospirosis. Population and cases contained in each of these risk areas were calculated using layer overlay techniques, as a GIS function (Vine et al., 1997). Incidence rates, as number of cases per 100,000 inhabitants, were calculated based on these estimates.

Finding(s)

A combination solid waste accumulation and flood conditions is the most appropriate theoretical explanation for leptospirosis. Observed incidence rates decrease with the distance from waste accumulation sites. The lowest incidence rate is observed for census tracts outside flood risk areas and far from waste accumulation sites.

RRL- 0209

Title Bristol Floods 1968. Controlled Survey of Effects on Health of Local Community Disaster
Author(s) G. Bennet
British Medical Journal, 1970 Vol 3

Key theme(s) Morbidity, Mortality and Floods, Health effects, flooding, Bristol

Summary

An investigation into the health of people in Bristol flooded in July 1968 was made by means of a controlled survey and a study of mortality rates. There was a 50% increase in the number of deaths among those whose homes had been flooded, with a conspicuous rise in deaths from cancer. Surgery attendances rose by 53%, referrals to hospital and hospital admissions more than doubled. In all respects the men appeared less well able to cope with the experience of disaster than the women.

Research Question(s)

- a. What happens to these people after the excitement of the rescue period has passed?
- b. Are there any long-term effects, effects which perhaps could not have been predicted early on after the disaster?
- c. In particular, might they enjoy less good health than those who had not been flooded?

Research Methodology

A comparison was made between people who had been flooded and people who had not with regard to surgery attendances, hospital referrals, and admissions. A road of council houses was selected in which 88 had been flooded and 88 had not, plus a block of 44 houses in a neighbouring road as additional controls. Information was obtained from all households in the designated area. Each household was visited by me as soon as possible after the floods (77% of the flooded were seen within six days of the flooding, and 92% within two weeks) and again one year later. Where possible each member was interviewed personally (though not always in private), but failing that a parent, spouse, or other responsible family member gave the information.

It was possible to examine the general practitioners' records for 58% (66% flooded, 52% not flooded) of the population.

Hospital referrals were estimated by counting the number of patients who had letters from hospital outpatient clinics (but not local authority or other clinics). Similarly, hospital admissions were estimated by the number of patients with discharge summaries in the envelope.

Finding(s)

(1) G.P. Records.

(a) Surgery Attendances

The attendances of the people flooded increased overall by 53% (males 81%, females 25%), though the total number of individuals attending did not change substantially. There were fewer not attending at all or attending only once or twice (2104. fall: males 31%, females 7%); the increase was in those attending three or more times (42% rise: males 76%, females 11%) (Table II). The 1 to 4-year-olds and those aged 55 and over had attendance rates higher than average, but there were no differences associated with social class. The non-flooded showed no such rise in attendances; indeed they showed a slight fall, and the men's attendances fell more than the women's. XI tests on the attendance pattern showed a highly significant increase in the attendances of the flooded men as compared with men who had not been flooded ($P < 0.001$). Within the flooded group there was a significant rise in male attendances after as compared with before the floods ($P < 0.01$). In both instances the women's attendances increased, but not to a significant level. There was no significant shift in any of the non-flooded groups.

Depth of Flooding.-The deeper the water in the house the greater presumably the damage and personal distress, and with 4 ft. (122 cm.) or more virtually everything in a room would be saturated. There were 149 people who had floods of 4 ft. or more. Before the flooding there was no significant difference between them and those who subsequently had less than 4 ft. of flooding, but there was a significant shift in the attendance pattern-0-2 to 3 or more for men with 4 ft. or over of floodwater in the year after. Women in that subgroup and those with less than 4 ft. showed the same shift, but not to a significant extent.

Temporary Rehousing.-Of the 209 flooded, 138 did not move from their homes at any time after the flooding. There was no significant difference in attendance patterns for the preceding year between those who had temporarily to be evacuated from their homes and those who did not, but the men who were not rehoused showed a significant shift in their attendance pattern from 0-2 to 3 or more. All the rehoused subgroup and the nonrehoused women showed the same shift in the year after, but none to a significant degree. For comparison, attendances at the local authority William Budd Health Centre were unchanged over the same two-year period. The population attending there was similar; they lived adjacent to the flooded areas but had not been flooded.

Also the National Health Insurance sickness returns for the whole of Bristol showed no change over the same period. In the four months after the flooding, however, there was a 15% rise for

Bedminster (the district worst affected and including the survey area) as compared with the same period in the previous year, but for the rest of Bristol the rise was only 2-5%. There was scattered flooding elsewhere in the city.

(b) Hospital Referrals and Admissions

The hospital referrals from the flooded people more than doubled in the year after the floods ($P < 0.01$), and they were accounted for mostly by the men (Table III). Hospital admissions showed the same trend. The number of pre-flood admissions from the flooded group was unexpectedly small, but if the admission rate for the non-flooded groups was applied to the flooded, giving a hypothetical value of 10, the rise was still significant at the 0.05 level. The actual rise was highly significant for both sexes (Table IV). The reasons for admission read almost as though they were a random selection: arterial insufficiency, maternity (three women), injury from an explosion, T's and A's, surgery for duodenal ulcer, deflected septum, nephritis and purpura, aural polyp, fractured neck of femur, gastric polyposis, reamputation of finger, and glandular fever; but nothing suggests any direct physical consequence of flooding.

(2) Self-reporting

The results are set out in detail in Table V, but the statistically significant changes concerned the advent of new symptoms. These were recorded as "psychiatric" for complaints "physical" for the rest, including such conditions as dyspepsia and migraine. Among the flooded men 33.0% reported new physical symptoms compared with 16% of non-flooded men. Among the flooded women 18.0% reported psychiatric symptoms (including psychiatric symptoms which might have been present before the floods), but only 6% of the non-flooded women did so.

Mortality Rates There were 58 deaths during the 12 months before 10 July 1968 from the homes subsequently flooded on that date. Over the next 12 months the number of deaths from the same addresses was 87, a rise of 50%. There was no appreciable change in the deaths for the rest of Bristol (in fact, a fall of 1%), so the increase is significant at the 0.02 level. The most pronounced rise was in the age group 45 to 64, where male deaths rose from 7 to 20 and female deaths from 5 to 9, and these occurred mainly in the third three month period (January to April) after the flooding. Otherwise the increases were predominantly among those over 65, especially women over 75 (a rise from 9 to 19). The causes of death were those entered on the death certificate, and it is not known which were confirmed at necropsy. Causes relating to heart diseases or cerebrovascular accidents may at times be unreliable, but when a specific malignant disease has been recorded it may be assumed to be reasonably accurate, though there will be several deaths from malignant disease the diagnosis of which is never discovered. In the year before the flooding there were nine deaths from malignant disease (International Classification of Disease 140-209); in the year after the number rose to 21. For the rest of Bristol (not flooded) the deaths from malignant disease over the same periods were 1,010 and 1,068 respectively. With a χ^2 of 3.50, D.F.=1, this just fails to reach a level of significance.

RRL- 0210

Title The 1998 floods in Bangladesh: Disaster Impacts, household coping strategies, and response

Author(s) Caro del Ninno, Paula A. Dorosh, Lisa C. Smith, Dilip K. Roy

Research Report IFPRI, 2001 Vol 122

Key theme(s) Morbidity, Mortality and Floods, Floods, Disaster Impacts, Household Coping Strategies, Disaster Response

Abstract / Summary

In 1998, “the flood of the century” covered more than two-thirds of Bangladesh, causing crop losses of 2.2 million tons of rice, an amount equal to 10.45 percent of target production in 1998/99. Even though this flood threatened the health and lives of millions through food shortages resulting from crop failure, loss of purchasing power, and the spread of water-borne disease, very few flood-related deaths occurred, and reportedly none was due to food shortages. This report, based on data from a survey of 757 rural households in seven floodaffected regions (*thanas*) conducted in November and December 1998 and on analysis of secondary data on food grain markets, describes how government policy, well-functioning private markets, household coping strategies, and donor and NGO interventions combined to maintain availability and access to food.

Research Question(s)

- a. Which impacts did the flood have on the food grain market and how was the policy response?
- b. Which impact did the flood have on rural households?
- c. How did households and government cope with the situation?

Research Methodology

This report is based on data from a survey of 757 rural households in seven flood affected regions (*thanas*). The survey was conducted in November and December 1998 and on analysis of secondary data on food grain markets, describes how government policy, well-functioning private markets, household coping strategies, and donor and NGO interventions combined to maintain availability and access to food.

Finding(s)

1) In the months immediately after the flood, government distribution of food grains was constrained by available public stocks. Despite the very small increase in government distribution during this period, 1.307 million tons of rice imported from India by the private sector stabilized the market and kept prices from rising above import parity levels, Government stocks of rice and wheat, which equaled 659,000 MTs at the beginning of September 1998, may also have helped stabilize markets by influencing private traders’ expectations of the government’s ability to intervene in local rice markets.

2) Analysis of IFPRI survey data indicates that flood-exposed households suffered severe crop

losses equal to 24 percent of the total value of anticipated production for the year. For the 55 percent of households that lost assets, their average loss was equivalent to 16 percent of the total value of their pre-flood assets. Employment opportunities for daily laborers declined as well, and their average monthly earnings in July/October 1998 were 46 percent below those in the same months in 1997. The decline in crop production, asset losses, and fewer employment opportunities contributed to increased food insecurity. The quality of households' health environments also deteriorated in the flood's wake, damaging or destroying peoples' homes and sanitary facilities, and reducing their access to safe water. These factors plus the reduced food consumption led to substantial increases in illness. Even after the floodwaters had receded, 9.6 percent of individuals in the sample suffered from diarrhea, and 4.7 percent were affected by respiratory illnesses. Severe or very severe flood exposure caused many children to lose weight and/or to fail to grow at a critical period in their mental and physical development. Over half of the children in the sample were stunted and 24 percent were wasted.

3) Households adjusted to the shock of the flood by reducing expenditures, selling assets, and borrowing. By far, borrowing was the major coping mechanism of households sampled, both in terms of the value of the resources and the number of households that borrowed.

4) The survey suggests that government direct transfers were well targeted to flood-exposed households and to the poor. Vulnerable Group Feeding transfers, targeted administratively through unionlevel committees, were better targeted to the poor than to the flood-exposed households. Nonetheless, government transfers were small relative to the households' needs, as indicated by the extent of household borrowing, which equaled six to eight times the monetary value of government transfers to poor flood-exposed households.

5) In spite of severe disruption to food production and the rural economy, the government of Bangladesh, together with donors, NGOs, and flood-exposed households themselves were extremely successful in mitigating the effects of the 1998 flood at the household level and in avoiding a major food crisis.

6) Nonetheless, continued investments in agricultural research, extension, roads, electricity, and other rural infrastructure; policies promoting efficient markets; and programs to provide targeted transfers and credit to poor households are needed to further enhance the food security of the poor.

RRL- 0211

Title Flash flood disaster – Nimes, France, 1988

Author(s) P. Duclos, O. Vidonne, P. Beuf, P. Perray

European Journal of Epidemiology, 1991 Vol 7 ISN 4

Key theme(s) Morbidity, Mortality and Floods, Flood - France - Disaster - Epidemiology - Health effects - Planning

Summary

On October 3, 1988, at 7:45 a.m. a flash flood occurred in the region of Nimes, France. Though the homes of 45,000 people were damaged and more than 1,100 vehicles were destroyed, only 3 severe injuries and 9 deaths were reported. A community survey was conducted to study (1) what factors might have contributed to the limited number of deaths, (2) the reactions of the population to the disaster, and (3) the health effects associated with the impact and postimpact phases of the disaster. Overall, 108 questionnaires were completed from a systematic sample of 187 households living in ground-level dwellings in two of the most seriously affected areas of the city. Only 17% of all interviewees knew that they lived in an area subject to flood. When they realized they were in danger, 93% of all persons were in their houses or other buildings, 4% were in the streets, and 3% were in cars. Fifty-six percent of the interviewees tried to get to safety. Thirty percent of the interviewees reported that they were rescued; 20% of these persons reported being saved from a direct life threat.

Neighbors (40%), family members (200/0), firefighters (12%), the Red Cross (10%), and military personnel (8%) conducted rescue operations. Six percent of all members of interviewed households were reportedly suffering mild injuries that, in 70% of these cases, had been sustained during the impact phase. Health problems and injuries during the postimpact phase may have been limited by the response of trained military personnel and by the distribution of boots and gloves to other responders. The limited death toll might be attributed to: (1) the disaster occurred early in the morning when people were still home (2) traffic heading into the city was stopped by flood water on some access roads, (3) the rescue operations were set up within the framework of the French disaster plan, and (4) the civilian response. No outbreaks of infectious disease were detected after the disaster.

Research Question(s)

- a. What factors might have contributed to the limited number of deaths?
- b. What were the reactions of the population to the disaster?
- c. What were the health effects associated with the impact and postimpact phases of the disaster?

Research Methodology

1. Assessment of the health impact of the disaster

To obtain a complete picture of the health effects of the flood, contacts were made with the Service d'Aide Médicale Urgente (SAMU), the hospitals, the Red Cross, the army medical services, the firefighters' medical services, the physician of the electricity and gas company, the

civil defense medical team, the "médecin de santé scolaire" and twenty general practitioners in Nîmes. Death certificates computerized at the Direction Régionale des Affaires Sanitaires et Sociales (DRASS) were reviewed for the city of Nîmes and for all 10 affected counties.

2. Surveillance of infectious diseases

The DRASS established a specific surveillance system for diarrheal diseases, typhoid fever, leptospirosis, and hepatitis A based on a systematic sample of 20 general practitioners (130/0) and 4 medical laboratories (20%) in Nîmes. In addition, four other general practitioners from other affected cities were enrolled in the surveillance. Two other general practitioners from non-affected cities nearby were also enrolled to serve as a control group.

3. Community survey

Because of limited resources, focus was placed on two areas of Nîmes particularly affected by the flood. A questionnaire was field-tested, revised, and administered to a systematic sample of families whose dwellings were located at least partly on the ground level

Finding(s)

1. Assessment of the health effect of the flood

The health effect of the disaster during the impact phase amounted to 9 deaths by drowning (including two persons who tried to rescue others) and only three severe injuries (one with arm and face burns, one with a leg fracture, and one with broken arms). The SAMU files also listed two hypothermia cases, three instances of near drowning, and approximately ten minor injuries. Death certificates did not reveal any increased mortality from the flood other than those above mentioned deaths which were coded as natural disaster related. Among rescue and cleanup workers, twelve cases of carbon monoxide poisoning were reported involving firefighters, civilians, and members of the military who were pumping water and effluents from basements. Three instances of exposure to chlorinated derivatives were also reported and a few sprains were treated by the civil defense infirmary.

Although we were not able to quantify this finding, interviewed physicians reported an increase in visits for mental problems among Nîmes residents with or without preexisting conditions. They did not report any increases in other conditions

2. Surveillance of infectious diseases

No specific increase was observed in infectious outbreaks. In October 1988, after the flood, only two cases of typhoid fever were confirmed by culture of *Salmonella typhi*. Because both victims had drunk water that bacteriologic analysis revealed unsuitable for consumption, these cases, in the absence of other clearly identified sources, were thought to be related to water. One of the victims was a Nîmes resident and the second lived in another flooded city. No relationship could be established between the two cases. There is normally an average of 5 typhoid cases a year in the Gard region.

3. Community survey

Though many results are presented for all members of interviewed households, some

information concerns only the household representative-interviewees. More detailed results, therefore; are presented for the interviewees. From a sample of 181 households, 108 (58°/0) questionnaires were completed (54 in the Richelieu area, and 54 in the Route d'Ales area). The 108 participating families included 228 persons. Demographic characteristics of interviewed households are presented in Table 1. Two percent of all dwelling units were completely destroyed. The level reached by the water on the first floor of dwelling units was over one meter in 38% of cases. Six percent of all persons reported mild injuries (contusions, cuts, and sprains) related to the flood. Sixty-one percent of the interviewees went to another location; 92% of these to seek safety, 8% to see family, 5% to seek people, and 4% to return to their houses. To evacuate their homes, 37% of interviewees needed some assistance. Among those interviewees who did not try to move to another location, 58% thought it was not necessary, 45°/0 felt safe, 25°/0 had no way to escape, 3% reached a dead end, 30/0 were handicapped, 10% stayed to protect their property, and 8% were in a stalled vehicle.

RRL- 0212

Title An attempt to quantify the health impacts of flooding in the UK using an urban case study

Author(s) L. Fewtrell, D. Kay
Public Health, 2008 Vol 122

Key theme(s) Morbidity, Mortality and Floods, Disability-adjusted life years; Death; Flooding; Injury; Infection; Mental health

Research Question(s)

To quantify the health effects of flooding in the UK to allow comparison between different flooding events.

Research Methodology

The literature review on flooding and health was conducted by searching a number of web-based databases (including Pubmed) and websites (including those of the Environment Agency (EA) and the Department of the Environment; Food and rural affairs (DEFRA)) for keywords; Including 'flood' and 'health'; 'drowning' and 'flood'; 'injury' and 'flood' etc. Bibliographies of identified papers were searched for additional relevant references. Two case study locations (Utleigh and Devonshire Park) in Keighley have been used. The areas were initially defined by Tony Poole (Bradford Metropolitan District Council) and John Blanksby (Pennine Water Group) according to locations where pluvial flooding had occurred within the last 5 years.

Finding(s)

Relatively few properties (and hence people) were affected by flooding in the case study areas and there were no predicted deaths or serious injuries; these results were supported by anecdotal knowledge of the events. Mental health problems, characterized as psychological distress, were estimated for adults; these were found to dominate the calculated health

impacts, being considerably greater than the combined physical symptoms in the case study examples.

Conclusions: While it was not possible to quantify every flood-related health impact, this method does allow comparisons to be made between different flood events and mitigation strategies.

RRL- 0213

Title Mortality from Flash Floods: a Review of National Weather Service Reports, 1969-81

Author(s) J. French, R. Ing, S. von Allmen, R. Wood,
Public Health Reports, 1983 Vol 98 ISN 6

Key theme(s) Morbidity, Mortality and Floods, Flash floods, mortality, USA

Summary

Of all weather-related disasters that occur in the United States, floods are the main cause of death, and most flood-related deaths are attributed to flash floods. Whenever a weather-related disaster involves 30 or more deaths or more than \$100 million in property damage, the National Weather Service (NWS) forms a survey team to investigate the disaster and write a report of findings. All NWS survey reports on flash floods issued during 1969-81 were reviewed to determine the mortality resulting from such floods, the effect of warnings on mortality, and the circumstances contributing to death. A total of 1,185 deaths were associated with 32 flash floods, an average of 37 deaths per flash flood. The highest average number of deaths per event was associated with the four flash floods in which dams broke after heavy rains. Although there were 18 flash floods in 1977-81 and only 14 in 1969-76, the number of deaths was 2Y2 times greater during the earlier period. More than twice as many deaths were associated with flash floods for which the survey team considered the warnings inadequate than with those with warnings considered adequate. Ninety-three percent of the deaths were due to drowning and 42 percent of these drownings were car related. The other drownings occurred in homes, at campsites, or when persons were crossing bridges and streams. The need for monitoring dams during periods of heavy rainfall is highlighted.

Research Question(s)

To obtain an estimate of mortality associated with flash floods and to identify factors that increase the risk of death and injury from such events.

Research Methodology

All NWS survey reports thought to be associated with flash floods were reviewed to determine the number of events that met the NWS working definition of a flash flood (heavy rainfall within a 12-hour period that leads to the issuance of a flash flood warning). Thirty-four reports covering 1969-81 met those criteria. Using those reports, we reviewed the mortality resulting from such floods and the effect of warnings on mortality and tried to enumerate the circumstances contributing to death and injury.

Finding(s)

Of the 34 reports on events meeting the criteria of a flash flood, 32 (94 percent) gave the number of deaths associated with the flood and were the source of the data in tables 1-4. Only three reports, however, provided information on injuries. With so few reports on injuries, we could not attempt in this review to assess injuries related to flash floods.

Mortality. A total of 1,185 deaths were associated with the 32 flash floods, an average of 37 deaths per flood (table 1). Although there were 18 flash floods in the 5-year period of 1977-81 compared with 14 in the previous 8-year period of 1969-76, the number of deaths was 21/2 times greater during the earlier period.

Flash flood characteristics. Descriptive information, including the number of deaths, location, circumstances, and date, for each of the 32 flash floods with fatalities reported is listed in table 2 by State.

The highest number of flash floods per State occurred in Arizona, Texas, and Pennsylvania (four each). Of these States, Pennsylvania had the highest average number of deaths per flood. However, the one flood resulting in the most deaths occurred in Rapid City, S. Dak., where 236 people died after a review of the meteorologic and topographic factors contributing to flash floods in NWS survey reports showed that most were due to heavy rainfall alone (table 3). The highest average number of deaths per event, however, was associated with the four flash floods in which dams broke after heavy rains.

Warnings. The types of warning given and the number of deaths associated with each event are shown in table 4. Although warnings were issued for heavy rains and flash flooding, no warnings were issued for potential dam failures in the four events involving dam breaks. More than twice as many deaths were associated with flash floods for which the survey team considered the warnings inadequate than with those with warnings considered adequate. Warnings deemed inadequate were largely heavy rain and flash flood warnings issued for a region within a broad time frame such as the next day rather than for a flash flood in a specific area and time frame.

The 20 deaths associated with those three flash floods when no warning was given occurred in remote recreational areas where the population considered at risk was small.

Causes of death. Causes of death were given in 16 of the 32 reports. They covered only 190 (15 percent) of the deaths; all such information was incomplete. Of these 190 deaths, 177 (93 percent) were due to drowning. A large portion (42 percent) of these drownings were car related; for example, victims had been in cars that were driven into low areas, across flooded

bridges, or off the road into deep water. The other drownings occurred in the home, at a campsite, or when persons were crossing bridges and streams (table 5). Only a few reports contained information on the age and sex of flash flood victims.

RRL- 0214

Title Risk Factors for Mortality and Injury: Post-Tsunami Epidemiological Findings from Tamil Nadu

Author(s) D. Guha-Sapir, L.V. Parry, O. Degomme, P.C. Joshi

Report by the Centre for Research on the Epidemiology of Disasters CRED, 2006

Key theme(s) Morbidity, Mortality and Floods, Tsunami, mortality, injury, risk factors, Tamil Nadu

Abstract / Summary

This paper aims at discussing possible measures to reduce the vulnerability of coastal populations during flooding disasters. This could be reduced in a number of ways. Promoting and providing swimming lessons amongst women and girls is likely to reduce their risk in flooding disasters. While the relocation of entire fishing communities away from the coast may not be feasible, improvements in local housing and other infrastructures could strengthen the resiliency of such populations in the future, as could the investment in multipurpose emergency shelters. Early warning systems are likely to be beneficial however careful consideration of message dissemination methods is required to ensure their effectiveness and should be developed in conjunction with community disaster preparedness and awareness programs.

Finally while a sound evidence base for mortality and injury risk factors is crucial for informing policy decisions and developing effective disaster preparedness and responsive systems, further studies aimed at strengthening the epidemiological data on acute disasters is required.

Research Question(s)

What are specific risk factors for mortality and Injury in coastal populations?

Research Methodology

In October 2005, research teams from the CRED and the University of Delhi worked in conjunction with the Tamil Nadu Voluntary Health Association to conduct a major household survey and focus group sessions in Tamil Nadu.

A sample of 660 households was randomly selected from the most severely affected hamlets in Nagapattinam District. A questionnaire designed to investigate possible risk factors at both the household and individual level was subsequently administered. In addition to the survey data, four focus group discussions were held with men and women from fishing families, doctors and representatives from NGOs.

Finding(s)

Just over one quarter of the population were injured in the day of the tsunami. Most injuries occurred in the extremities, with abrasions and lacerations reported as the most common injury-type. As expected, the vast majority of deaths and injuries occurred on the day of the tsunami. Young children and the elderly had much higher risk of death than the rest of the population. Results confirmed that women were at significantly higher risk of death than men however upon closer analysis that gender difference was only relevant for women between 15 and 50 years. By contrast, men were at much higher risk of injury.

Another key risk factor for tsunami deaths was the inability to swim; a characteristic that was also strongly correlated with gender as significantly fewer women were able to swim than men. Furthermore, the risk of mortality was more strongly correlated with a dwelling's proximity to the sea than with the household occupation type.

13% of the population received a verbal warning from family or friends in the area. Death rates were significantly lower among the population that was warned, suggesting that early warning may have saved lives.

RRL- 0215

Title Patterns of chronic and acute diseases after natural disasters – a study from the International Committee of the Red Cross field hospital in Banda Aceh after the 2004 Indian Ocean tsunami

Author(s) Debarati Guha-Sapir, Willem Gijsbert van Panhuis, Joel Lagoutte

Tropical Medicine and International Health, 2007 Vol 12 ISN 11

Key theme(s) Morbidity, Mortality and Floods, Natural disasters, chronic diseases, humanitarian aid, Indonesia

Research Objective

To assess the pattern of diseases in a natural disaster, which are not necessarily a direct consequence of the event but can impact on the way health assistance is to be provided.

Research Methodology

This cross-sectional, record-based study was conducted in the ICRC field hospital in Banda Aceh, established as one of the first medical-treatment facilities in response to the tsunami. The hospital disposed of major medical specialties and provided first- and second-line treatment to patients from the region. Patients' demographic information and diagnosis was obtained from the outpatient registration system for cases presented between 15 and 31 January 2005. No private patient data were collected. Data were entered anonymously into a computer database and assigned to individual record numbers.

Cases were grouped into two categories. The first ('chronic diseases') included all chronic diseases, such as hypertension and diabetes, in addition to acute manifestations related to chronic conditions, such as kidney stones and asthma attacks. The second category ('acute diseases') included all acute conditions, such as upper respiratory tract infections and trauma, of which an unknown proportion was directly related to the disaster. Psychiatric diseases were classified and analysed separately.

Finding(s)

The study shows that 43.5% of the diagnoses was chronic diseases. The odds of chronic vs. acute diseases increased by 16.4% per day up to January 23 [95% confidence interval (CI): 7.8–25.6%] and decreased thereafter by 13.1% (95% CI: 6.6–19.1%) per day. The odds of acute diseases were 34% lower among females than males (95% CI: 16–49%) and 4.3 times higher among children than the rest of the population (95% CI: 2.4–7.6). There were relatively few trauma cases among females and children.

Chronic diseases underlie a substantial proportion of consultations of disaster-affected populations. Medical teams should be prepared for acute presentations of chronic illnesses. Children suffer mainly from infectious and other diseases in the same diagnostic groups as in an otherwise normal, poor population. Advantage should be taken of the presence of large numbers of medical and nursing volunteers and funds to not only rebuild but also improve the pre-disaster healthcare infrastructure in poor regions. Trauma and injury are not an important cause of morbidity among women or children, which most likely is attributed to survival bias. Unless emergency care is available within hours of the event, the scope for improvement in the survival rates will always be limited. Psychiatric care should be anticipated for both disaster-related and pre-disaster patients. However, many psychiatric cases may be adaptation reactions to great personal loss which require social support rather than a purely psychiatric approach.

RRL- 0216

Title An analysis of the causes and circumstances of flood disaster deaths

Author(s) S.N. Jonkman, I. Kelman

Disasters, 2005 Vol 29 ISN 1

Key theme(s) Morbidity, Mortality and Floods, Disaster deaths, drowning, flood deaths, flood fatalities, flood mortality, flooding.

Abstract / Summary

The objective of this paper is to investigate and to improve understanding of the causes and circumstances of flood disaster deaths. A standardised method of classifying flood deaths is proposed and the difficulties associated with comparing and assessing existing information on flood deaths are discussed. Thirteen flood cases from Europe and the United States, resulting in 247 flood disaster fatalities, were analysed and taken as indicative of flood disaster deaths. Approximately two-thirds of the deaths occurred through drowning. Thus, a substantial number of flood disaster fatalities are not related to drowning. Furthermore, males are highly vulnerable to dying in floods and unnecessary risk-taking behaviour contributes significantly to flood disaster deaths. Based on these results, recommendations are made to prevent loss of life in floods. To provide a more solid basis for the formulation of prevention strategies, better systematic recording of flood fatalities is suggested, especially those caused by different types of floods in all countries.

Research Question(s)

To investigate and to improve understanding of the causes and circumstances of flood disaster deaths.

Research Methodology

Literature review

Finding(s)

Cause of death and circumstances

Drowning accounts for the majority of the fatalities (67.6 percent), with the implication for education and mitigation that approximately one-third of flood disaster fatalities are not due to drowning. Vehicle-related drowning occurs most frequently, mainly when people try to drive across flooded bridges, roads or streams. Such instances of drowning occur during several phases of the flood: at the onset, when people are surprised by the floodwaters, and in the aftermath, such as after the storm system has passed but when the waters are still high.

Low-water crossings, where a road traverses a normally dry stream bed or where there is a slight dip in the road across a drainage area, are particularly dangerous (Kelman, 2005). This may reflect motorists' misconception that automobiles can provide adequate protection from rising water (MMWR, 1993). Another especially dangerous activity is driving over flooded

bridges. In the 1992 Puerto Rico floods, 11 of the 14 fatal car crashes happened on a flooded bridge (Staes et al., 1994).

Specific dangers are associated with attempted rescues, but the consequences vary. As can be seen in table 2, three people lost their lives during the rescue process, only one of whom was a rescuer. Other sources, not included in the data in table 2, confirm the dangers associated with rescue. In North Carolina, when Hurricane Floyd hit in 1999, five rescuer deaths were reported in a death toll of 52 (MMWR, 2000). In the 1988 floods in Nîmes, France, two of the nine people who lost their lives drowned during rescue operations (Duclos et al., 1991).

Fourteen (5.7 percent) heart attack fatalities were reported, three of which occurred during the evacuation process following the 2002 floods in Germany. Better preparation and planning, which would eliminate the need for sudden and stressful evacuations, could save lives (Kelman, 2005).

All deaths due to fire and carbon monoxide poisoning happened in buildings. Also in buildings, 15 (6.1 percent) fatalities were the result of drowning and eight (3.2 percent) were due to physical trauma. In most events, people living in the affected areas could be warned and evacuated, but those actions—and preparation for those actions—must be effected properly (Handmer, 2000). In addition, the consequences of evacuation must be less than the consequences of non-evacuation.

Differences between flood deaths in Europe and the US, as shown in table 2, are of particular interest. The most striking difference to emerge is that drowning in vehicles seems to be a worse problem in the US than in Europe. Possible reasons for this are:

- a better understanding or stronger recollection of the dangers of flooding in Europe;
- better warning systems combined with better compliance with warnings in Europe;
- different nature of flooding in Europe and the US;
- higher recurrence rates of floods that pose a danger to vehicles in the US, perhaps due to differing road networks (for instance, fewer low-water crossings in Europe) or different flood characteristics (for example, intensity of cloudbursts); and
- different reporting systems for flood deaths.

Similarly, all reported deaths due to electrocution and fire occurred in the US. A different system of reporting data or different terminology could be reasons. Such differences would be difficult to trace back without reconstructing the circumstances surrounding each fatality.

Furthermore, the types of events considered might influence the outcomes. Most US events analysed were associated with windstorms (that is, cyclones), while the Euro might influence these statistics. In the US, non-elderly people might take risks in floods that their European counterparts do not. In Europe, the elderly might be left to fend for themselves during floods more frequently than in the US; they might choose to stay in flooded buildings; or they might experience difficulties in receiving, interpreting and acting on flood warnings. The ICPR (2002) notes that, during the 1999 floods in France, eight of the nine drownings in buildings involved 'pensioners'. In the cases examined here, one-half of the drownings in buildings involved elderly people, suggesting that this factor could be important.

Gender

Of the fatalities where gender is reported, 70 percent are male.

Activity and behaviour

The way in which people respond to floods is an important factor in the associated morbidity and mortality (French and Holt, 1989). A substantial proportion of the flood-related deaths is believed to be attributable to unnecessary risk-taking behaviour.

The 2002 floods in Germany illustrate the preventable nature of such deaths. Reimer's (2002) descriptions of the circumstances surrounding individual deaths suggests that at least eight of the 19 fatalities were due to unnecessary action:

- six people entered their home or the floodwaters to rescue belongings, such as laundry or firewood;
- one person was boating in the floodwaters; and
- one person tried to drive across a flooded street.

Other reported examples of risk-taking behaviour in floods include driving around barricades warning of the danger and attempting to wade across flooded watercourses. During several recent European floods, different forms of flood tourism were reported, including large crowds gathering on riverbanks and bridges and people engaging in recreational boating activities on flooded streams.

Timing of death

Timing of death relative to flood occurrence has been deduced for 214 fatalities. Of these 214 fatalities, 87 percent occurred during the impact phase.

The relationship between time of death and the issuance of official warnings could not be investigated here due to lack of information.

Season is also pertinent to flood fatalities. Enough data—mainly related to air and water temperature—were not available to determine whether or not the mortality rate was higher during certain seasons. Additionally, other seasonal factors, such as the number of hours of darkness per day, might influence the number of deaths.

RRL- 0217

Title Use of rapid diagnostic tests for malaria in an emergency situation after the flood disaster in Mozambique

Author(s) M. Hashizume, H. Kondo, T. Murakami, M. Kodama

Public Health, 2006 Vol 120

Key theme(s) Morbidity, Mortality and Floods, Malaria diagnosis, rapid tests, emergency situations

Abstract

Objectives: To determine how diagnosis of malaria may be improved by combining the use of rapid diagnostic tests (RDTs) for *Plasmodium falciparum* malaria with clinical diagnosis by the presence or history of fever compared with clinical diagnosis alone in emergency situations with flood-affected displaced populations in Mozambique.

Study design: A cross-sectional study conducted at the emergency outpatient clinic in a village in the Cho'kwe` district of Gaza Province, 3 weeks after Cyclone Eline hit Mozambique in February 2000.

Methods: A hundred and thirty children aged less than 15 years with clinical malaria were selected for examination by RDT and fluorescent microscopy using acridine orange as a reference test. The diagnosis of clinical malaria was made by a history of fever in the last three days or axillary temperature above 37.08C at the time of attending the emergency outpatient clinic. Two positive predictive values were calculated; RDTs combined with clinical diagnosis and clinical diagnosis alone.

Results: Positive predictive values of RDTs combined with clinical diagnosis by the presence of fever or history of fever were 87.6% (92/105) (95% confidence interval (CI) 80.8–92.8) compared with 74.6% (97/130) (95% CI 66.2–81.8) for clinical diagnosis alone. Five patients were diagnosed false negative.

RRL- 0218

Title Cryptosporidiosis-Associated Mortality Following a Massive Waterborne Outbreak in Milwaukee, Wisconsin

Author(s) Neil J. Hoxie, Jeffrey P. Davis, James M. Vergeront, Raymond D. Nashold

American Journal of Public Health, 1997 Vol 87 ISN 12

Key theme(s) Morbidity, Mortality and Floods, Cryptosporidiosis, waterborne outbreak, epidemiology

Abstract / Summary

During March and April 1993, a massive waterborne outbreak of cryptosporidiosis occurred among residents of and visitors to Milwaukee, Wisconsin. Understanding the potential for fatal outcomes associated with waterborne cryptosporidiosis outbreaks needs to be an important part of discussions about preventing such outbreaks. This report presents results of an analysis of death certificate data to provide an estimate of cryptosporidiosis-associated mortality during the 2 years following the massive waterborne outbreak of *Cryptosporidium* infection in Milwaukee.

Research Question(s)

To estimate the magnitude of cryptosporidiosis associated mortality during the 2 years following a massive waterborne outbreak.

Research Methodology

Wisconsin death certificate data obtained from the Center for Health Statistics, Wisconsin Division of Health, were analyzed for April 1, 1990, through March 31, 1995.

Finding(s)

This analysis indicates that among residents of the Milwaukee vicinity, the number of cryptosporidiosis-associated deaths increased markedly following the waterborne outbreak. Fifty-four cryptosporidiosis-associated deaths occurred during the 2-year post-outbreak period compared with 4 in the 2 years before the outbreak.

This represents more than a 13-fold increase in cryptosporidiosis-associated mortality. If, in this population, 4 cryptosporidiosis-associated deaths in 2 years are expected under typical circumstances, then during the 2 years following the outbreak, an additional 50 cryptosporidiosis-associated deaths occurred. These results indicate that waterborne outbreaks of cryptosporidium infections can result in significant mortality, particularly among immunocompromised populations.

RRL- 0219

Title The impact on health and risk factors of the diarrhoea epidemics in the 1998 Bangladesh floods

Author(s) O Kunii; S Nakamura; R Abdur; S Wakai

Public Health, 2002 Vol 116

Key theme(s) Morbidity, Mortality and Floods; Bangladesh; diarrhoea; outbreak; health impact

Abstract / Summary

The 1998 flood in Bangladesh ravaged approximately 60% of the land and affected over 30 million people. The aim of this study is to examine the impact of the flood on the health of the communities affected and to explore factors associated with episodes of diarrhoea. We conducted structured interviews with 517 people in two districts that had been affected in October 1998, when the flood water level was at its peak. Of the 517 respondents, 98.3% developed health problems or found that existing health problems were exacerbated. Many perceived that their general health condition was 'much worse' (16.9%) or 'worse' (64.3%). The most prevalent condition was fever (63.6%), followed by respiratory problems (46.8%), diarrhoea (44.3%), and skin problems (41.0%). Only 1.0% and 6.7% of the respondents treated water before drinking, by boiling and chlorination, respectively, although water collected from tube-wells (93.2%) and rivers (6.0%) was perceived by 75.0% of the respondents to be contaminated.

Factors associated with developing or worsening diarrhoea were as follows; the number of family members, poor economic status, a lack of distribution of water purification tablets, the type of water storage vessels, not putting a lid on the vessel, no use of latrines, perceived change of drinking water, food scarcity, and worries about the future. In logistic regression analysis, men, poor economic status, lack of distribution of water purification tablets, and the type of water storage vessels had a significant association with diarrhoea. The 1998 Bangladesh flood had a substantial impact on the health of communities. Diarrhoea was associated with socioeconomic status, water handling and household sanitation. There ought to be more emphasis on health education in the pre-disaster period in order to empower communities against floods.

Research Question(s)

To illustrate the sanitary conditions, hygiene behaviour and health effects of the communities affected during the floods, and to clarify the factors influencing the incidence of diarrhoea.

Research Methodology

Questionnaire survey

University-graduate local people were trained as interviewers and conducted a structured, face-to-face interview with one adult per household of 517 houses, selected with area sampling from nine villages of two districts, about 140 km northwest and 40 km southeast of Dhaka, respectively. The two districts were selected according to access from Dhaka (neither too far nor too close), severity of the floods and socioeconomic status approximately average among affected districts. The survey was carried out between 28th September and 20th October, about 2 months after the flood started, when the flood water started receding. The questionnaire was composed of enquiries pertaining to age, sex, education, economic status, number of family members, deaths and sickness in the family occurring during the flood, and causes of death and sickness. If any deaths occurred in the family, verbal enquiry was used to identify the cause of death. We also asked the respondent about the development or worsening of their own health problems during the flood, its severity, help-seeking behaviour, and obstacles to visiting medical facilities. The questionnaire also included sanitary conditions such as the source of drinking water, type of household water storage, treatment of water before drinking, distribution of water purification tablet (WPT), use of latrine, perception of change in drinking water, food scarcity, food distribution and concern about the future.

Statistical analysis

Various factors related to sex, age and incidence of diarrhoea were examined using the chi-square test and Fisher's exact test for nominal variables; the unpaired t-test and Mann-Whitney's U-test for continuous variables. Multivariate analysis was performed to find factors associated with the incidence of diarrhoea. All P-values presented are two-tailed. All the statistical analyses used the significance P-value 0.05 and were made using SPSS version 7.5.

Finding(s)

This study showed that the 1998 flood in Bangladesh had a substantial impact on the health of the communities affected, and caused a particularly high incidence of diarrhoea and respiratory problems. This disease pattern was quite similar to that of the 1988 flood in Bangladesh. When a flood occurred in which the water level had risen by degrees, this did not seem to lead to high mortality as a result of direct causes such as drowning and injuries, as is often the case in flash floods. It is believed by the public and health authorities in the world, that potential outbreaks of communicable diseases normally arise after natural disasters, due to the contamination of water and disruption of water-purification and sewage-disposal systems.^{5–8} Nevertheless, some studies have demonstrated that such outbreaks rarely occur and that mass immunisation against cholera and typhoid fever, commonly anticipated in the past, are unnecessary.

However, since the areas were inundated for a 2-month period, during which time those affected had been forced to live in harsh conditions without good access to food, safe water or medical care, this could indirectly affect mortality and morbidity. As has been shown in previous studies, the flooding might bring an increase in levels of endemic illnesses in flood-affected areas, rather than an epidemic of a specific disease.^{4,11 – 13} The study of the 1988 flood in Bangladesh demonstrated that most deaths and illnesses after the flooding were

attributed to nonspecific diarrhoeal diseases.¹ In our other report examining 76 stool samples of diarrhoea patients from the affected area in the 1998 Bangladesh flood, the causative pathogens varied from *Vibrio cholerae* O1 to enteropathogenic *Escherichia coli*, which were endemic in the areas.

The study also revealed that those affected had low socioeconomic status, poor sanitary conditions and hygiene practices, which might be associated with the diarrhoea outbreak, and little intervention such as water purification tablets distribution had been implemented. In the affected communities, diarrhoea epidemics were believed to be attributable to submerged pump wells and it was recommended that they be purified with bleaching powder.

However, as has been shown in our study and by other researchers,^{15,16} household water storage and handling could be an important factor in increasing diarrhoea morbidity. Previous studies suggested that several epidemics could have been caused by the contamination of stored water into which hands and objects were introduced.

Previous studies showed that lack of knowledge about the cause of diarrhoea and its prevention could be related to such poor hygiene practices.

RRL- 0220

Title Enterotoxigenic *Escherichia coli* and *Vibrio cholerae* Diarrhea, Bangladesh, 2004

Author(s) Firdausi Qadri, Ashraful I. Khan, Abu Syed G. Faruque, Yasmin Ara Begum
Emerging Infectious Diseases, 2005 Vol 11 ISN 7

Key theme(s) Morbidity, Mortality and Floods, E. Coli, *Vibrio Cholerae*, Bangladesh

Abstract / Summary

This article emphasizes that ETEC can be a major source of acute watery diarrhea in epidemics caused by floods. This report is the first to show that during waterborne natural disasters, ETEC can also cause dehydrating diarrhoea severe enough to require clinical care and, in many instances, intravenous rehydration. During epidemics, focus on ETEC should be on pediatric patients <2 years of age, since ETEC was the most prevalent bacterial enteropathogen identified in this age group. The treatment strategy should be designed accordingly, since ETEC strains are becoming increasingly resistant to erythromycin (15), the drug usually used for young children with acute watery diarrhoea, irrespective of diagnosis.

Research Methodology

Since ETEC spreads through contaminated water and food (8,9), we analyzed diarrheal stools for this pathogen to assess the prevalence of ETEC during the epidemic.

ETEC causes diarrhoea by producing different combinations of the heat labile (LT) or heat stable (ST) enterotoxins and 1 or more of at least 22 different colonization factors, which contribute to the virulence of the pathogen. Since genes for these factors are predominantly present on plasmids, which may be lost on storage, we tested for phenotypic expression of these factors by using freshly cultured isolates. For this purpose, diarrhoeal stools were collected from patients in a 2% systematic routine surveillance system; every 50th patient attending the hospital is routinely screened for *V. cholerae*, *Shigella* spp., and *Salmonella* spp. (4) at the Clinical Research and Service Centre of the ICDDR, B.

RRL- 0221

Title Health Impacts of Flooding in Lewes: a Comparison of Reported Gastrointestinal and other Illness and Mental Health in Flooded and Non-flooded Households

Author(s) Reacher M, McKenzie K, Lane C, Nichols T

Published in Communicable Disease and Public Health, 2004 Vol 7 ISN 1

Key theme(s) Morbidity, Mortality and Floods; Health impact; Lewes.

Abstract

Severe flooding may become more frequent due to global warming. A historical cohort study was conducted by telephone interview for new episodes of illness in all age groups, and for psychological distress in adults, following severe river flooding on 12 October 2000 in the town of Lewes in Southern England.

Two hundred and twenty-seven residents of 103 flooded households and 240 residents of 104 non-flooded households in the same postal district were recruited by random selection of addresses from a post flooding survey and a commercial database respectively.

Having been flooded was associated with earache (RR 2.2 [1.1,4.1] $p = 0.02$), and a significant increase in risk of gastroenteritis with depth of flooding (RR 1.7 [0.9,3.0] $p = 0.09$, p for trend by flood depth = 0.04). Adults had a four-times higher risk of psychological distress defined as a score of ≥ 4 in response to the 12-item General Health Questionnaire (GHQ-12) (RR 4.1 [2.6, 6.4] $p < 0.0005$, p for trend by flood depth = 0.01).

Associations between flooding and new episodes of physical illness in adults diminished after adjustment for psychological distress. Flooding remained highly significantly associated with psychological distress after adjustment for physical illnesses. Psychological distress may explain

some of the excess physical illness reported by flooded adults and possibly by children as well. Policies to promote population resilience to flooding where flood prevention has failed must include practical support for flood victims and provision of appropriate psychological support. Associations with physical illnesses affirm the need for advice and assistance with individual, household and environmental hygiene and access to medical services.

RRL- 0222

Title Diarrheal Epidemics in Dhaka, Bangladesh, During Three Consecutive Floods: 1988, 1998, and 2004

Author(s) B. S. Schwartz, J.B. Harris, A.I. Khan, R.C. Laroque
American Journal of Tropical Medicine and Hygiene, 2006 Vol 74 ISN 6.

Key theme(s) Morbidity, Mortality and Floods, Bangladesh, Diarrhea

Abstract

The study examined demographic, microbiologic, and clinical data from patients presenting during 1988, 1998, and 2004 flood-associated diarrheal epidemics at a diarrhea treatment hospital in Dhaka, Bangladesh.

Compared with non-flood periods, individuals presenting during flood-associated epidemics were older, more severely dehydrated, and of lower socioeconomic status. During flood-associated epidemics, *Vibrio cholerae* was the most commonly identified cause of diarrhea, and the only diarrheal pathogen whose incidence proportionally increased in each epidemic compared with seasonally matched periods. Rotavirus was the second most frequently identified flood-associated pathogen, although the proportion of cases caused by rotavirus infection decreased during floods compared with matched periods. Other causes of diarrhea did not proportionally change, although more patients per day presented with enterotoxigenic *Escherichia coli*, *Shigella*, and *Salmonella* species-associated diarrhea during floods compared with matched periods. Our findings suggest that cholera is the predominant cause of flood-associated diarrheal epidemics in Dhaka, but that other organisms spread by the fecal-oral route also contribute.

Research Question(s)

What are the demographic and microbiologic features that characterized recent flood-related diarrheal epidemics in Dhaka, Bangladesh.

Research Methodology

A surveillance system was established at the ICDDR,B in 1979 to systematically sample children and adults with diarrheal illness. As part of the microbiological surveillance system, stool and rectal swab samples were evaluated for a range of microorganisms. We examined demographic, microbiologic, and clinical data from patients presenting during 1988, 1998, and 2004 flood-associated diarrheal epidemics at a diarrhea treatment hospital in Dhaka, Bangladesh.

Finding(s)

We observed that *V. cholerae* played a primary role in four distinct flood-related diarrheal epidemics in Dhaka. Other pathogens that cause secretory diarrhea, particularly ETEC and rotavirus, also contributed significantly to flood-related epidemics. Despite a proportional decrease in the cases of rotavirus-associated diarrhea, cholera and rotavirus together accounted for the majority of cases of diarrhea among individuals presenting to the ICDDR,B during all flood periods examined. There was also more limited data to suggest that ETEC and other pathogens contribute significantly to flood-related epidemics. Our results may be helpful to public health officials to prepare for future flood-related epidemics in Bangladesh. Possible preparations may include stocking adequate supplies of ORS, intravenous fluids, antibiotics, and, perhaps, targeted use of cholera vaccines to prevent or interrupt transmission of *V. cholerae*.

RRL- 0223

Title "I wish I'd never heard of Banbury": The relationship between 'place' and the health impacts from flooding

Author(s) S.M. Tapsell, S.M. Tunstall

Health and Place, 2008 Vol 14 ISN 2

Key theme(s) Morbidity, Mortality and Floods; Hazards; Physical and psychological health; Stress; Place

Summary

This paper focuses upon a small qualitative study of two communities in England that were flooded over the Easter weekend in 1998. It reports on the only known longitudinal study of flood-affected respondents in the UK with the same participants over a 4,5-year period. It examines how 'place', both as a physical location within the floodplain and in terms of social places, may impact upon the health of those affected. It also demonstrates how floods may influence people's relationship with and perception of place, further impacting upon health outcomes. Illustrations in the form of narratives are provided by those who were flooded. Findings demonstrate that even relatively small, localised flood events may seriously disrupt people's lives and have a significant impact upon their physical but particularly their mental health and well-being.

RRL- 0224

Title The Health Effects of Flooding: Social Research Results from England and Wales

Author(s) S. Tunstall, S. Tapsell, C. Green, P. Floyd

Journal of Water and Health, 2006 Vol 4 ISN 3

Key theme(s) Morbidity, Mortality and Floods; England; Wales; physical health; psychological health

Summary

This paper presents interview survey data by social scientists using established health measures on the health effects of flooding for residents in 30 locations in England and Wales. Firstly, it examines the extent to which flooded residents reported suffering physical and psychological health effects during and after the event. Secondly, it explores the issue of whether these effects were long-lasting by comparisons with the general population and with those at risk but not flooded. In the study, about two thirds of the flood victims were found to have scores on the General Health Questionnaire-12 scale indicative of mental health problems (scores of 4+) at their worst time after flooding. The evidence of the study also suggests that some flood victims suffered long term mental health effects as a result of their experience of flooding. The study examines the influence of a wide range of factors: characteristics of the flood event, types of property, and sociodemographic and the intervening factors such as the extent of family or community support that may explain the health effects of flooding. It finds that a complex set of social and other factors are involved and that some factors susceptible to human intervention such as having adequate flood insurance cover are important factors in the stress experienced by flood victims.

RRL- 0225

Title Flooding in Europe: a brief review of the health risks

Author(s) P. Vasconcelos

Eurosurveillance Weekly Release, 2006 Vol 11 ISN 16

Key theme(s) Morbidity, Mortality and Floods

Abstract / Summary

In the light of current flooding events in Bulgaria, Serbia and Romania [1], staff at the European Centre for Disease Prevention and Control (ECDC) have undertaken some preliminary review of the adverse health effects of such natural disasters.

Adverse effects of natural disasters on human health include trauma deaths, mainly by drowning, injuries, enteric infections, mental health such as post-traumatic stress disorder, vectorborne disease, rodent-borne disease, poisoning, snake bites, and other negative health

outcomes such as disruption of healthcare services and population displacement.

Research Objective

To undertake a preliminary review of the adverse health effects of such natural disasters.

Research Methodology

Literature Review

Finding(s)

Adverse effects on human health include:

- trauma deaths, mainly by drowning;
- injuries;
- enteric infections due to increased faeco-oral cycling from disruption of sewage disposal and
- safe drinking water infrastructure;
- mental health such as post-traumatic stress disorder;
- vectorborne disease, such as malaria, dengue and dengue hemorrhagic fever, yellow fever,
- and West Nile fever;
- rodent-borne disease, such as leptospirosis;
- poisoning caused by toxic substances;
- snake bites as snakes tend to seek shelter in households to escape from flooding;
- other negative health outcomes, such as disruption of healthcare services and population displacement.

A limited number of short term epidemiological studies have been undertaken to assess the health impacts of flooding, but there is a deficiency in studies of long term health and economic impacts. Population resilience is likely to vary widely depending upon the economic and organizational resources available.

Limited data on flood events shows that the greatest burden of mortality is from drowning, heart attacks, hypothermia, trauma and vehicle related accidents. The speed of onset of floodwaters is a factor determining the number of immediate flood-related deaths. Flood-related injuries, such as contusions, cuts, sprains have been reported in several studies, as well as burns, electrocutions, snake bites and wound infections.

Several studies in developed countries have reported increases in mental health problems such as anxiety, depression, sleeplessness, and post-traumatic stress disorder among flood victims. There is some evidence that diarrhoea disease increases after flooding, particularly in developing countries, but also in Europe. Floods may lead indirectly to an increase in vectorborne diseases through the expansion in the number and range of vector habitats.

RRL- 0226

Title Possible Prevalence and Transmission of Acute Respiratory Tract Infections Caused by *Streptococcus pneumoniae* and *Haemophilus influenzae* among the Internally Displaced Persons in Tsunami Disaster Evacuation Camps of Sri Lanka

Author(s) Hiroshi Watanabe, Ranjith Batuwanthudawe, Vasanthi Thevanesam, Chiharu Kaji
Internal Medicine, 2007 Vol 46 ISN 17

Key theme(s) Morbidity, Mortality and Floods; *Haemophilus influenzae*, *Streptococcus pneumoniae*, tsunami, internally displaced persons, acute respiratory tract infection, evacuation camp

Abstract

Objective: The objective of this prospective study was to investigate the status of acute respiratory tract infections caused by *Haemophilus influenzae* and *Streptococcus pneumoniae* in tsunami disaster evacuation camps.

Methods: Nasopharyngeal swabs (NP) of 324 internally displaced persons (IDP) in 3 different tsunami disaster evacuation camps of Sri Lanka were collected between March 18th and 20th, 2005, and analyzed for MIC, β -lactamase production, serotypes, PCR and pulsed-field gel electrophoresis (PFGE).

Conclusion: Our results demonstrated that acute respiratory tract infections caused by various types of *H. influenzae* and *S. pneumoniae* were prevalent and some of them, including resistant isolates, were potentially transmitted from person to person in tsunami disaster evacuation camps in Sri Lanka. Therefore, we should consider the introduction of preventive measures, such as improved ventilation, rapid relocation and highly effective vaccines to IDP in evacuation camps for preventing invasive disease caused by *H. influenzae* and *S. pneumoniae*.

RRL- 0227

Title Tsunami in South Asia: What is the risk of Post-Disaster Infectious Disease Outbreaks?

Author A. Wilder-Smith

Annals, Academy of Medicine, Singapore, 2005 Vol 34 ISN 10

Key theme(s) Morbidity, Mortality and Floods; Crisis, disaster, displaced population, emergency

Abstract / Summary

The WHO has warned that in the aftermath of the recent tsunami, infectious disease outbreaks will add to the heavy toll of the disaster itself, possibly even doubling the number of casualties. However, many experts believe the risk of infectious disease outbreaks following natural disasters have been overemphasized and have led to unnecessary and potentially harmful public health activities. This paper discusses the risk and prevention strategies of potential infectious diseases in the aftermath of the tsunami based on a literature review of previous similar disasters and current evidence. Infectious disease outbreaks, if any, will most likely be the consequence of post-tsunami camp situations involving large displaced populations rather than the tidal wave itself. Lessons have been learned from previous large-scale humanitarian crises about the provision of aid and the mitigation of epidemics. This paper examines the risks and preventive strategies of vector- and food/water-borne diseases, measles, acute respiratory infections and meningitis. Alert thresholds at which to trigger outbreak investigations and standardized guidelines with regards to their control are outlined, based on the Sphere project.

Research Objective

To examine the risks and preventive strategies of vector- and food/water-borne diseases, measles, acute respiratory infections and meningitis.

Research Methodology

Literature review; searches were done on the WHO website and on MEDLINE, limited to those with English language, using the search terms of "tsunami". All articles between 26 December 2004 and 2 March 2005 were reviewed. In addition, a search for articles on MEDLINE was performed using the search terms "natural disasters", "flooding", "complex emergencies", "communicable diseases in complex emergencies", and "displaced populations".

Finding(s)

Flooding is the most common type of natural disaster worldwide, accounting for an estimated 40% of all natural disasters. There are multiple environmental consequences of flooding that can directly affect public health. For example, water sources can become contaminated with faecal material or toxic chemicals. Water or sewer line may be disrupted affecting access to a safe and adequate water supply and nutrition. Nevertheless, in the past 3 decades, epidemics of water-borne diseases, such as cholera or shigella dysentery, have become uncommon after floods.

The public health impact of the tsunami in South Asia can potentially be immense, comprising high rates of communicable diseases, elevated prevalence of acute malnutrition, and high excess mortality rates, but these are most likely a consequence of the refugee camp setting and displaced populations rather than the tidal wave itself. As with most natural disasters, the threat of post-disaster infectious disease outbreaks should not be overrated but also not underestimated. Exaggerated fear of infectious disease outbreaks should certainly not divert funding from the most pressing needs of the reconstruction of communities and restoration of livelihoods. At the time of writing, no outbreak has occurred, and this is partly due to prompt international aid response, but it will take months, before we can rule out the possibility of a major epidemic. Complacency must not set in as disease surveillance systems still have gaps, not all health actors are reporting through the same systems, conditions in affected areas remain favourable for communicable diseases, and people's capacities are overstretched. The international community will need to sustain the surveillance and outbreak preparedness for a long time.

RRL- 0228

Title An observation on correlation between rainfall and the prevalence of clinical cases of dengue in Thailand

Author(s) Viroj Wiwanitkit
Journal of Vector Borne Diseases, 2006 Vol 43

Key theme(s) Morbidity, Mortality and Floods; Correlation – dengue – rainfall – Thailand

Abstract

Background & objectives: An investigation was carried out in Thailand to study the correlation between rainfall and prevalence of dengue infection during 2002–03, which can be used for prevention and control of the disease.

Methods: Rainfall data (2002–03) collected from Ministry of Public Health were utilised for transformation of the infection and the rainfall data were derived from Royal Irrigation Department, Thailand. The correlation between the rainfall and the prevalence of dengue was assessed by regression analysis.

Results: The least square equation plot prevalence (y) versus rainfall (x) is $y = 3.0x + 4.6$ ($r = 0.78$, $p < 0.05$) ($r = 0.68$, $p < 0.05$).

Interpretation & conclusion: The study indicated that the prevalence of dengue infection in Thailand may depend on rainfall. Therefore, the surveillance and control of mosquito should be intensified during the period with high rainfall is recommended. However, the other confounding factors like ambient temperature and humidity which also determine the transmission of dengue should be looked into, before concluding that the increased prevalence

is a result of rainfall alone. Further, similar studies to assess the correlation between the rainfall and prevalence of infection in the other countries are required to confirm these observations.

Morbidity and Mortality of Earthquakes

RRL- 0229

Title of article

Death and Injuries due to the Earthquake in Armenia: A Cohort Approach

Author(s)

Armenian H.K., Melkonian A., Noji E., Hovanesian A.P.

International Journal of Epidemiology, 1997 Vol 26 ISN

Key theme(s)

Cohort, deaths, disasters, earthquakes, injuries

Abstract

This is the first population-based study of earthquake injuries and death that uses a cohort approach to identify factors of high risk. As part of a special project that collect data about the population in the aftermath of the earthquake that hit northern Armenia on 7 December 1988, employees of the Ministry of Health working in the earthquake zone and their families were studied as cohort to assess the short and long term impact of the disaster. The current analysis assesses short term outcomes of injuries and deaths as a direct result of the earthquake.

Considering that most of the high rise buildings destroyed in the earthquake were built using standard techniques, the most effective preventive effort for this disaster would have been appropriate structural approaches prior to the earthquake.

Research Question(s)

What were high risk factors for death in the earthquake of 1988 in Armenia?

Research Methodology

From an unduplicated list of 9017 employees of the Ministry of Health, it was possible to contact and interview 7016 employees and their families over a period extending from April 1990 to December 1992. The current analysis presents the determinants of 831 deaths and 1454 injuries that resulted directly from the earthquake in a study population of 32 743 people (employees and their families).

Finding(s)

Geographical location, being inside a building during the earthquake, height of the building and location within the upper floors were risk factors for injury and death in the univariate analysis.

However, multivariate analysis revealed that being in the Spitak region and in the city of Gumri and inside a building at the moment of the earthquake were the strongest predictors for death. Although of smaller magnitude, the same factors had significant odds ratios for injuries. Building height was more important as a factor in predicting death than the location of the individual on various floors of the building except for being on the ground floor of the building which was protective.

RRL- 0230

Title The evaluation of trauma patients in Turkish Red Crescent Field Hospital following the Pakistan earthquake in 2005

Author(s) Murat Bozkurt, Ali Ocguder, Ugur Turktas, Mustafa Erdem

Injury, 2007 Vol 38 ISN 3

Key theme(s) Pakistan; Earthquake; Field hospital; Trauma

Abstract / Summary

To provide better emergency and outpatient services in well-equipped field hospitals, organisation and team and equipment selection are of utmost importance to meet the demands of the earthquake zone. In the planning stage, the evaluation of data collected after the earthquake is essential. On 14 October 2005, following the earthquake in the city of Muzafferabad of Kashmir, Pakistan on 8 October 2005, Turkish Red Crescent Field Hospital was established and equipped with health professionals. A total of 2892 patients were treated and followed up. All the patients were prospectively evaluated. The profiles of the patients transferred, operated, or followed up within this period were documented. Furthermore, the patients who applied with post-traumatic musculoskeletal trauma were also documented. Of 1075 patients, who applied to orthopaedics outpatient clinic, 543 were female and 632 were male. The patients were evaluated based on their fracture as follows: pelvis (n = 45), femur (n = 59), tibia (n = 87), ankle and foot (n = 45), vertebra (n = 41), clavicle (n = 10), humerus (n = 38), forearm (n = 20) and hand and wrist (n = 45). Medical necessities in an earthquake zone are dynamic and change rapidly. Field hospitals must be prepared for requested changes to their mode of activity and for extreme conditions.

Research Methodology

In the Turkish Red Crescent Field Hospital established in Muzafferabad between 20 and 31 October 2005, a total of 2892 patients were treated and followed up. All the patients were evaluated prospectively. The profiles of the patients transferred, operated, or followed up within this period were documented. Furthermore, the patients who applied with posttraumatic musculoskeletal trauma were also documented.

Finding(s)

The second health care team that started to serve 12 days after the earthquake completed the treatment and follow-up of 2892 patients within a 12-day period. The gender distribution of the patients was 1522 male and 1370 female. The patients were classified based on their systemic disorders as follows: musculoskeletal system injury (n = 1075), respiratory tract disorders (n = 438), cardiological disorders (n = 110), gastro-enterological disorders (n = 328), urinary tract disorders (n = 207), soft tissue infections (n = 276), dermatological problems (n = 265), and others (n = 193). Of 1075 patients seen in the orthopaedic outpatient clinic, 543 were female and 632 were male. The age distribution of the patients were as follows: 363, under 15 years of age (33.76%); 225, between the ages of 15 and 30 years (20.93%); 418, between the ages of 30 and 60 years (38.88%); 69, over 60 years of age (6.41%). Trauma patients suffered from open fractures (n = 63, 5.86%) or injuries. Twentyfive of these patients (2.32%) suffered from infections. Our centre was the first point of application for 59 (5.48%) of the patients with femoral fractures, 87 (8.09%) of the patients with fractures of the tibia, 38 (3.53%) of the patients with humeral fractures, and 20 (1.86%) of the patients with forearm fractures. None of these patients had received any previous. Of these patients, 13.58% were treated by health care providers who were not physicians. Four patients with open fractures had wide soft tissue infection due to fixation attempted by the use of hard substances containing mud or clay, a common belief for treatment of this kind of wound by the people of the area. Two of these cases had to be amputated below the knee, and one was amputated above the knee. One case, however, received wide debridement and external fixation and was transferred to Islamabad for further reconstruction. Unusual and earthquake-specific injury types were also noted. Four cases applied with drop hand without significant bone or soft tissue lesion. Another common lesion type specific for earthquake was injuries to the scalp with severe defects due to collapsing roofs. Eleven children presented to the outpatient clinic with open wounds in the scalp. In the time period described (second group), two infant (18 months of age and 26 months of age) deaths occurred due to pneumonia and septic shock.

RRL- 0231

Title The 1980 Earthquake in Southern Italy: Rescue of trapped Victims and Mortality

Author(s) De Bruycker M., Greco D., Annino I., Stazi M.A.

Bulletin of the World Health Organization, 1983 Vol 61 ISN 6

Key theme(s) Earthquake; rescue operations; mortality; Italy

Abstract / Summary

A retrospective study was undertaken on the health effects of the 1980 earthquake in southern Italy. The results stressed the importance of providing rescue activities in the first 48 hours after the impact. Strengthening the self-reliance of the community in disaster preparedness is suggested as the best way to improve the effectiveness of relief operations. In disaster-prone areas, training and education in methods of rescue should be an integral part of any primary health care programme.

Research Objective

To identify the risk factors, the most appropriate type of rescue operation and medical aid in terms of personnel and material, and the optimum time for their introduction.

Research Methodology

The study population included 3619 people living in 7 villages situated near the epicentre of the disaster. A house-to-house retrospective survey was performed by local interviewers using a standard questionnaire.

Finding(s)

The overall casualty rate (dead and injured) was 19,7%. Nearly all the death occurred among trapped people who died before they could be rescued. Eighty percent of all the trapped people were extricated within 2 days, mostly without the use of sophisticated means. The probability of survival decreased sharply, the longer the time before extrication. The crude mortality during the 18 months following the earthquake was 19 per thousand among the injured people who received treatment, and 14,1 per thousand among non-injured people. After age standardisation, there was no significant difference between these two figures and the expected mortality figures for the Italian population in normal times.

RRL- 0232

Title The 1980 Earthquake in Southern Italy: Morbidity and Mortality

Author(s) M. De Bruycker, D. Greco, M. F. Lechat

International Journal of Epidemiology, 1985 Vol 14 ISN 1

Key theme(s) Earthquake, health effects, morbidity, mortality

Abstract / Summary

The effects on health of the 1980 earthquake in southern Italy were surveyed retrospectively. The sample population includes 3619 people living in seven villages situated near the epicentre. Deaths were one hundred times and injury rates more than five times higher in trapped than in non-trapped victims. The possibility for escape was crucial for survival and depended on the type of building. Most of the rescue and relief work was carried out within a few days by unprepared local people who concentrated assistance on people sharing the same dwelling. The results suggest that the emergency phase for medical care was limited to the three to four days after impact. During the 18 months following the quake, mortality rates in injured (13.7%) and non-injured victims (15.8%) were similar. These results point to the need to establish, in each disaster prone area, a health evaluation system on which effective disaster relief and especially the preparedness of the community can be based.

Research Objectives

- a. To study risk factors for injury and death
- b. To identify the most appropriate type and timing of rescue

Research Methodology

Sampling

The reference population comprised those people living in the region most affected by the earthquake within which seven villages, covering an area of 261 km², were selected for study according to criteria such as a crude injury rate of over 50 per thousand and a mortality rate of over 20 per thousand. One in three households were chosen randomly using the population registers as the sampling frame. Thus, the sample was composed of 1300 households (total 3619 people), whose members were in the study area on the day of the disaster.

Definitions

The 'injured' were classified as those who reported themselves as being injured and could describe the type and part of the body affected. People who died immediately as a consequence of impact, or people who were found dead when extricated, were classified as 'early deaths from impact'. A 'casualty' was defined as a person either dead or injured from impact. A person was classified as 'trapped' when he/she had been trapped underneath debris or locked into an enclosed space and needed intervention from outside to be freed, alive or dead.

Collection of Data

The survey was performed 18 months after the quake. Local interviewers, trained on site, completed a standard questionnaire during home visits. Data collected in the field were transferred directly from the questionnaire onto a microcomputer.

Finding(s)

Trapping

The casualty rates (deaths and injuries) were 80% in trapped people and 9% in the non-trapped, giving a total of 19.7% among the 3619 people surveyed. Death rates were 35.0% in trapped versus 0.3% in nontrapped individuals; injury rates varied similarly according to trapping, 45.0% and 8.7%. The ratio of injuries to deaths was respectively 1.3 injured to 1 death in trapped and 26.6 injured to 1 death in non-trapped individuals.

Age-specific death rates were similar in all age groups and there were no statistically significant differences in overall rates of death and injury between the sexes. The probability of being alive at extrication from the debris declined sharply over time.¹ During the first day, 333 (93%) of the trapped people who survived were rescued. Among the people who died before being extricated from the debris, 17 (9%) were reported to have shouted for help.

Location at the Time of the Earthquake

At the time of impact (7.34 p.m., Sunday 23rd November, 1980) most of the people (83.1%) were inside their houses (Table 1). The mortality was similar for the people inside their houses and for those who were outside in the open air (5.5%). The mortality amongst people in bars and dancing places was significantly higher (9.3%) ($p < 0.01$). Although the proportion of people trapped was higher among people caught by the tremor inside the house (15.8%) than among those outside (9.7%), death rates were higher in the people trapped outside (53.3%) than in those trapped inside (32.8%). Of those in public places 19.8% were trapped and about half (46.9%) of those trapped died. The proportion of trapped victims and the death rates increased significantly according to the number of floors in buildings ($p < 0.01$) (Table 2). The occupants of the ground floor experienced, on average, a lower risk of trapping (8.5%) and death (3.0%) than those on any higher floor, of whom 26.6% were trapped and 9.2% died. However, there is no evidence of variation in rates of trapping or death above the ground floor. Physical damage to houses was classified into three degrees (Table 3). There was a highly significant association ($p < 0.01$) between degree of damage, on one hand, and proportion of trapped and early death and injury on the other. This association was independent of the association with the numbers of floors in the building.

Injuries

In almost half of the cases (233/514) more than one part of the body was affected. Therefore, classification was made according to the most severe lesion. Lacerations were the most frequently observed (42.2%), followed by contusions (26.5%), fractures (18.9%) and cuts (9.7%). Amongst people with one reported site of injury, the legs were the most frequently injured (39%), followed by the head (23.2%), chest (18.9%), arm (16.4%) and pelvis (2.5%). The ability to walk was used as a screening test to assess the severity of injuries; 44.5% of all injured victims could walk without help, 22.8% needed help and 32.7% could not walk at all. The same proportions were observed within each age group.

Medical Assistance

Ninety-two (17.9%) of the surviving injured victims did not receive medical assistance; 165 (32.1%) were directly transported to a medical centre for treatment; 257 (50%) of the injured received medical care on site of whom 101 were eventually transferred elsewhere. Of the first medical aid on site 90% was delivered within three days of impact, and 88.8% of the admissions to medical centres were also registered within this time. Only 4.8% of the patients requiring hospitalisation as a consequence of the earthquake were admitted more than seven days after the impact. Of those admitted 60% (160) stayed longer than a week in a medical centre.

Sequelae over 18 Months

The use of tranquillizers was investigated; 9% of the surviving inhabitants started taking tranquillizers after the earthquake and this was noted three times more frequently amongst injured survivors (22.5%) than amongst physically unharmed inhabitants (7.5%). Half of the survivors still used them 18 months later. A significant association was found between the ability to walk after injury and subsequent death or other physical sequelae. Of those entirely unable to walk 4.8% died and 23.6% experienced other sequelae as compared to 0.9% and 6.5% respectively among those able to walk without help. The mortality of the injured victims surviving impact and extrication was compared to the mortality of the uninjured. The mortality rate of the 2903 uninjured was 14.1 per thousand, 15.8 per thousand when adjusted for the age structure of the injured. Of the 514 injured victims, 13 (25.3 per thousand) died. Of these 13 deaths, three occurred within 24 hours and three others on the second day. When these six cases are excluded, the mortality rate of the injured victims becomes 13.7 per thousand (7/508). Thus, from two days after the earthquake onwards, there was no significant difference in mortality between injured and uninjured victims.

RRL- 0233

Title Earthquake in Guatemala: Epidemiologic Evaluation of the Relief Effort

Author(s) C. de Ville de Goyet, E. del Cid, A. Romero, E. Jeannée

PAHO Bulletin, 1976 Vol 10 ISN 2

Key theme(s) Earthquake, Guatemala, response, morbidity, mortality.

Abstract / Summary

Initial recovery from the February 1976 earthquake in Guatemala was greatly enhanced by effective national and international relief efforts. This experience is examined from an epidemiologic standpoint and possible ways for further improving responses to such events are suggested.

The damage wrought by the earthquake evoked a commendable and efficient national response. It also led to international relief activity that was clearly instrumental in assisting the country's short term recovery efforts.

At the same time, this initial recovery period caused a good deal of experience to be gained in the field of disaster management. Some of the lessons derived from the experience are examined, and a number of approaches are suggested for measurably improving both national and international response to future disasters of this kind.

Research Methodology

Literature review and official statistics

Finding(s)

After the earthquake the official death toll rose from 800 on day 1 to 22,778 on day 18. As of day 18; the Guatemalan National Emergency Committee's official estimate indicated that 76,504 persons had been injured.

Unfortunately, the reliability of the reporting system under emergency conditions was very low.

Recommendations: after an earthquake very high priority should be given to water supply restoration. Generally, the risk of epidemic is exaggerated. Mass immunization is though not the best method of disease control.

Overall the international relief effort was clearly instrumental on helping the people and the government of Guatemala to overcome the effects of the disaster. However the value of this assistance varied greatly. On one hand, it included priceless vital services such as air transportation, professional evaluation, specialized expertise, and prompt provision of fully equipped hospitals. On the other hand, it also involved the dumping of useless donations such as expired medical samples. Some of the foreign assistance was ill timed. For the future, it would appear very desirable to anticipate needs to some extent and to inform prospective and remote donors accordingly.

RRL- 0234

Title The Kashmir Earthquake Experience

Author(s) Shabir A. Dhar, Manzoor A. Halwai, Mohammed R. Mir, Zaid A. Wani

European Journal of Trauma and Emergency Surgery, 2007 Vol 33

Key
theme(s) Kashmir Earthquake

Abstract / Summary

On October 8, 2005, a major earthquake measuring 7.6 on the Richter scale struck the Himalayan region of Kashmir. Around 90,000 people died in the mass disaster. The Bone and Joint Hospital in Kashmir found itself in a relatively unique situation of having to deal with the orthopedic morbidity generated by this quake. The hospital received 468 patients over a period of 10 days, out of which 463 were received over the initial 5 days. The admission for a single day peaked at 153 patients on the third day. Due to the unprecedented admission in terms of numbers the hospital utilized outreach methods to streamline admission by sending out specialists to the affected areas. Manpower was judiciously utilized to concentrate specialist advise where required. Besides documenting the pattern of trauma, this paper throws light on some unforeseen problems faced in dealing with a large number of patients far exceeding the normal capacity of the hospital.

Research Question(s)

- a. Which orthopedic injuries occurred during and after the disaster?
- b. Which logistical, medical and human problems in concerns of management were produced?

Research Methodology

Our hospital received a total of 468 patients mainly over a period of 10 days (the admission over the last 5 days was only six patients). We recorded the pattern of injuries, the management, the logistic and administrative difficulties faced as well as some unusual yet enlightening experiences after analyzing the data, retrospectively.

Finding(s)

1) The patients received on the first day were mainly from within a 40 km radius of the hospital. As there was no great structural damage around Srinagar, therefore, the injuries were caused mainly by the response of the people to the unprecedented shaking of the ground and buildings. Most of the patients had jumped out of the buildings through windows. However, the only earthquake related death that the hospital witnessed occurred on this day itself due to a flail chest injury caused by a collapsing wall. Of the 468 cases received, 91 were under 16 years of age and 377 were in the adult age group. Of these patients, 271 were males and 197 were females.

2) After the first 36 h avoidable admission decreased by 87%. Due to the large number of the

patients and the emergent nature of their injuries, the normal routine of the hospital was suspended and emergency management given priority.

3) As the nursing staff was stretched due to a 300% increase in patient load, hence, the pre- and postoperative supervision of admitted cases was compromised. Eighty-seven patients had no attendants and were relatively more severely injured.

4) In the aftermath of the quake, the hospital was flooded with the aid. The patients were supplied drugs, implants, plaster of Paris, uniforms, orthotics, and food free of charge. The hospital bore the charges of extrabedding and linen as well.

5) The hospital follows a protocol of keeping operated patients for 4 days postoperatively. In the quake scenario this could not be adhered to as patients had no shelters to return to. This problem was especially grave in the 87 cases who had lost their entire families.

6) Their report brings home the fact that we can possibly never be ready and equipped for a mass disaster situation in a heavily populated area. We concur with Naghi et al. in that initial admission to the hospital consists of patients with trauma of every genre, a significant proportion of which is avoidable with proper referral and management at the local primary health center level.

Conclusions:

- Predicting the total number of morbidity in a mass disaster that a particular hospital may have to dealwith is not possible at the outset.
- To maximize the efficiency of patient care in a demanding situation, a rapid and coordinated response is needed. In the third world where composite trauma centers are still evolving the informed referral can ease the difficulty arising out of this situation. Telemedicine can enhance the quality of this response.
- Sending hospital specialists to the most affected areas can reduce and streamline the referral. Transfer of information can be eased and improved by the use of field slips.
- Time and type of disaster can give an idea as to the pattern of injuries expected.
- Arrangements for the lack of attendants and difficulties in discharge have to be factored in the management plan.

RRL- 0235

Title Crush syndrome of children in the Marmara Earthquake, Turkey

Author(s) Osman Dönmez, Adalet Meral, Mahmut Yavuz, Oguzhan Durmaz

Pediatrics International, 2001 Vol 43 ISN 6

Key theme(s) children, crush syndrome, earthquake, serum creatine kinase

Abstract / Summary

Crush syndrome is defined as traumatic rhabdomyolysis with systemic and local complications. Crush syndrome and its related complications were diagnosed on the basis of clinical and biochemical data. In this study, the authors evaluated 20 children with crush syndrome transferred to our center in Bursa during the Marmara earthquake, 1999. They investigated the clinical and laboratory findings of these children and found out that serum creatine kinase, aspartate aminotransferase, and alanine aminotransferase levels were high in all patients. Fifty-five percent of the patients ($n=11$) had one extremity injury and 45% ($n=9$) had multiple extremity injuries. Fasciotomy was required in 15 children. Serum muscle enzymes and D-dimer levels were high in children with multiple extremity injuries. Acute renal failure developed in 35% ($n: 7/20$) of them. Peak serum creatine kinase level was positively correlated with aspartate aminotransferase, alanine aminotransferase, hospitalization time, serum urea and creatinine ($P<0.05$).

Crush syndrome was therefore more severe in children with multiple extremity injuries and acute renal failure frequently developed in these children. Peak serum creatine kinase level as well as potassium, urea, uric acid, creatinine, lactic dehydrogenase, aspartate aminotransferase, alanine aminotransferase, and calcium levels were the helpful biochemical parameters in estimating the severity of crush syndrome.

Research Question

What are the clinical and laboratory findings of children with CS and the main principles in approaching the care for these children?

Research Methodology

Twenty children with CS were hospitalized and their clinical and laboratory results were evaluated. Crush syndrome was diagnosed in these children according to the following criteria:

1. Crushing type of injury to a large mass of skeletal muscle.
2. The sensory and motor disturbances in the compressed limbs, which subsequently became tense and swollen.
3. Myoglobinuria and/or hematuria.
4. Peak creatine kinase (CK) >1000 U/L.

Renal problems related with CS were defined as having any one of the following associated with oliguria/anuria; elevated levels of urea or creatinine, hyperkalemia, hyperphosphatemia, hypocalcemia, or metabolic acidosis.

Mean age of the patient was 10.2~0.7 years (range: 3.5 months to 15 years).

All patients received 2500–3000 cc/m² per day of intravenous (i.v.) fluid infusion, diuretics and alkaline therapy.

Intravenous fluid therapy had been already started at the rescue area in eight children and their i.v. lines were open when they were admitted to the hospital. Clinical and laboratory parameters were monitored. Systolic and diastolic blood pressure (BP), heart rate, total blood count, potassium (K), creatine kinase (CK), urea, creatinine (Cr), uric acid, sodium (Na), calcium (Ca), aspartate aminotransferase (AST), alanine aminotransferase (ALT), lactic dehydrogenase (LDH), and blood gasses were measured. Prothrombin time (PT), active partial thromboplastin time (APTT), D-dimer and fibrinogen were also determined for monitoring DIC. Children with high fever were investigated for systemic infection sources by obtaining urine, blood and wound cultures. Children with acute renal failure (ARF) initially were evaluated by renal ultrasonography (US). Renal parenchyma injury was screened by a technetium 99-dimercaptosuccinic acid (DMSA) scan 3 months later and US was repeated. The extent of injury was classified into two groups according to the anatomical sites of injury involving one or more than one extremity.

Finding(s)

Peak serum CK level as well as serum K, Cr, AST, ALT, uric acid, and LDH levels increased with the number of crushed limbs reflecting the extent of the underlying muscle damage. The risk of ARF also increased with the number of affected extremities. These results could help the clinician both in evaluating the severity of CS and recognizing the areas that need immediate critical management. The authors also suggest that early vigorous volume replacement is the key factor to prevent ARF, which is the most serious complication. According to them, these children should be considered immediately for transferring to hospitals for critical management and the volume replacement should start at the rescue area.

Title of article	Strategies in Evaluation and Management of Bam Earthquake Victims
Author(s)	Mohammad J. Emami, Ali R.Tavakoli, Hossein Alemzadeh, Farzad Abdinejad
	Prehospital and Disaster Medicine, 2005 Vol 20 ISN 5 World Association for Disaster and Emergency Medicine
Key theme(s)	Bam; catastrophe; disaster; preparedness; earthquake; emergency medical services; mass casualties; medical disaster response; multi-casualty incidents; trauma care
Abstract / Summary	

On 26 December 2003, an earthquake measuring 6.5 on the Richter scale occurred in the city of Bam in southeastern Iran. Bam was destroyed completely, >43,000 people were killed, and 30,000 were injured. The national and international responses were quick and considerable. Many field hospitals were created and large numbers of patients were evacuated from their homes and transported to hospitals throughout Iran. Nearly 700 patients were transferred to Chamran hospital in Shiraz within the first 48 hours after the earthquake.

This paper discusses strategies used to handle the large number of casualties entering one hospital within a short time. These strategies were designed specifically for the Bam earthquake, but are useful in other, similar situations.

Research Methodology

This is a retrospective study based on the medical records of earthquake casualties dispatched to Chamran Hospital. A screening tunnel composed of multiple stations was prepared before patients entered to facilitate the large influx of patients. Each of the victims was passed through this screening tunnel and assigned into one of three groups: (1) those needing emergency surgical intervention; (2) those needing less urgent surgery; and (3) those needing elective operations, supportive care, observation, and/or rehabilitation.

Finding(s)

Results: Among the 708 patients, 392 were male (male/female ratio: 1.24) with a mean value of their ages of 30.5 years. (range: 1.5 months–70 years). Extremity fractures (136, 19%) were more common than were axial skeleton fractures (28, 4%). Out of the total 708 patients, 152 (21.5%) patients needed emergency operations, 26 (4%) needed less urgent surgery, and 530 (74.5%) required wound care or antibiotic therapy and other forms of supportive care. Some complications occurred, such as two patients with compartment syndromes of the leg, three required below-the-knee amputation, eight suffered acute renal failure, two developed fat emboli syndrome, and one had a brain injury that resulted in death.

Conclusion: A comprehensive disaster plan is required to ensure a prompt disaster response and coordinated management of a multi-casualty incident. This can influence the outcomes of patients directly. A patient screening tunnel has advantages in rapid and effective evaluation and management of victims in any multi-casualty incident.

RRL- 0237

Title of article Health Effects of Earthquakes and Volcanoes: Epidemiological and Policy Issues

Author(s) DG Guha Sapir
Disasters, 1993 Vol 17 ISN 3

Key theme(s) Natural disasters, epidemiology, volcanoes, earthquakes.

Abstract / Summary

While some natural disasters, such as explosivity index (VEI) greater or equal to landslides and floods, have been successfully controlled by engineering interventions, volcanoes and earthquakes continue to inflict spectacular destruction and damage.

Nonetheless, the policy implications of the kind of data, whether they relate to the emergency plans of the national planning boards and technical ministries or to international emergency assistance programmes, have been traditionally neglected. Emergency relief has been dominated by charitable motives and has been largely ad hoc in nature. Professional approaches towards preparedness and mitigation have received attention only recently. Repeated disasters in some countries and massive appeals for assistance are forcing policy makers to review strategies. Some issues that are either ripe for policy change or which urgently require international attention are presented below. Any real change in the vulnerability of populations to disasters will require sustained involvement by funding and development agencies.

Finding(s)

To borrow a medical analogy, political interest in disasters manifests a manic depressive pattern. Immediately after a disaster has occurred, national and international interest is at a peak. Assistance and advice pours in, frequently unasked and, even more annoyingly, inappropriate. Emergency funds and assistance have a short life span, as does public attention, and action is taken in an unplanned and haphazard manner.

As several epidemiological studies have noted, external assistance arrives notoriously late and usually one step behind the evolving pattern of needs. In acute disasters, most deaths occur within 24 to 48 hours of the impact. This underscores the critical importance of local preparedness compared to external assistance. It is clear that it is virtually impossible to assure outside help, much less international assistance, within the first 24 hour period. External assistance could be much more usefully oriented towards longer term support and preparedness programmes. International assistance should be reviewed to see when it can realistically be expected to be operational and to ensure that the assistance provided is appropriate to the time. Meanwhile, the capacity of the local community to take immediate action should be strengthened. Appropriate training for public sector workers as well as for residents settled in high risk areas should be given priority. Finally, local resources and expertise should be mobilised and only those resources that are not available in the country should be requested from outside. The arrival of planeloads of volunteers and specialists is more of a media event than a source of practical assistance.

RRL- 0238

Title Analysis of 33 Pediatric Trauma Victims in the 1999 Marmara, Turkey Earthquake

Author(s) Serdar H. Iskit, Harika Alpay, Halil Tug̃ tepe, Cevdet O' zdemir

Journal of Pediatric Surgery, 2001 Vol 36 ISN 2

Key theme(s) Crush syndrome, crush injury, acute renal failure, multiple trauma, earthquake disasters.

Abstract / Summary

The Marmara earthquake, which destroyed more than 150,000 buildings and caused 15,000 deaths and 40,000 casualties, resembled the Hanshin-Awaji earthquake in many respects. Previous reports from similar disasters from several centres have not addressed trauma in the pediatric age group. The aim of this study was to analyze the clinical and laboratory data of pediatric trauma patients referred to a tertiary center after the 1999 Marmara earthquake.

Crush injury and Crush syndrome were the most common problems in the pediatric patients after the 1999 Marmara earthquake. The high incidence of ARF emphasises the importance of preparing a well-organised medical team for pediatric patients in the predisaster period to give adequate early fluid replacement. The authors believe that close monitoring of children with CI rather than looking for predictive factors is the best way to avoid the development and complications of ARF. Urgent disaster planning for children is recommended on both a national and international basis.

Research Question(s)

To present experience with traumatic lesions in the pediatric age group after the 1999 Marmara earthquake.

Research Methodology

The medical records of 33 injured children, aged from 14 days to 16 years, were reviewed retrospectively. The time spent buried under rubble, type of injury, treatment given, complications, laboratory data, and development of acute renal failure (ARF) were noted. Patients in whom ARF developed were treated with a standard regimen of fluid replacement, alkalization, and diuretics. Limbs with crush injuries were managed as conservatively as possible.

Finding(s)

All except 3 cases were evacuated from under the debris of collapsed buildings after 1 to 110 (mean, 30.04 \pm 6.48) hours. Seventy-eight percent were transported to the center within the first 3 days. Crush injury (CI) was present in 15 cases, and in 10 of them ARF had already developed by admission. Although serum levels of creatinine were elevated (1.2 to 5 mg/dL) in all cases with ARF, hyperkalemia was observed in only 4. The mean serum creatinine kinase (CK) level of cases with crush syndrome (CS) was 6,040 \pm 4,158 U/L. No significant correlations were detected between the development of CS, age, the time spent under the rubble, the time

before admission, or the number of crushed extremities. Conclusions: CI and CS were the most common entities encountered among our pediatric patients after the 1999 Marmara earthquake. The high incidence of ARF indicates the importance of medical management of this age group during rescue. Because neither laboratory data nor clinical findings predicted CS in the patients, the authors recommend close observation and monitoring of children with CI for the development of ARF.

RRL- 0239

Title of article Pediatric Surgical Emergencies in the Setting of a Natural Disaster: Experiences From the 2001 Earthquake in Gujarat, India

Author(s) Vivek Jain, Rea Noponen, Baird M. Smith

Journal of Pediatric Surgery, 2003 Vol 39 ISN 5

Key theme(s) Disaster relief mission, trauma, natural disaster, earthquake, India.

Abstract / Summary

On January 26, 2001, a 7.9 Richter earthquake struck the Indian state of Gujarat. Over the next 6 days, the International Red Cross set up a mobile hospital in the city of Bhuj, near the epicenter. The authors describe all surgeries on children treated there during the first 4 weeks of operation. The evolution of presenting injuries is noted, the types of surgery required are classified and an effective disaster relief team composition and strategy including psychiatric and rehabilitation services are proposed.

Research Question(s)

To examine the pediatric surgical emergencies in the aftermath of the 2001 earthquake in Gujarat.

Research Methodology

Total casualties were estimated at 30,000, with 250,000 people injured. Of 1,142 inpatients treated at Nor-Finn hospital during the first 4 weeks, approximately 300 (25%) were ≤ 17 years old. Of these, the authors report on the 62 who underwent surgery. Demographic data collected includes (where possible) age, date of presentation, injury, and surgery performed. Injuries are classified as orthopedic, soft tissue, burns, or miscellaneous. Injuries are grouped in 4 weekly time periods beginning February 1 when the hospital opened.

Finding(s)

Results: Children's ages were evenly distributed. Children required surgery less often than adults. Of children needing surgery, 42% needed orthopedic attention, 42% had soft tissue trauma, 10% had burns, and 6% had miscellaneous injuries. During the hospital's first week, operations were predominantly orthopedic. During the second week, orthopaedic and soft

tissue injuries occurred at similar frequency. In weeks 3 and 4, soft tissue and burn surgeries were prevalent.

Conclusions: More than 25% of patients requiring hospitalization were children, of whom greater than 20% needed surgery. The operations fell into 4 categories: orthopedic, soft tissue injuries, burns, and miscellaneous. There was an immediate need for orthopedic and general surgery skills followed by a delayed need for plastic surgery skills.

The experience at Nor-Finn hospital—where injured children received operations in the month after the January 2001 Gujarat earthquake—suggests children of all age groups required surgeries, although at lower rates than adults. In the earliest phase of disaster relief, orthopaedic and general surgery skills are essential. There is a delayed need for definitive management of burn injuries. These skills must be complemented by those necessary to manage crush syndrome (eg, renal failure) and PTSD. The need for ongoing psychiatric and rehabilitative services underscores the importance of working closely with local physicians and medical personnel.

RRL- 0240

Title	Risk Factors Associated with Moderate and Serious Injuries Attributable to the 1994 Northridge Earthquake, Los Angeles, California
Author(s)	Maya Mahue-Giangreco, PHD, Wendy Mack, PHD, Hope Seligson, MS, Linda B. Bourque, PHD Annals of Epidemiology, 2001 Vol 1
Key theme(s)	Northridge Earthquake , Disasters, Natural Disasters, Medical Record Linkage, Confounding Factors (Epidemiology), Injury Severity Score, Wounds and Injury, Epidemiology, Environmental Exposure, Environmental Hazards.

Summary

The Northridge earthquake occurred on Monday, January 17, 1994 (Martin Luther King Day), at 4:31 A.M. Most of the nine million residents of Los Angeles County, as well as residents in adjacent Ventura, Orange, San Bernardino, and Riverside Counties were awakened by this magnitude 6.7 earthquake. Natural catastrophes such as earthquakes introduce a number of important questions regarding injury epidemiology and hazard reduction. Only by studying events (where this is an option) can such questions be addressed and recommendations be made for reducing losses in future disasters. Forecasts of loss due to earthquakes are provided to help focus prevention programs, determine seismic safety codes, guide earthquake preparedness, and design protocols for appropriate responses during and after an earthquake. Estimates of morbidity and mortality associated with these forecasts do not typically employ real data, but depend heavily on simulated data (1–13). Conclusions based on these models may be misleading, leading to inadequate or inappropriate recommendations and mobilization

of resources. A pilot study of emergency department (ED) logs completed by the Los Angeles County (LAC) Department of Health Services (DHS) in 1996 showed an increase in injury visits at a sample of emergency departments after the 1994 Northridge Earthquake (14, 15). A subsequent study used a detailed review of medical records to: (a) obtain demographic characteristics of the patient and injury circumstances; (b) link earthquake-related injury scene addresses to existing building and geologic databases; and (c) use multivariate statistical models to evaluate associations between potential risk factors for earthquake-related injuries and injury severity. We now report the results of that research.

Research Question(s)

To use emergency department data to estimate levels of morbidity and risk factors due to earthquake-related mechanisms of injury subsequent to an urban night-time earthquake.

Research Methodology

Data were abstracted from 4190 medical records for the month of January, 1994. Injuries attributable to the earthquake were identified through emergency department and medical records. These injuries were: (a) categorized by mechanism of injury; (b) assigned an injury severity score; and (c) linked to structural and geologic data. Proportional polytomous and dichotomous logistic regression were used to estimate risk of more severe injury associated with demographic characteristics, injury characteristics, structural characteristics, and geologic factors.

Finding(s)

More severe earthquake-related injuries (serious versus moderate and moderate versus minor) were statistically significantly associated with patient age (60 years old), upper extremities, falling, multi-family structures, pre-1960 housing, and the 50th percentile of Peak Ground Acceleration, after adjusting for all other available demographic, injury, structural, and geologic characteristics.

Patients aged 60 or older had 6.1 times (95% CI = 1.6–22.4) the risk (relative to 30–39 year olds) of a more serious earthquake-related injury. A significant trend for increasing risk of more serious injury with older age groups was also noted ($p < 0.05$). Patients who sustained upper extremity injuries had 2.6 times (95% CI = 1.0–7.2) the risk of more serious injury compared to those sustaining injuries to the lower extremities. Patients who fell had 5.3 times (95% CI = 2.1–13.3) the risk of more serious injury compared to those struck by or cut by objects. Those injured in multi-family housing had 4.8 times (95% CI = 1.6–14.1) the risk of more serious injury compared to those injured in single or duplex housing. Those injured in housing built prior to 1960 had 4.6 times (95% CI = 1.0–21.5) the risk of more serious injury compared to those injured in structures built after 1975. A significant trend ($p < 0.05$) was noted with increased risk for more serious injury in older housing.

Conclusion

The current recommendation of 'duck, cover, and hold' might not be optimal during a nighttime earthquake, particularly if individuals are in the padded environment of the bed. Actions such as reaching for or catching objects, bracing, or holding onto perceived stable

objects may increase risk for more serious injury. Alternate responses include assuming a tucked position (as in airline crashes) or staying in bed for non-ambulating people. Structural damage and structure size were not associated with more serious injuries, but structure use and age were, leading the authors to suspect that unmeasured socioeconomic factors might impact risk factors. The importance of including population demographic characteristics in hazard modeling is emphasized

RRL- 0241

Title Health Needs of Patients With Chronic Diseases Who Lived Through the Great Hanshin Earthquake

Author(s) Kikuko Mori, Kazuhiro Ugai, Youko Nonami, Tomoko Kirimura
Disaster Management & Response, 2007 Vol 5 ISN 1

Key theme(s) Disaster response, chronic diseases, earthquake, Japan

Abstract / Summary

The purpose of the article was to identify the health needs of patients with chronic diseases who lived through the great Hanshin earthquake of 1995.

Twenty-nine patients with rheumatism, diabetes, or chronic respiratory disease were enrolled in the study. Semi-structured interviews were performed by the authors in 2004. Results: Priorities for patients with all three diseases were securing medications and ensuring that they were able to take their medications. Furthermore, each group required specific methods to be taken into account. The authors concluded that emergency preparedness planning and care priorities for individuals with chronic health problems, such as rheumatism, diabetes, and pulmonary disease, should include attention to medication availability, stress management, support for activities of daily living, appropriate food, and availability of support devices necessary to minimize exacerbation of symptoms.

Research Question(s)

What are the health needs of patients with chronic diseases who lived through the great Hanshin earthquake of 1995?

Research Methodology

Twenty-nine patients with rheumatism, diabetes, or chronic respiratory disease were enrolled in the study. Semi-structured interviews were performed by the authors in 2004. Patients were asked about problems they encountered in maintaining their health during the postquake period and the damage to their residences they experienced as a result of the earthquake. Each interview lasted approximately 40 minutes.

Finding(s)

Priorities for patients with all three diseases were securing medications and ensuring that they were able to take their medications. Rheumatism patients required methods of preventing their bodies from becoming cold, fatigued, and stressed in order to prevent aggravation of their disease; they also wanted relief workers to understand the physical limitations they experience. The health needs of diabetic patients included receiving an appropriate diet and developing ways to cope with the stress caused by the change in living environment. Patients with chronic respiratory diseases reported that their health needs included developing methods to prevent their bodies from becoming cold, fatigued, and stressed in order to prevent aggravation of their disease, access to respiratory masks to minimize dust and cold air exposure, and guidance in methods to alleviate respiratory symptoms. Conclusions: The emergency preparedness planning and care priorities for individuals with chronic health problems, such as rheumatism, diabetes, and pulmonary disease, should include attention to medication availability, stress management, support for activities of daily living, appropriate food, and availability of support devices necessary to minimize exacerbation of symptoms.

RRL- 0242

Title Hospital-acquired infections following the 1999 Marmara earthquake

Author(s) O. Öncül, Ö. Keskin, H.V. Acar, Y. Küükardali

Journal of Hospital Infection, 2002 Vol 51

The Hospital Infection Society

Key theme(s) Earthquake; hospital-acquired infection; trauma; Acinetobacter, Marmara earthquake

Abstract / Summary

In this study, medical records of all casualties admitted to our hospital following the Marmara earthquake, which struck northwest Turkey and resulted in the destruction of several towns in the Marmara region, were evaluated retrospectively. The time buried under the rubble, demographic data, type of medical and surgical therapies performed, type of injury and data on infection were analysed. Between 17 August and 25 September 1999, 630 trauma victims were received at our hospital and 532 (84%) of them were hospitalized. The mean age of hospitalized patients (312 males, 220 females) was 32 years (2 ± 90 years). Two hundred and twenty patients were hospitalized for more than 48 h. Forty-one of them (18.6%) had 43 hospital-acquired infection (HAI) episodes, which were mostly wound infections (46.5%). A total of 143 culture specimens was collected and 48 yielded the following potential pathogens: 15 *Acinetobacter baumannii* (31.2%), nine *Staphylococcus aureus* (18.7%), seven *Pseudomonas aeruginosa* (14.6%), six *Escherichia coli* (12.5%), six *Klebsiella pneumoniae* (12.5%), two *Stenotrophomonas maltophilia* (4.2%) and three various *Pseudomonas* spp. (6.3%). All S.

aureus strains were found to be resistant to methicillin in vitro. Two strains of *A. baumannii* and one *P. aeruginosa* were found to be resistant to all antimicrobials including carbapenems. Fifty-three victims died (10%) and 36 of those died during the first 48 h because of severe injuries and multi-organ failure. After 48 h of hospitalization, the mortality rate was significantly higher in those patients with HAI (14/41) than those without (3/179) (34.1% vs. 1.7%, $P<0.05$). In conclusion, trauma is the significant factor associated with HAI and a high incidence of *Acinetobacter* strains was responsible for HAI in trauma patients.

Research Question(s)

Which hospital-acquired infections occurred following the 1999 Marmara earthquake?

Research Methodology

We retrospectively reviewed the medical records of all casualties admitted to our hospital. Demographic data and data on infection, potential risk factors (e.g., invasive procedures, antibiotic use, duration of hospitalization) and mortality rates were collected. Records of hospitalized patients were evaluated by members of the Infection Control Committee on a daily basis. In accordance with the guidelines of CDC (Centers for Disease Control and Prevention), HAI was defined as an infection that was neither present nor incubating at the time of admission, but had its onset during hospitalization.

Microbiological studies

The evaluation of wound cultures was done by quantitative techniques and all samples, except blood cultures, were processed immediately in two steps. The samples were cultivated on 5% sheep blood agar and ethylene methyl blue (EMB) agar. Plates were incubated at 37°C for 24 h and the API automated system was used to identify the organisms. Antibiotic susceptibility was determined by the Kirby-Bauer disk diffusion test on Mueller-Hinton agar (Oxoid, Basingstoke, UK) according to the recommendations of the National Committee for Clinical Laboratory Standards.⁸ Biphasic blood culture media (Oxoid, Basingstoke, UK) was used for blood cultures. Ten millilitres of venous blood samples were withdrawn from patients at least twice from each arm.

Finding(s)

There were 532 injured patients admitted to our hospital between 17 August 1999 and 25 September 1999. Of the patients hospitalized for at least 48 h, 41 were defined as suffering from HAI. The time spent under rubble varied from 6 to 135 h. The mean time was longer in patients who died from HAI as compared with the control group (15.9 vs. 13.8 h) ($P<0.05$). This was true for patients who died irrespective of a HAI ($P<0.05$). Hospitalization length of stay was longer in patients with HAI and in patients who died ($P<0.05$).

Eleven patients who developed infection were considered not to have met the CDC criteria for HAI. The 41 HAI patients developed 43 infective episodes; the HAI rate was 18.6%. These were predominantly wound infections (46.5%) (Table II). Decompression fasciotomy was done on the legs in 29 patients on arms in 14, and in both in nine patients for the treatment of compartmental syndrome. Hyperbaric oxygen therapy (HBO2) was given to 52 patients in 946 sessions varying between three and 70 sessions. Each HBO2 sessions was performed under 2.5 ATA for 90 min.

There were 143 culture specimens collected from patients with HAI. All strains of *Staphylococcus aureus* were methicillin-resistant, though no glycopeptide-resistant strains were detected. Two strains of *Acinetobacter baumannii* and one *Pseudomonas aeruginosa* were resistant to all antibiotics tested including the carbapenem group. Culture results are summarized in Table III. Of the hospitalized patients, 53 died (9.9%). Of these, 36 patients (6.8%) were dead within 48 h of hospitalization. The causes of death included haemorrhagic shock, multi-organ failure and cardiovascular and respiratory deficiency. The mortality rate was 34.1% (14/41) in those patients with HAI while only three patients died in the non-HAI group (3/179) ($P < 0.05$).

It should be emphasized that the earthquake trauma resulted in a change of isolated microorganisms. The most prevalent organism was *A. baumannii*, which previously had rarely had been isolated from our ICUs (31.2% vs. 7.3%)

The time spent under the rubble was a significant contributing factor in mortality in patients with HAI. We noted that the mortality rate was higher in those patients who had been trapped under rubble for a longer period of time, possibly because of nutritional and electrolyte imbalance, blood loss, decreased oxygen saturation and duration of hypotension. HAI caused by organisms, other than those usually associated with HAI, should be anticipated in this vulnerable patient group.

RRL- 0243

Title Factors Associated with Earthquake Deaths in the Great Hanshin-Awaji Earthquake, 1995

Author(s) Yoneatsu Osaki, Masumi Minowa

American Journal of Epidemiology, 2001 Vol 153 ISN 2

Key theme(s) case-control studies; mortality; multivariate analysis; natural disasters; risk factors

Summary

The authors conducted descriptive and case-control studies to find factors associated with earthquake deaths due to the Great Hanshin-Awaji earthquake on January 17, 1995, in Nishinomiya, Japan. In the case-control study, cases included all 1,104 deaths. Controls were randomly selected from survivors. Earthquake mortality increased for people over age 50 years. Mortality among people who had lived in dwellings that were completely destroyed was much higher. One risk factor was physical disabilities (odds ratio = 1.9, 95% confidence interval (CI): 1.0, 3.4). When the analysis was limited to the people who had lived in intact or partially destroyed dwellings, the odds ratio rose to 5.6 (95% CI: 1.6, 19.8).

Research Question(s)

To find factors associated with earthquake deaths

Research Methodology

We conducted two epidemiologic studies. Descriptive epidemiologic analyses were used to evaluate the impact of age and the degree of damage to dwellings. A case-control study was conducted to identify factors associated with earthquake-related deaths other than age and degree of damage to dwellings. We chose the city of Nishinomiya, in which the second largest number of victims was observed, because the city government had a database on social welfare covering all city occupants. This city, with a population of about 400,000, is the eastern neighbor of Kobe. One year after the earthquake, there were 1,104 earthquake-related deaths and 6,386 casualties in the city.

Finding(s)

Our analysis clearly demonstrates that age and the degree of damage to dwellings were the most important risk factors. The age-specific mortality from this earthquake tended to be higher for the younger generation compared with deaths for the younger generation in the preceding year, but tended to be lower among the elderly. Age-specific mortality increased after age 50 years. A difference in mortality by gender was not observed.

A new variable called "physical handicaps" combined three variables, namely, bedridden elderly, physical disabilities, and intractable diseases, because of the small number of subjects with these conditions. When analysis was conducted using living alone, having physical handicaps, and being on public assistance as three independent variables, a significant risk factor was physical handicaps (odds ratio = 1.7), with a high model chi-square level.

Our study did observe a new probable risk factor—that of physical disability. This risk factor was significant for people who had lived in intact or partially destroyed dwellings. When the analysis was limited to the people who had lived in completely destroyed dwellings, no related factors were observed. When the analysis was limited to the people who had lived in either intact or partially destroyed dwellings, individuals with physical disabilities were 5.6 times more likely to have become victims of this earthquake

RRL- 0244

Title Fatal and hospitalized injuries resulting from the 1994 Northridge earthquake

Author(s) Corinne Peek-Asa, Jess F Kraus, Linda B Bourque, Dushyanthi Vimalachandra
International Journal of Epidemiology, 1998 Vol 27

Key theme(s) Northridge earthquake , Injury, disaster planning, epidemiology, risk factors

Summary

The Northridge earthquake struck Los Angeles on 17 January 1994, originating from a previously unknown thrust fault. The earthquake measured 6.7 on the Richter scale and caused extensive damage to buildings, utilities and roadways. This report describes injuries occurring in the Northridge earthquake which resulted in death or hospital admission.

Research Question(s)

Which injuries occurred in the Northridge earthquake and resulted in death or hospital admission?

Research Methodology

Earthquake-related deaths were identified by the Los Angeles Department of the Coroner. All 78 hospitals in Los Angeles County were screened for earthquakerelated admissions and were found in 16 of them. Coroner's records and medical records from the 16 hospitals were individually reviewed to identify earthquakerelated injuries and to obtain information about the injury.

Finding(s)

A total of 171 earthquake-related injuries was identified in Los Angeles County, 33 were fatal and 138 required hospital admission. Injury rates were approximately equal by gender and increased significantly with increasing age.

Cause of injuries

Most of the fatalities were due to building collapse, and most of the hospital-admitted injuries were caused by falls or being hit by objects. Motor vehicle injuries and burns were also common causes of injury.

Injury event characteristics

All 33 of the fatal injuries occurred on the day of the earthquake with 27 (81.8%) of these deaths occurring within minutes of earthquake onset (Table 3). Of the remaining fatalities, three survived up to 24 hours, 2 survived for up to 4 days, and one death occurred 8 days following the injury. Among the hospitalized, 89.1 % of the injuries occurred on the day of the earthquake although injuries related to the earthquake continued to occur until 30 January 1994.

Injury patterns

The ISS for fatalities ranged from 4 to 76 and for severe fatal injuries from 1 to 26. The head was the most commonly injured body region among fatalities (48.5%), followed by thoracic injuries (42.4%). Abdominal and lower extremity injuries were also common among fatalities. It should be noted that injury patterns by body region for fatalities may be underestimated because autopsies were not complete for 60.6% of cases.

Building inspections

Of the 57 injuries linked to building inspection data, 33 (57.8%) were non-fatal and 24 (42.1%) were fatal. Seventyfive per cent of the fatalities which were linked to the building database had reported building damage, compared with 27.3% of buildings in which hospitalized injury occurred. Injuries most often occurred in apartment complexes

Conclusion

Earthquakes cause injuries through many mechanisms, and a clearer understanding of these pathways can help focus prevention strategies. Research combining comprehensive surveillance with risk factor assessment can help identify behaviours and circumstances increasing the risk of injury in an earthquake.

RRL- 0245

Title The Epidemiology of Earthquake Injuries and Implications for Response Program Planning: A Case Study of the Gujarat Earthquake, India

Author Revati K. Phalkey

European University Degree in International Humanitarian Assistance, 2007.

Ruhr University of Bochum, Germany

Key theme(s) Epidemiology – Earthquake

Abstract / Summary

This document analyzes the injury epidemiology and treatment outcomes in the patients treated at the Bidada Sarvodaya hospital (an intact secondary rural hospital of Kutch) following the earthquake of January 26, 2001. A total of 575 patient discharge reports (over a period of 10 weeks from January 26, 2001 to April 1, 2001) were reviewed systematically by hand, for injury data.

Middle-aged males predominated our study population. Orthopedic injuries, particularly fractures of the lower limbs (tibia-fibula, femur, radius-ulna and humerus in this order of frequency), were the most common injuries reported. Two spinal cord injury patients developed paraplegia. Below the ankle was the most frequent level for

amputation. Other serious injuries like head, chest, abdominal trauma, and crush syndrome were minimal and indicative of a poor rescue and first aid effort. Open reduction with internal fixation of fractures followed by cleaning and debridement of contaminated wounds were most frequently performed surgical procedures. Four secondary deaths and 102 transfers for tertiary care were reported.

The study findings were in general agreement with results from the analysis of 29 published studies (1976-2007) reporting earthquake injury data. The author concludes that available studies have non-standardized assessments and reporting systems rendering the data obtained from them inappropriate for comparisons. An injury case reporting form has been recommended to overcome the drawbacks of standardization and inadequate data availability. The report further attempts to understand the complexities of medical response planning after earthquakes and recommends a community-based early response strategy to overcome the problem of delayed external rescue and relief.

Research Objectives

- a. To provide an overview of the epidemiology of the injuries (morbidity) observed amongst the medical care seekers at the Bidada Sarvodaya (rural charitable trust run hospital) in Kutch following the earthquake on January 26, 2001 in Gujarat, India.
- b. Analyse secondary data obtained from the discharge case report forms of patients treated at the hospital between January 26, 2001 and April 1, 2001 (10 weeks).
- c. Analyse secondary data obtained from the discharge case report forms of patients treated at the hospital between January 26, 2001 and April 1, 2001 (10 weeks).

Research Methodology

The survey is a retrospective cross sectional study based on secondary source data obtained from the Bidada Sarvodaya hospital, Mandvi, Kutch Gujarat. The author visited the hospital from August 17-24, 2007 to obtain data dated January 26, 2001 to April 4, 2001. Actual discharge report forms of patients treated for earthquake related injuries and illnesses in the hospital were investigated. A total of 1248 patient series numbers were obtained from the hospital record files. The reports were individually reviewed by hand. A total of 575 (46 %) case report forms were analyzable for the variables recorded. Patient records were analyzed for sex, age, village for geographic origin, date of admission, date of discharge, diagnosis, injury types (compound/ crush/ multiple/ soft tissue), anatomical side of injury, anatomical site of injury, level and type of fractures, presence of infection, treatment imparted, hospital procedure performed and outcome of treatment (including transfer). The data thus obtained was entered in the Microsoft® Excel: mac for descriptive analyses. Furthermore, a bibliographic review of articles was performed to support the preliminary findings from the data. PubMed, Lexis Nexis, Medline, Blackwell Synergy and Science Direct databases were used to search.

Finding(s)

Results

The mean age of the patients treated at the hospital was 30.7 years (\pm 20.87) with a range of 0 to 90 years.

There were 314 (25.1%) individuals were 18 years old or younger and 136 (13.0%) were 60 years or older. The data showed a predominance of middle-aged males. The hospital stay for a

majority of the patients (25.3%) was between 2 to 4 days. The duration of hospital stay ranged from 0 to 64 days.

136 patients reported multiple injuries and compound injuries were reported in 76 out of 575 patients. Extremity injuries included mainly fractures. Soft tissue injuries included cuts, bruises, contusions and lacerations. Lower extremity fractures dominated the overall injury type (78.0%, See Table 7). The two cases of abdominal injury were of burst abdomen type. Head injury included minor conditions mainly fractures of the mandible. Chest injuries included multiple fractures of the ribs and three cases requiring intercostal drain tube insertions for restoring respiratory function. Spinal cord injuries constituted mainly vertebral burst fractures. There were 2 cases of paraplegia reported. Nerve injuries included Brachial Plexus Injury (3), Radial nerve (2) and Radio-Ulnar nerve (1) respectively. Operative treatment was more frequent than conservative (42% of the patients) . A total of 38 amputations were recorded. Below ankle amputations were more often reported involving the foot (36%). This was similar to the crush injuries seen. There were four deaths (0.6%) reported in total.

The findings of our study agree with other reports of earthquake morbidity.

Conclusions

- There is a temporal increase in disaster mortality and a strong geographical correlation has been observed. Developing countries are most affected.
- Earthquakes are sudden impact, least predictable, high mortality and even higher morbidity phenomenon with extensive health impacts.
- Morbidity and mortality rates can be reduced greatly by strict adherence and regulation of seismic resistant building codes in earthquake prone areas and through effective rescue and timely relief.
- The cost of seismic hazard proof building is often prohibitively high in developing countries.
- Adherence to anti seismic codes is more often not mandatory in developing countries.
- Earthquakes rarely strike the same place again. Therefore the question of having gained from previous experience does not arise.
- In these circumstances rescue and relief preparedness form mainstay of effective response and impact mitigation for earthquakes.
- The Mortality to injury ratio has been observed to be 1:3 in most earthquakes in the past.
- Earthquake injuries have complex causal pathways and are influenced by many variables.
- Earthquake induced disability is an important concern especially in relation to developing countries.
- Prospective cohort studies may indicate the long-term impacts of physical injuries leading to considerable disabilities in the affected populations.
- Injury data is sparse, fragmented, incomplete and often missing.
- Most health needs and morbidity patterns following earthquakes are similar across countries.
- It then makes more sense to share data internationally. 111
- A review of the literature on earthquake injury epidemiology reveals non-standardized assessments and reporting. The study variables are random and inconsistent. The aspects compared in the studies differ greatly.

- Summary conclusions drawn from this data is largely incompetent to guide decisions for preparedness and mitigation especially in view of earthquake unpredictability. Standardized Injury Reporting forms like the one proposed in the documents need to be developed and tested in the field.
- The need for improvement in record keeping and more importantly data completeness is stressed to enhance data comparability across earthquakes and countries.
- The effectiveness of field hospitals as relief efforts is debated primarily since they arrive too late and are always a step behind in the changing health needs of the populations.
- Pre disaster preparedness is the key with a focus on community preparedness for effective rescue and pre-hospital care to improve morbidity outcomes for patients.

RRL- 0246

Title Epidemiology of Traumatic Injuries from Earthquakes

Author(s) Marizen Ramirez, Corinne Peek-Asa
Epidemiologic Reviews, 2005 Vol 27

Key theme(s)

Summary

Public health professionals face multiple challenges to prevent and reduce earthquake-related morbidity and mortality in this increasingly complex environment. To design programs to prepare for earthquakes and mitigate their effects, this article searches how to achieve a comprehensive understanding of the risks for earthquake-related injuries.

Research Question(s)

How to gain a comprehensive understanding of the risks for earthquake-related injuries?

Research Methodology

Extensive literature search of published studies on earthquake-related traumatic injuries in MEDLINE and PubMed, as well as conference proceedings. We focused our search on studies of acute traumatic injuries, excluding studies of long-term health outcomes such as crush syndrome and psychological sequelae and those that did not include direct measurements of human health outcomes, such as statistical casualty modeling predictions. Supplemental information was also collected from technical reports and databases maintained by government agencies and research institutions identified from online searches.

Finding(s)

Every earthquake is different, as is every population affected. Thus, there is a critical need for evidence-based prevention and preparedness efforts, and earthquakes provide an ongoing challenge to the field of epidemiology.

Overcoming these challenges will require increased efforts to establish better methods of collecting and sharing data across agencies at the local, national, and international levels. Continued collaborative research efforts among epidemiologists, engineers, seismologists, and geographers will enable creation of databases that contain information about multiple earthquakes. Data sharing can also lead to more comparable definitions and methodological approaches, more precise measures of exposure and risk, and access to information about populations to serve as rate denominators. For example, efforts to catalogue populations by using Geographical Information Systems can provide immediate information that can be used by first responders to pinpoint locations, buildings, and infrastructures during response, and they can also be used by researchers to build exposure databases. Linking Geographical Information Systems data with other databases, such as information collected through the census, can provide additional details about population and building characteristics.

Improved research methodologies and greater access to information can in turn be used by disaster managers to organize mitigation and response efforts (487). Protocols for both immediate and long-term response can be developed and tested in different types of populations and environments. Doing so requires that anecdotal evidence, lessons learned, and recommendations for response and relief activities commonly reported for single earthquakes be compiled, compared, and evaluated (42 ↗, 49 ↗–53 ↗). These accumulated data can provide a catalogue of the various methods for delivering medical services, surveillance, evacuating and transporting the dead and injured, and search and rescue activity. Ultimately, this information can be used for specialized teams in earthquake-prone areas that can develop response protocols specific to the risk profile of the population, the built environment, and earthquake characteristics.

RRL- 0247

Title Surgical and psychosocial outcomes in the rural injured—a follow-up study of the 2001 earthquake victims

Author(s) Nobhojit Roy, Hemant Shah, Vikas Patel, Hemant Bagalkote

Key theme(s) Injury, 2005 Vol 36
Trauma Outcome; Disaster; Post traumatic stress disorder; Rural surgery; Earthquake; Missed injuries; Reoperations; Amputation; Gujarat; India; January 2001; Developing countries; Field hospitals; International rescue; Postoperative infection; Buffer zone

Abstract / Summary

To determine the surgical outcomes of hospital care among rural population and their physical and psychosocial rehabilitation following an earthquake.

Research Methodology

We traced displaced victims treated for earthquake-related injuries to their new homes. A community health worker interviewed patients with an oral questionnaire in the local language about injuries, the examining physician and first aid, orthopaedic implants, amputations, wounds, disability, deformity, residual pain, occupational and economic rehabilitation, post traumatic stress disorder (PTSD) and perceptions of healthcare rendered.

Finding(s)

We located 133 of the 179 non-urban victims, from 11 villages. There were 10% missed injuries, 19% infection rate, restricted range of motion in 12%, non-union rate in 23% and reoperations in 30.5% patients. Fifty-one percent had resumed their previous occupation, but only 30% had recovered economically. Of 98% who had destroyed homes, 89% had their homes rebuilt. Residual sadness was the only significant PTSD symptom.

This trauma outcome study highlights the shortcomings of surgeons for disaster-related work. One-tenth of the injuries were missed, suggesting that field examination at the site of disaster was more difficult than in the comfort of the hospital emergency room. Further there were inappropriately timed, aggressive implant operations, short time commitments, a lack of follow-up and a high rate of reoperations contributing to subsequent morbidity. These pointed to a need for training in disaster medicine within the curriculum of surgical residency. On the brighter side, despite poor sterility, prolonged transport times and no prehospital care, the postoperative infection rate was lower than expected. This perhaps was due to use of potent antibiotics in a previously unexposed rural population. Good physiotherapy given in the temporary shelters, by the informal carers within the family and by voluntary groups, kept up a good range of motion and reduced the final disability. PTSD was marked 3–6 months after the event, but was minimal 2 years postquake. Sadness about the event was the only residual PTSD symptom. While there were varying perceptions of satisfactory outcome, we found good coping mechanisms in place. The simple village folks were largely happy to be alive and accepted the residual deformities and cosmetic blemishes as a “small price to pay”.

RRL- 0248

Title Morbidity Following Mexico City's 1985 Earthquakes: Clinical and Epidemiologic Findings from Hospitals and Emergency Units

Author(s) Constanza I. Sanchez-Carrillo, MD, PhD
Public Health Reports, 1989 Vol 104 ISN 5

Key theme(s) Earthquakes

Abstract / Summary

Medical records of 822 inpatients and outpatients cared for by the Department of the Federal District medical services during the 1985 Mexico City earthquakes were reviewed. Record incompleteness varied between 92.8 percent and 14.0 percent for the various study variables. No gender differences were detected among the groups; more than 70.0 percent of the patients were ages 15 to 64 years. Multiple traumatic injuries were frequent for inpatients across age groups, while simple contusions were more frequent among outpatients. Multiple head traumas, thorax-abdomen multiple traumas, and simple fractures of an arm or leg were more frequently recorded for inpatients than for outpatients. Head wounds with contusions; simple contusion of the thorax-abdomen, arms, and legs; and psychological trauma were more frequently recorded for outpatients. Although a great many records were incomplete, the data may reflect what actually happened to these patients, given the similarity of the findings with other reports of disasters. Improved record keeping during emergencies is needed to standardize the quantity and the reliability of the data so that statistical and medical care requirements are soundly based. The use of standard questionnaires for data collection is stressed to facilitate the management of clinical and epidemiologic activities. Longitudinal studies are needed to determine patterns of physical injuries, psychological trauma, and survival.

Research Objectives and Question

- a. Review medical records of inpatients and outpatients who sought emergency medical care as a consequence of the earthquakes
- b. Are the records complete?
- c. How is the morbidity among seekers of medical care?

Research Methodology

Medical care is delivered in Mexico by means of three schemes: (a) social security, (b) welfare, and (c) private. Social security is care supported by government, employees, and employer or by government and employees. Welfare care is subsidized by the government. Within Mexico City the Ministry of Health and the Department of the Federal District (DFD) provide welfare medical services to those not entitled to social security and to people who cannot afford private care. During the emergency period the three schemes provided medical care to all seekers, regardless of income and user service adscription. The DFD has 24 hospitals and emergency units distributed throughout the Federal District; 10 of these did not provide emergency medical care because they were too distant from the areas that suffered damage or because they were geared to provide gynecological and obstetric services. All medical

records from the remaining 14 units were reviewed by hand to identify those which had medical notations dated from the hour of the first tremor (7:19 a.m.) to up to 72 hours thereafter. Trained physicians initiated the medical record review a week after the main tremor and transferred demographic and health related data; that is patient's general health status, location at the time of the tremor, and injury type and site, into precoded forms. A total of 886 records were identified, of which 64 (7.2 percent) were excluded from further analysis because the notations could not be used for the study objectives or were illegible. Access to this secondary source of data resulted from a collaborative effort of the Ministry of Health, FD, and other agencies (6). Because the review was done retrospectively, it was not feasible to obtain missing data on some variables. The analysis is based, therefore, on the total number of records that included data on a given variable.

Finding(s)

Almost 73 percent of the patients, regardless of type of care received, were adults ages 15 to 64 years; the remainder were children less than 15 years old (21.9 percent) or persons older than 64 years (5.2 percent). Health status was recorded as serious for 39.5 percent of the inpatients and 15.7 percent of the outpatients.

Injuries were produced when people fell or were trapped. Information for this variable was obtained from only 58 inpatient records (24.7 percent) and 133 outpatient records (22.7 percent).

Among the hospitalized, multiple traumas were identified in more than half of the records (51.3 percent), simple fractures in 14.9 percent, and simple contusions in 10.4 percent. Compound fractures (3.9 percent), wounds with contusions (5.8 percent), other types of minor lesions (10.5 percent), and psychological traumas (3.2 percent), among others, were recorded in the remaining 23.4 percent of the records. For the outpatients, simple contusions were noted in 29.9 percent of the records, psychological traumas in 23.5 percent, wounds with contusions in 17.1 percent, multiple traumas in 11.7 percent, simple fractures in 10.6 percent, and other lesions in 7.2 percent. Compound fractures were more frequently recorded for children (7.0 percent) and the elderly (9.1 percent) than among adults. Simple contusions were experienced by 13.0 percent of adults and wounds with contusions by 18.2 percent of the elderly. Other types of injuries, such as penetrating wounds, psychological trauma, amputations, gas poisoning, and burns combined under the "other" category were mentioned in 14.3 percent of the children's records and 10.4 percent of the adults' records, but none of these were recorded for the elderly. Of the inpatients (table 3), 24 had leg injuries (30.8 percent), 21 had injuries of the thorax or abdomen (26.9 percent), 18, the head (23.1 percent), and 15, the arms (19.2 percent).

Complications observed during care were mentioned in 23 inpatient records (9.8 percent) and in 125 outpatient records (21.3 percent). No complications were reported for patients older than 64 years. Among children, brain concussions (42.9 percent) and shock (28.6 percent) were the two most frequent complications. Large vessel damage was the most commonly recorded complication among adults (25.0 percent); this was followed by other, less frequent problems such as shock, anemia, brain concussion, pulmonary insufficiency, and pneumothorax; each of these was recorded in 15.0 percent of the records. Among outpatients anemia was, by far, the most frequent (99.8 percent) complication; 29.0 percent of the anemic patients were children. Shock was the only other complication detected, and it was found on one child's record.

The findings obtained from the study agree with other reports (19,25) in that more persons who were inside their homes were injured compared with those who were outdoors. As expected, multiple traumas were more frequent (51.3 percent) among the inpatients than among the outpatients (11.7 percent), but simple contusions (29.9 percent) and psychological trauma (23.5 percent) were more frequent among the outpatients. Furthermore, leg and head injuries were equally frequent among both groups of patients (30.0 percent), and body injuries were recorded nearly twice as frequently for the inpatients (26.9 percent) as for outpatients (14.8 percent). The distribution of these findings agrees with that of other reports on morbidity due to natural disasters (19,25,28), and it may also be a reflection of adequate patient triage.

RRL- 0249

Title Extremity injuries in children resulting from the 1999 Marmara earthquake: an epidemiologic study

Author(s) Bartu Sarisözen, Kemal Durak
Journal of Pediatric Orthopaedics, 2003 Vol 12 ISN 4

Key theme(s) children, crush syndrome, earthquake, extremity injury

Summary

The purpose of this study was to determine the clinical features, type and severity of musculoskeletal injuries in paediatric age groups in comparison with adult victims of the Marmara earthquake, which occurred on 17 August 1999. Of 151 injured patients hospitalized due to musculoskeletal trauma, 31 (20.5%) were under 16 years of age. The most important problems in the patients were extremity trauma, crush syndrome, acute renal failure and other ensuing medical complications. Five (18.5%) out of 27 children with crush syndrome required haemodialysis because of acute renal failure and three (11.1%) required amputation. Haemodialysis was needed in 54 (93.1%) of 58 adult patients with crush syndrome; amputation was necessary in 12 (20.7%) of them. Although the types of injuries resulting from the earthquake were similar in adults and children, the orthopaedic consequences of these injuries showed significant differences, especially in the rates of crush syndrome leading to acute renal failure and amputation.

Research Question(s)

To determine the incidence, anatomical location, type and results of musculoskeletal injuries in children, compared with adult victims suffering from injuries caused by the Marmara earthquake.

Research Methodology

We retrospectively reviewed medical records of 659 patients who were transferred to our hospital in the first 72 h. We excluded some of the patients from the present study. The remaining 337 hospitalized patients were included in the study and categorized according to age at the time, nature and anatomic location of the injury. The injuries, treatments and complications were compared between two groups of patients: those over 16 years of age or under and those over 16 years of age. In injuries involving extremities, crush syndrome was diagnosed because of the compression of large parts of the limbs associated with marked swelling and pain, neurological disturbances or disorders in the circulation. Clinical and laboratory data were studied and the relationship between the number of injured extremities and the serum concentration of creatine kinase (CK) was established; thus, severity of the crush syndrome was analysed. In order to study the data of different age groups w2 and Mann–Whitney U tests were used and $P < 0.05$ was considered significant.

Finding(s)

Of 337 hospitalized patients, 51 were under 16 years of age and 151 had primarily musculoskeletal system injuries. The time they had been trapped under debris ranged from 3 to 72 h (8 ± 19 ; mean \pm SE).

When patients under 16 years of age were studied according to their age subcategories, it was observed that the number of total injuries and injuries in the musculoskeletal system increased in parallel with age and that the rate of chest, abdomen and head injuries in the age group of 0–5 years was higher than the other groups. Of 31 children, whose primary injuries were musculoskeletal trauma, 27 had crush syndrome, one had isolated femur fracture, one had spinal injury and two had crush extremity injury.

In children with crush syndrome, extremity injuries were classified as (1) one lower extremity in 10 children, (2) both lower extremities in 16 children and (3) both lower extremities plus one upper extremity in one child. In all these patients, both thigh and leg compartments were crushed. Of six children, crush syndrome was accompanied by brachial plexus injury in one, pneumothorax in one, femur fracture in two, tibia fracture in one and tarsal fracture in one child. Peak serum CK concentration increased significantly in relation to the number of crushed extremities. Peak serum CK concentration in children with one injured extremity was 8405 ± 8060 U/L (mean \pm SE) and with two or more injured extremities, $25\,247 \pm 10\,986$ U/L (mean \pm SE). fasciotomy was performed in only lower extremities of the 22 children because of crush syndrome.

Because of acute renal failure (ARF) resulting from crush syndrome, six (22.2%) of 27 children were treated with blood purification either by haemodialysis or by continuous intravenous fluid infusions. Of the children who were treated with fasciotomies, two required above-knee amputation and one bilateral hip disarticulation. A mean of four (± 6) additional surgical interventions had to be made for each patient with a fasciotomy. These interventions, to a large extent, consisted of wound debridements and skin grafting procedures. In 14 children wound cultures were positive on the fasciotomy sites. The bacteria grown were mainly *Staphylococcus aureus*, *S. epidermidis*, *Pseudomonas aeruginosa* and *Acinetobacter baumannii*. Four patients with crush syndrome died during the treatment period. One patient

died of sepsis and three of shock and organ failure. When the number of injured extremities was taken into account, all of the children in whom ARF developed, amputation was performed and who died had two or more extremity injuries. Of 27 children with crush syndrome, 26 had peripheral nerve palsies due to prolonged external pressure and compartment syndrome. Seven out of these children had combined femoral and sciatic nerve palsy and 20 had peroneal nerve palsy.

RRL- 0250

Title Injuries as a Result of California Earthquakes in the Past Decade

Author(s) Kimberly I. Shoaf, Loc H. Nguyen, Harvinder R. Sareen, Linda B. Bourque
Disasters, 1998 Vol 22 ISN 3

Key theme(s) Earthquakes, 1994 Northridge, California, risk factors, injury tally, injury risk
Summary

While official estimates of human toll are commonly reported following disasters, this study of actual numbers, types and causes of casualties has not developed. In this paper, we identify the numbers and risk factors for injuries within community-based samples across three earthquakes in urban California. We first report the numbers and types of injuries in each earthquake and then identify risk factors specifically associated with the Northridge earthquake.

Research Question(s)

How many and which risk factors can be identified within community-based samples across three earthquakes in urban California?

Research Methodology

Random-digit-dial (rdd) telephone surveys were conducted in affected areas after each of the three earthquakes. After the Whittier Narrows earthquake, interviews were conducted with 690 residents of Los Angeles County between 12 and 18 month post-event. Following the Loma-Prieta earthquake, interviews were conducted with 656 residents in the five counties in the San Francisco Bay area between 6 and 10 month following the disaster. After the Northridge earthquake, computer assisted telephone interviews (CATI) were conducted with a total of 1,830 residents of Los Angeles county in three waves of cross-sectional data collection between 6 and 24 month post-impact.

All three studies used similar instruments in collecting data and interviews were conducted in both English and Spanish by trained interviewers from the UCLA Institute for Social Science

Research, Survey Research Center.

In both the Whittier Narrows and Loma Prieta studies, oversampling was undertaken in the high-impact areas. In the Whittier Narrows study, the areas of oversampling included the communities of Monterey Park, Rosemead, El Monte, South El Monte and Whittier. Respondents from the rest of the county were weighted to present 2.4 individuals each, for a total weighted sample size of 1,309 cases. In the Loma Prieta study two different oversampling areas were demarcated. One area of oversampling included those areas of San Francisco and Alameda counties adjacent to the Bay Bridge and included the Marina district. The other area included parts of Santa Clara and Santa Cruz counties. Weights were calculated based on the sampling proportions with those from the general five-county area receiving a weight of 6.2; those in oversampled San Francisco/Alameda area being assigned a weight of 6.0; The total weighted sample contains 3,416 cases. The survey following the Northridge earthquake was conducted using a population proportionate to size (PPS) sample with no oversampling, for a total sample size of 1,830 cases in Los Angeles County (see Bourque et al., 1997 for details of the Northridge sample).

Finding(s)

Injuries across the three earthquakes

Following both the Whittier Narrows and Loma Prieta earthquakes, less than 1 per cent of respondents reported being physically injured as a result of the earthquake. Following the Northridge earthquake, 8.2 per cent of the respondents reported being injured as a result of the earthquake.

Characteristics of those injured

After the two Los Angeles County earthquakes, females were more likely to report being injured. After the Loma Prieta and Northridge earthquakes, whites were more likely to report being injured. After the Loma Prieta earthquake, injured respondents were significantly older than non-injured; on the contrary after the Northridge earthquake it was other way round.

Types and causes of injury

The majority of injuries reported in all three earthquakes were minor. The mechanism of injury varied across the three earthquakes.

Body part injured

In the Loma Prieta earthquake, injuries to the trunk were most common whereas in Northridge, the extremities were the most commonly reported injury site.

Predictor of injury

Those who were married or living together, males, those living in single-family dwellings (houses) and Latinos were less likely to report being injured in the earthquake. The mean age for injured respondents was 37.3 years whereas that for the non-injured was 41.3 years. Education was also related to reporting a physical injury. Being injured is also related to perception of oneself as a victim of the earthquake.

Who moved

Latinos were most likely to move from where they were at the time of the earthquake. Those

who moved were also significantly younger than those who stayed in place. Those who had children in the home were also more likely to move.

RRL- 0251

Title Musculoskeletal injuries associated with earthquake A report of injuries of Iran's December 26, 2003 Bam earthquake casualties managed in tertiary referral centers

Author(s) Tahmasebi Mohammad Naghi, Kiani Kambiz, Jalali Mazlouman Shahriar, Taheri Afshin

Injury, 2005 Vol 36

Key theme(s) Musculoskeletal injuries; Iran; Earthquake

Abstract / Summary

This is a descriptive analysis, performed on victims of Iran's December 26, 2003 Bam earthquake that were referred to tertiary referral trauma management centre in Tehran. Two hundred and ten patients were included in this study. Associated musculoskeletal injuries and renal function of the patients were recorded. The mean time under rubble was 1.9 h in our patients with a mean rescue to first medical aid time of 13.5 h. The study recorded 19 cases of compartment syndrome and 6.7% of patients had impaired renal function. The incidence of compartment syndrome had a direct relation to the time under rubble and the incidence of renal failure was directly related to rescue to first medical aid time. Axial skeleton fractures, amongst them the lateral compression type pelvic fractures, were particularly common. Fracture associated neural injuries were also common. Institution of renal protective protocols from the very first hours after injury more conservative approaches to treatment of fractures in these crush trauma patients are strongly recommended.

Research Question(s)

- a. What were the most common musculoskeletal fractures associated with in the aftermath of the Bam earthquake?
- b. How was the renal function of the patients?

Research Methodology

The musculoskeletal injuries of earthquake survivors who were admitted in Shariati Hospital were recorded. Patients admitted at the Shariati Hospital underwent a uniform protocol of initial management and apart from the trauma team, a nephrologists and a psychologist visited all patients. A total of 210 patients were included in the study. A questionnaire was used for gathering information pertaining to head and neck, urologic and abdominal injuries and information regarding the timing of care-giving and type of treatment given was also recorded on the same questionnaire. Finally, the data were analysed using descriptive statistics and regression logistic analysis by SPSS software.

Finding(s)

The mean age of the patients was 30.2 years with a range of 7–70 years. 57.6% of patients were females and the mean time under rubble was 1.9 h. The mean time from rescue to first medical aid was 13.5 h (with a range of 1–72 h) as stated by patients and the mean time from first aid to referral to Tehran was 3 days (with a range of 0.5–16 days).

We had 7 patients with upper limb compartment syndrome and 12 patients with lower limb compartment syndromes. (The compartment syndrome was defined as intra-compartmental pressure of more than 30 mmHg.) Nine patients with crushing injuries (including lacerations, contusions and pre-compartment status) in the upper limbs and 13 patients with crushing injuries in lower limbs were seen. Fourteen patients (6.7%) had major soft tissue loss. Six patients (2.9%) had acute renal failure and nine patients (3.8%) had elevated creatinine levels that responded to therapeutic measures. Three patients with acute renal failure had fasciotomies. The most common peripheral nerve injury was to the sciatic nerve (25 cases) and radial nerve (15 cases) and six (2.9%) patients had spinal injuries, which were all associated with vertebral fractures. 93.3% (14) of the radial nerve injuries were associated with fractures (11 with humeral shaft fractures). Sixty-eight percent (17) of the sciatic nerve injuries were associated with lower limb fractures or dislocations. Eighteen patients had compartment syndrome (8.6%) and 16.7% (35) had major soft tissue injury. 36.2% (76) of the patients had axial skeleton fractures (pelvic and vertebral) with 22 (10.5%) vertebral fractures and 63 (30%) pelvic fractures. The most common type of pelvic fracture was lateral compression. (32 cases) with isolated fractures (20) and anteroposterior compression fractures (5 cases) the next most common. 22.7% of vertebral fractures were associated with spinal injuries (5 cases). 29.9% of our patients had upper limb fractures and 46.7% had lower limb fractures. The most common injured bone in the upper limb was the humerus and in the lower limb the femur. 73.3% of humeral fractures were associated with radial nerve injuries and 22.7% of vertebral fractures were associated with spinal injuries. 15.2% of our patients had head injury with 6.2% intracranial and 7.6% superficial injuries. 8.1% of our patients had thoracic injuries with 8 patient with rib fractures and 8 patients with intrathoracic injuries. 8.6% of our patients had abdominal injuries which required surgery and 5 patients had urologic injuries which were all associated with pelvic fractures. The incidence of renal failure increased with increase in time from rescue to first medical aid but was relatively independent of time being under rubble. As calculated by logistic regression coefficient, there is a meaningful relation between the time being under rubble and incidence of compartment syndrome: each hour passing, the chance of incidence of compartment syndrome increases by 15.23% in the upper limbs and 13.3% in the lower limbs. In addition, a 5% increase in the chance of renal failure happens with each passing hour from the rescue to receiving first aid. Ninety patients were treated conservatively, 69 underwent open reduction and internal fixation, 20 underwent debridement or repair and 17 had external fixation. Seven patients had amputations and seven needed skin grafts.

RRL- 0252

Title Morbidity and Mortality of Hospitalized Patients After the 1995 Hanshin-Awaji Earthquake

Author(s) Hiroshi Tanaka, MD, Jun Oda, MD, Atsushi Iwai, MD, Yasuyuki Kuwagata, MD
American Journal of Emergency Medicine, 1999 Vol 17

Key theme(s) Hanshin-Awaji Earthquake

Abstract / Summary

The objective of this study was to provide an overview of the morbidity and mortality of hospitalized patients during the Hanshin-Awaji earthquake. Medical records of 6,107 patients admitted to 95 hospitals (48 affected hospitals within the disaster area and 47 back-up hospitals in the surrounding area) during the initial 15 days after the earthquake were analyzed retrospectively.

Patient census data, diagnoses, dispositions, and prognoses were considered. A total of 2,718 patients with earthquake related injuries were admitted to the 95 hospitals included in our survey, including 372 patients with crush syndrome and 2,346 with other injuries. There were 3,389 patients admitted with illnesses. Seventy-five percent of the injured were hospitalized during the first 3 days. In contrast, the number of patients with illnesses continued to increase over the entire 15-day period after the earthquake. The mortality rates were 13.4% (50/372), 5.5% (128/2,346), and 10.3% (349/3,389) associated with crush syndrome, other injuries, and illness, respectively. The overall mortality rate was 8.6% (527/6,107 patients). Morbidity as well as mortality rates increased with age in patients with both injuries and illnesses. In the initial 15-day period, there was an unprecedented number of patients suffering from trauma, and they converged upon the affected hospitals. Subsequently an increased incidence of illness was observed. This survey underscores the need for adequate disaster response in such an urban situation.

Research Question(s)

To provide an overview of the morbidity and mortality of hospitalized patients during the 15-day period following the earthquake.

Research Methodology

This is a descriptive study of patient census data covering the 15 days following the earthquake. Patient information was obtained from the medical records at 48 affected and 47 back-up (unaffected) hospitals.

"Affected hospitals" within the damage area were defined as hospitals functionally overwhelmed by a rush of patients, as well as hospitals with structures or facilities physically destroyed, making patient care in the surgical intensive care unit difficult. There were a total of 195 such affected hospitals consisting of 34,614 beds in the damage area. Excluded were 36 specialty hospitals (ie, psychiatric, pediatric, geriatric, and rehabilitation hospitals) where there were few admissions 15 days. Another 108 affected hospitals were eliminated because the

number of newly admitted patients in these hospitals was less than 40 during the first 7 days after the earthquake.

A total of 51 key affected hospitals, each having more than 100 beds were included in the study, of which 3 declined to participate in the study. The 48 hospitals which did participate in the study make up 28% of all affected hospitals and 53% of all hospital beds in the affected area .

Another 47 back-up hospitals located in the surrounding were also included in the study. These key hospitals were located beyond the damage area, in an area approximately 50 km west, 20 km north, and 50 km east of Kobe, and included 34 secondary-care and 13 tertiary-care hospitals with an average of 458 (range, 41 to 1,201) beds. These hospital facilities were not damaged, making patient care in the intensive care or surgical units possible.

The survey was completed between June 10 and December 20, 1995, by 10 board certified members of the Japanese Association for Acute Medicine in the Department of Traumatology, Osaka University Medical School. After obtaining approval from each hospital administrative office, we arranged on-site visits to review the specified medical records.

The records of inpatients with earthquake-related injuries and all illnesses in the affected hospitals were investigated. The records of transfer patients in the back-up hospitals were also investigated. There were a total of 6,107 patients requiring medical care (2,694 males and 3,413 females) admitted to hospitals during the 15 days after the earthquake. Patients dead on arrival to hospitals were excluded from this survey.

Patient census data, complaints, diagnoses, injury types and mechanisms, dispositions and prognoses were recorded retrospectively. Crush syndrome was defined by the following criteria¹⁴: (1) patients had injuries related to having been crushed under collapsed building; (2) patients manifested swelling and/or neurological disturbances, including motor and/or sensory deficits at the injury sites; (3) peak creatinine phosphokinase (CPK) was >3,000 U/L; and (4) abnormal urine conditions such as myoglobinuria and hematuria were observed.

All data were entered into an IBM computer and analyzed using Microsoft ® Access database software.

Finding(s)

Following the earthquake, 202 patients with crush syndrome developed acute renal failure; 61% required dialysis. The other traumas apparent from our survey consisted mainly of fractures and soft tissue injuries. The total number of head, thoracic, and abdominal injuries was less than 7.5% of all injuries. However, the mortality rate was high for patients with these types of injuries; 22% (11/50) of those with head injuries, 6.3% (5/79) of those with thoracic injuries, and 28% (19/67) of those with abdominal injuries.

In the Hanshin-Awaji disaster, morbidity as well as mortality rates increased with age for both injuries and illnesses.

Main roads, lifelines, and many hospitals were severely damaged. Medical equipment was also

damaged, and there was a shortage of medical staff, pharmaceuticals, and other supplies. Under these conditions, affected hospitals were completely isolated and the impact on the regular emergency medical care system was well beyond its capacity.

In the initial period, there was a massive number of patients suffering from trauma, and they converged upon the affected hospitals; subsequently an increased incidence of illness was observed. This survey clearly demonstrates the basic trends in morbidity and mortality following a major urban earthquake, with a view toward disaster preparedness.

RRL- 0253

Title Earthquakes and crush syndrome casualties: Lessons learned from the Kashmir disaster

Author(s) R Vanholder, A van der Tol, M de Smet, E Hoste
Kidney International, 2007 Vol 71

Key theme(s) Pakistan; Kashmir; earth quake; crush syndrome; rhabdomyolysis

Abstract / Summary

Major earthquakes may provoke a substantial number of crush casualties complicated by acute kidney injury (AKI). After the 1988 Armenian earthquake, the International Society of Nephrology (ISN) established the Renal Disaster Relief Task Force (RDRTF) to organize renal care in large disasters; this approach proved to be useful in several recent disasters. This paper depicts the organizational aspects of the rescue intervention during the Kashmir earthquake, in 2005. Specific problems were fierce geographic circumstances, lack of pre-registered local keymen, transportation problems, and inexperience of local teams to cope with problems related to mass disasters. Once treatment was installed, global outcomes were favorable. It is concluded that well-organized international help in renal disasters can be effective in saving many lives, but still necessitates conceptual adaptations owing to specific local circumstances.

Research Question(s)

To depict organizational aspects of the rescue intervention during the Kashmir earthquake, in 2005

Finding(s)

The entire Kashmir intervention of the RDRTF lasted for 22 days. In total, 88 victims with AKI were registered in the broad Islamabad area. Related to a global mortality of 73 000 in Kashmir, these figures are substantially lower than the ones observed in the Marmara earthquake in 1999 with 639 AKI cases for 17 480 deaths (ratio AKI/deaths1000:1.2 vs 36.6,

$P=0.001$) (Table 3). Of those 88, 55 (63%) needed dialysis (Table 3). If the number of those needing dialysis is related to the global mortality number, the figures are again substantially lower in Kashmir than the ones observed in the Marmara earthquake (0.8 vs 27.3, $P=0.001$) (Tables 3 and 4). These low numbers of AKI cases compared to the number of fatalities underscore the difficulties in rescue and transportation.

Once rescued, the need for dialysis among victims with AKI was similar or even lower in Kashmir, as compared to other major earthquakes. In the Marmara earthquake, for example, need for dialysis was higher (74 vs 63%, $P=0.016$) (Table 3). Overall mortality of AKI patients was 15/85 in Kashmir (19%) (Table 3) and this figure was similar to the frequencies observed after the Marmara (15%) (Table 3), Chi-Chi (17%), and Bam earthquakes (13%) ($P=NS$). Considering the extreme circumstances, the overall mortality rate in Kashmir compares favorably to these previous disasters.^{9,19,20} Of note, mortality figures after major disasters should be considered with care as they may be prone to many uncontrollable factors. The first patient with AKI was hospitalized within the first 24 h after the disaster and the first dialysis session was started in the same patient, also during the first 24 h. Dialysis activity increased gradually. The maximal dialysis activity was reached at day 10, when there were 39 patients dialyzed, distributed over five hospitals. A total number of 54 victims received dialysis. The last dialysis took place at day 45. Daily dialysis was performed in 27 patients, whereas 21 patients received alternate day dialysis; in two patients, even longer intervals were respected, and dialysis frequency was not exactly known in four patients. Dialysis sessions lasted 3–4 h. Daily dialysis was more frequently performed at PIMS Hospital and in more heavily affected victims, such as those having undergone fasciotomy

Problems with transportation of patients.

The low number of AKI patients and their late admission are attributable to transportation difficulties; it is conceivable that many victims with AKI died from complications, essentially hyperkalemia, before they could reach a hospital. The same conditions also hampered the transport of infusion fluids into the damaged area. Relevant numbers of AKI cases started being hospitalized only 5–7 days after the earthquake, which is late.

Conclusion

Effective treatment of crush casualties remains one of the most important measures in decreasing disaster-related death toll. Medical experience from past disasters may be helpful in preventing the repetition of previous mistakes and will improve outcomes. As every disaster is unique, developing different disaster scenarios for various parts of the world is important for decreasing logistic pitfalls of future catastrophes. We hope that our present analysis of the most recent Kashmir disaster may be helpful to reach this aim.

RRL- 0254

Title Earthquakes in El Salvador: A Descriptive Study of Health Concerns in a Rural Community and the Clinical Implications, Part I

Author(s) Joanna C. Woerschling, Audrey E. Snyder
Disaster Management & Response, 2003 Vol 1 ISN 4

Key theme(s) Earthquake; health implications; rural communities

Abstract / Summary

This is the first article in a series that evaluates the health concerns of people living in a Salvadoran rural community after major earthquakes. Part I reviews the background, methods, and results of post-earthquake conditions with regards to healthcare, access to healthcare, housing, food, water and sanitation. Part II reviews the implications of these results and recommendations for improvements within the community. Part III investigates the psychosocial and mental health consequences of the earthquakes and provides suggestions for improved mental health awareness, assessment, and intervention.

El Salvador experienced 2 major earthquakes in January and February 2001. This study evaluates the effects of the earthquakes on the health practices in the rural town of San Sebastian.

This study evaluated 594 individual family members in 100 households.

Results: Communicable diseases affected a number of family members. After the earthquakes, 38% of households reported new injuries, and 79% reported acute exacerbations of chronic illness. Rural inhabitants were 30% more likely to have an uninhabitable home than were urban inhabitants. Concerns included safe housing, water purification, and waste elimination. The findings indicate a need for greater public health awareness and community action to adapt living conditions after a disaster and prevent the spread of communicable disease.

Research Question(s)

To evaluate the effects of the earthquakes on the health practices in the rural town of San Sebastian.

Research Methodology

The research was conducted with use of a convenience sample survey of subjects affected by the earthquakes. The sample included 594 people within 100 households. The 32-question survey assessed post-earthquake conditions in the areas of health care and access to care, housing, food and water, and sanitation.

Finding(s)

The primary preexisting health concerns were hypertension, renal disease, heart disease, tobacco use and alcohol use. New injuries occurred in 38% of the households with 79% had a

member that experienced an exacerbation of a chronic disease. Of the households surveyed, 48% needed to use healthcare resources after the earthquakes with 85% reporting the receipt of some form of assistance. Over 52% of homes were uninhabitable. Changes occurred in access to food, cooking fuel and water. There were significant differences in rural and urban environments such as a greater ability to manage a chronic ailment in the urban environment. Urban residents were more likely to use a community trash collection system whereas rural residents were more likely to throw their garbage on the ground. Participants in the rural environment were more likely to have an uninhabitable home, as well as, receive temporary housing. The implications of these results and recommendations will be addressed in Part II of the Earthquakes in El Salvador Descriptive Study series.

RRL- 0255

Title Chest Injuries Transferred to Trauma Centers After the 1999 Taiwan Earthquake

Author(s) Wen Yi-Szu, MD, Hsu Chung-Ping, MD, Lin Tzu-Chieh, MD, Yang Dar-Yu, MD
American Journal of Emergency Medicine, 2000 Vol 18

Key theme(s) Taiwan Earthquake, Chest Injuries

Abstract / Summary

To better understand the effects of delayed medical care and long transportation times when emergency medical services (EMS) failed after the 1999 Chi-Chi, Taiwan earthquake, we analyzed the patterns and outcomes of patients with chest injuries who were transferred to an unaffected back-up hospital. The medical records of 164 trauma patients who were transferred to Taichung Veterans General Hospital from September 21 to September 24, 1999 were reviewed. Of the 164 patients, 26 (15.9%) had chest injuries. Chest injuries were caused by blunt trauma in all cases. Minor chest injury was noted in 16 patients (61.5%). Mortality developed in two patients, who were transferred after first aid in the field hospital and were in shock status on arrival to emergency department of the back-up hospital. Inadequate resuscitation attributable to insufficient manpower in field hospitals and long transportation times to back-up hospitals are the major problems to be solved in developing disaster plans. For evacuation of overwhelming casualties and for support of medical resources, transportation by helicopter is suggested in aftermath of a large earthquake.

Research Question(s)

- a. What are the effects of delayed medical care and long transportation times when emergency medical services fail after an earthquake?
- b. Which patterns and outcomes of patients with chest injuries referred to an unaffected backup hospital in the aftermath of the 1989 Chi-Chi earthquake can be found?

Research Methodology

The study analyzed traumatized patients admitted at the Taichung Veterans General Hospital during the first 3 days after the earthquake. This hospital serves as a level I trauma center in the central part of Taiwan island, and is the only hospital in this region with a helicopter landing area. This hospital was not affected by the earthquake, and served as a back-up hospital. The medical records of 164 trauma patients referred to this hospital from September 21 to September 24 were reviewed.

Finding(s)

- 1) In this study, most of the chest injuries were minor or superficial (61.5%) .
- 2) In all of the 26 patients with chest injuries resulted from blunt trauma. Of the 26 patients, 19 were transferred on the first day, 5 on the second day, and 2 on the third day (Table 1). Chest wall contusion and superficial injury were diagnosed in 16 patients (61.5%).
- 3) Fracture of rib was noted in 8 patients, including one with flail chest and four with combined hemopneumothorax.
- 3) Hemothorax and pneumothorax developed simultaneously in six patients. Two of these six patients did not present with rib fractures. All of the patients with hemopneumothorax had associated injuries other than the chest injuries. Mortality developed in two patients.
- 4) Traumatic asphyxia was noted in two patients transferred from field hospitals and hemodynamically stable on arrival to the ED. They both recovered functionally 3 days later. Three patients were in shock status on arrival at the ED.
- 5) Crush syndrome of the extremities was found in only 2 of the 26 patients with chest injuries. However, there were two patients with traumatic asphyxia because of entrapment within collapsed walls.
- 6) Almost all of the hospitals were affected and EMS failed. However, field hospitals still took the responsibility of first-line resuscitation for the traumatized patients. Triage in field hospitals was important, because overwhelming casualties exceeded capacity of hospitals and EMS, and resources were not available in the first several hours after the earthquake. Rescuers and medical staff could only perform primary survey and resuscitation of traumatized patients.
- 7) Impassable roads and disrupted communication systems made it extremely difficult to respond adequately. Many volunteer doctors and overseas disaster relief specialists ended up wasting time on circuitous detours before joining the rescue effort.

RRL- 0256

Title Profile of Chest Injuries Arising From the 1995 Southern Hyogo Prefecture Earthquake

Author(s) Naoki Yoshimura, Shinichi Nakayama, Keitaro Nakagiri, Takashi Azami

Chest, 1996 Vol 110 ISN 3

Key theme(s) chest injury; crush syndrome; earthquake

Abstract

Study objective: To better understand the types of chest injuries that are likely to occur following a major earthquake in the urban environment, we analyzed the pattern of chest injuries arising from the earthquake that struck the southern part of Hyogo Prefecture in Japan at 5:46 am on January 17, 1995 and registered 7.2 on the Richter scale.

Design and setting: The medical records of 487 patients with injuries who were referred to Kobe University Hospital from January 17 to January 23 were reviewed.

Results: Of the 487 patients, 63 (12.9%) were found to have chest injuries. Of these 63, eight patients with severe chest compression were dead on arrival at the hospital. Eight patients were admitted to our hospital, two of whom developed crush syndrome. The remaining 47 (74.6%) patients had light to moderate injuries and were treated in the emergency department on an outpatient basis.

Conclusions: Minor trauma was the most common type of chest injury. However, there were severely injured patients who were trapped in collapsed buildings.

Morbidity and Mortality of Windstorms, Hurricanes and Cyclones

RRL- 0257

Title Nutritional status of children under 5 years of age in three hurricane-affected areas of Honduras

Author(s) Roberto E. Barrios, James P. Stansbury, Rosa Palencia, Marco T. Medina
Pan American Journal of Public Health, 2000 Vol 8 ISN 6

Key theme(s) Hurricanes, Honduras, child nutrition

Abstract / Summary

Hurricanes and other natural disasters can produce crop destruction, population displacement, infrastructure damage, and long-term public health consequences that include increased malnutrition among the affected populations. This paper presents the results of anthropometric measurements taken of 295 children under 5 years of age from three regions of Honduras that were affected by Hurricane Mitch, a major storm that struck Central America in the fall of 1998. The children in our study were sampled in three shelters in the capital city of Tegucigalpa; in the resettlement zone of Nueva Choluteca, Choluteca; and in the small urban area of Catacamas, Olancho. Our data indicated that, in comparison to the period before the hurricane, there was an elevated prevalence of wasting in all three of the study areas, and that there were also high levels of underweight in the Tegucigalpa and Nueva Choluteca study areas. There were statistically significant differences between the mean values of malnutrition indicators for Catacamas and those for the Tegucigalpa and Nueva Choluteca settlements. These differences suggest that resettled families were confronting a nutritional crisis in July and August of 1999, some 9 months after the hurricane struck.

Research Methodology

During July and August of 1999 we collected height, weight, and epidemiological information on 295 children under the age of 5 years: 99 children in the department of Olancho, 96 children in the department of Choluteca, and 100 children from three shelters in Tegucigalpa. The measurements were collected by three field researchers: a nutritionist, a registered nurse, and an anthropologist. Study reliability was determined from a subsample of 30 repeat observations. Reliability and technical error of measurement (TEM) were calculated in line with Ulijaszek.

Finding(s)

Our anthropometric results reflect adequate levels of interobserver reliability and reduced

measurement error. The calculated TEMs for height/recumbent length and for weight were 0.44 cm and 0.16 kg, respectively. Reliability for height was 99.8%, and the figure for weight was 99.5%. Table 1 shows the prevalence of severe malnutrition and of mild-to-moderate malnutrition (MMM) as measured by height-for-age z scores (HAZ), weight-for-height z scores (WHZ), and weight-for-age z scores (WAZ), described as stunting, wasting, and underweight, respectively. To make comparisons we obtained malnutrition prevalence information from studies done in Honduras in the years before Hurricane Mitch, from 1987 through 1996 (Table 1). Overall, the prevalence levels of mild-to-moderate stunting, wasting, and underweight were higher in the temporary settlements of Tegucigalpa and Nueva Choluteca than they were in the Catacamas community sample. Chi-square analysis indicated there was a statistically significant difference in the prevalence of stunting and underweight among the three regions ($P < 0.01$). Differences in the prevalence of wasting among the three samples were not statistically significant, despite the elevated prevalence of low weight-for-height in the samples in the temporary settlements in Tegucigalpa and Nueva Choluteca. Table 2 shows the means for anthropometric indicators in the three samples. The nutritional status of children in Catacamas was better on average than it was for the children studied in Nueva Choluteca and in Tegucigalpa, for all three anthropometric indices. Tested with ANOVA, differences among the areas were significant for all three indices. Additionally, *t* tests indicated statistically significant differences between Nueva Choluteca and Tegucigalpa for mean WHZ ($P = 0.0373$) and between Nueva Choluteca and Catacamas for the same indicator ($P = 0.0043$). The significantly lower average weight-for-height score and elevated prevalence of wasting in Nueva Choluteca underline the acute nutritional emergency faced by those resettled in this area at the time of our survey.

RRL- 0258

Title Risk factors for mortality in the Bangladesh cyclone of 1991.

Author(s) C. Bern, J. Snizek, G. M. Mathbor, M. S. Siddiqi

Bulletin of the World Health Organization, 1993 Vol 71 ISN 1

Key theme(s) Cyclone, Bangladesh, mortality

Abstract / Summary

Cyclones continue to pose a dangerous threat to the coastal populations of Bangladesh, despite improvements in disaster control procedures. After 138,000 persons died in the April 1991 cyclone, we carried out a rapid epidemiological assessment to determine factors associated with cyclone-related mortality and to identify prevention strategies. A nonrandom survey of 45 housing clusters comprising 1123 persons showed that mortality was greatest among under-10-year-olds (26%) and women older than 40 years (31%). Nearly 22% of persons who did not reach a concrete or brick structure died, whereas all persons who sought refuge in such structures survived. Future cyclone-associated mortality in Bangladesh could be prevented by more effective warnings leading to an earlier response, better access to

designated cyclone shelters, and improved preparedness in high-risk communities. In particular, deaths among women and under-10-year-olds could be reduced by ensuring that they are given special attention by families, neighbours, local authorities, and especially those in charge of early warnings and emergency evacuation.

Research Question(s)

To identify factors that might have determined why some people survived and others did not.

Research Methodology

The survey was conducted in two coastal districts of Bangladesh: Chakaria on the mainland, and Kutubdia, an offshore island. Both these areas were severely affected by the cyclone, losing 10% or more of their population, and were accessible using local transport. Most inhabitants lived in houses made of bamboo and thatch (kutcha), but a few affluent members of the community lived in houses made of brick or concrete (pukka). Commercial markets and community buildings are generally pukka. The dwellings stand in clusters of 2-10 houses, representing an extended family.

The study was carried out in areas that were severely affected to maximize the amount of data collected on risk factors for mortality (7). The sample was therefore not population-based, and excluded areas that could not be reached by local transport at the time of the survey. No attempt was made to estimate total mortality from the cyclone.

Finding(s)

We hypothesized that people who heard the warning early would be more likely to survive. However, although nearly every household surveyed was warned about the cyclone 3-6 hours before its impact, this awareness was not associated with a decreased risk of dying.

Two features can be identified to make cyclone warnings more effective. First, warnings should be simplified and made more specific about the estimated time until impact, the areas forecast to be most affected, and the response required by the population. Second, people must be educated, through community activities, drills, and exercises, to be better prepared to take shelter.

Sheltering behaviour is a major determinant of survival (10, 11). No one who reached a pukka building died, but in most of the areas surveyed, the short time between the approach and impact of the storm surge prohibited late responders from reaching an effective shelter. Shelters should therefore be made more accessible. Three of the five cyclone shelters surveyed were virtually unused, and only a small proportion of the people surveyed who reached safe locations used cyclone shelters. By far the greatest number of people in safe shelter were those who sought refuge in small public buildings such as markets, schools, and mosques. A few private pukka houses also provided shelter to immediate neighbours.

RRL- 0259

Title of article Weathering the Storm: The Impact of Hurricanes on Physical and Mental Health

Author(s) Linda B. Bourque, Judith M. Siegel, Megumi Kano, Michele M. Wood

The ANNALS of the American Acad. of Political and Social Science, 2006 Vol 604 ISN 29

Key theme(s) hurricanes; physical health; mental health; evacuation; morbidity; mortality; Hurricane Katrina

Summary

The authors briefly review the deaths, injuries, and diseases attributed to hurricanes that made landfall in the United States prior to Hurricane Katrina; recent hurricane evacuation studies and their potential for reducing death, injury, and disease; information available to date about mortality, injury, and disease attributed to Hurricane Katrina; and psychological distress attributable to hurricanes. Drowning in salt water caused by storm surges has been reduced over the past thirty years, while deaths caused by fresh water (inland) flooding and wind have remained steady. Well-planned evacuations of coastal areas can reduce death and injury associated with hurricanes. Hurricane Katrina provides an example of what happens when evacuation is not handled appropriately. Preliminary data indicate that vulnerable elderly people were substantially overrepresented among the dead and that evacuees represent a population potentially predisposed to a high level of psychological distress, exacerbated by severe disaster exposure, lack of economic and social resources, and an inadequate government response.

Research Question(s)

- a. Which impacts on physical and mental health due to hurricanes have been reported till know?
- b. Which role does preparation and prevention play and how good did it work in the past?
- c. Which are approaches are thinkable for better prevention?

Research Methodology

Literature Review

Finding(s)

1. The impact of hurricanes, cyclones, and typhoons on physical and mental health differs substantially between developed and developing countries. Within the United States and its territories, an area at high risk of hurricanes, mortality rates have declined over the past century, and the causes of mortality have shifted considerably. Few people drown in a storm surge; rather, they drown in flooded inland rivers and other bodies of water, or die from injuries caused by falling trees, collapsing structures, or other wind-tossed debris. In contrast, mortality in developing countries continues to be high, and a substantial proportion of deaths result from drowning in storm surges.

2. Deaths that occur during the impact phase could be prevented if officials issued timely evacuation orders and provided transportation for those unable to evacuate and if coastal residents heeded recommendations to evacuate. Especially vulnerable elderly should be evacuated early.
3. Postimpact deaths and injuries primarily occur during cleanup activities and as a result of naive attempts to replace nonfunctioning utilities. Both chain saws and portable generators consistently are reported to be a source of injury, illness, and death following hurricanes.
4. Studies of psychological morbidity following hurricanes suggest that distress increases in both children and adults but diminishes with the passage of time. Severity of exposure and prehurricane mental health problems are the most consistent predictors of distress.

RRL- 0260

Title Health Concerns of Women and Infants in Times of Natural Disasters: Lessons Learned from Hurricane Katrina
Author(s) William M. Callaghan, Sonja A. Rasmussen, Denise J. Jamieson, Stephanie J. Ventura
 Maternal and Child Health Journal, 2007 ISN 11

Key theme(s) Hurricane katrina . Pregnant women and infants . Natural disasters

Summary

Pregnant women and infants have unique health concerns in the aftermath of a natural disaster such as Hurricane Katrina. Although exact numbers are lacking, we estimate that approximately 56,000 pregnant women and 75,000 infants were directly affected by the hurricane. Disruptions in the supply of clean water for drinking and bathing, inadequate access to safe food, exposure to environmental toxins, interruption of health care, crowded conditions in shelters, and disruption of public health and clinical care infrastructure posed threats to these vulnerable populations. This report cites the example of Hurricane Katrina to focus on the needs of pregnant women and infants during times of natural disasters and provides considerations for those who plan for the response to these events.

Research Methodology

The authors outline the historic risk of adverse pregnancy outcomes and low breastfeeding rates from population-based data in the affected areas. They then briefly review how the Centers for Disease Control and Prevention (CDC) and other public health agencies responded to the urgent needs of pregnant women and their infants following Hurricane Katrina. Finally,

using Hurricane Katrina and its aftermath as a paradigm, they suggest considerations for addressing the needs of pregnant women, infants, and breastfeeding mothers when preparing for disaster response.

Finding(s)

In response to the events precipitated by Hurricane Katrina, CDC formed a multidisciplinary, cross-agency response group to address the urgent needs of pregnant women and infants. A fact sheet for pregnant women was incorporated into a packet of materials for distribution to evacuees, and a public service announcement with basic messages for pregnant women was broadcast in areas where large numbers of evacuees were relocated. The fact sheet was designed to aid non-obstetric health care providers in triaging pregnant women and providing basic prenatal services (<http://www.bt.cdc.gov/disasters/pregnantdisasterhcp.asp>). The fact sheet emphasized awareness of the possibility of pregnancy, re-instituting prenatal services for women whose care was interrupted, basic trimester-appropriate Components of prenatal care, and signs and symptoms that should prompt urgent referral to a facility equipped to deal with acute obstetric care. Free telephone counseling about the effects of specific exposures on pregnancy or lactation was made available to women and their health care providers, under a CDC contract with the Organization of Teratology Information Specialists (OTIS) (www.otispregnancy.org). Extensive information on potential exposures and what was known about their impact on the pregnant woman and fetus was made available as fact sheets on OTIS's website. CDC also published guidelines on its website for non-obstetric providers about care of pregnant women, and distributed information about infant feeding, stressing the importance of continuing breastfeeding and offering recommendations for using infant formula (e.g., using ready-to-feed formula, cleaning bottles). Pregnant women and infants have unique health concerns in the aftermath of a natural disaster such as Hurricane Katrina. Disruptions in the supply of clean water for drinking and bathing, inadequate access to safe food, exposure to environmental toxins (e.g. carbon monoxide due to the inappropriate indoor use of devices powered by liquid fuels and natural gas), interruption of health care, crowded conditions in shelters, and disruption of public health and clinical care infrastructure posed threats to these vulnerable populations. Loss of electricity limits access to information and strategies to address the challenges to dissemination must be addressed.

RRL- 0261

Title Deaths Associated with Hurricane Georges — Puerto Rico, September 1998
Centers for Disease Control and Prevention
Morbidity and Mortality Weekly Report, 1998 Vol 47 ISN 42

Key theme(s) Hurricane George, Mortality

Summary

This report presents preliminary data about deaths resulting from the hurricane in Puerto Rico. Preliminary findings of the investigation of deaths in Puerto Rico associated with Hurricane Georges indicate that all deaths occurred during the post-impact phase. Because improvements in hurricane warning systems have greatly decreased deaths during the impact phase of such storms in many areas, additional intervention efforts in these localities should focus on adverse health events in a storm's aftermath, such as those associated with storm damage and clean-up.

Research Question(s)

What are the number and causes of deaths associated with Hurricane Georges in Puerto Rico?

Research Methodology

Case studies reported by the Medical Examiner. The ME determined whether a death was hurricane-related, including deaths during the impact phase of the storm (i.e., associated with high winds, storm surge, or flash flooding), and during the post-impact phase (i.e., associated with hurricane-related effects such as structural damage, power outages, and injuries incurred during cleanup).

Finding(s)

Preliminary findings of the investigation of deaths associated with Hurricane Georges indicate that all deaths occurred during the post-impact phase. Because improvements in hurricane warning systems have greatly decreased deaths during the impact phase of such storms in many areas, additional intervention efforts in these localities should focus on adverse health events in a storm's aftermath, such as those associated with storm damage and clean-up.

RRL- 0262

Title Carbon Monoxide Poisoning After Hurricane Katrina --- Alabama, Louisiana, and Mississippi, August--September 2005
Morbidity and Mortality Weekly Report, 2005 Vol 54 ISN 39
Centers for Disease Control and Prevention

Key theme(s) Hurricane Katrina; Carbon Monoxide; gasoline-powered engines.

Summary

Hurricane Katrina resulted to the loss of life, widespread property damage, and power outages. Due to the use of portable generators and other gasoline-powered appliances for electrical power and cleanup after the disaster, a total of 51 cases of CO poisoning were reported by hyperbaric oxygen (HBO₂) facilities in Alabama, Louisiana, and Mississippi.

This report describes these cases and the rapidly implemented reporting system that identified them.

Research Question(s)

To describes the cases of CO poisoning and then rapidly implement a reporting system that identifies them

Research Methodology

To monitor cases of CO poisoning from HBO₂ facilities after Hurricane Katrina, CDC collaborated with the Undersea and Hyperbaric Medicine Society (UHMS). The compiled cases reported by members were submitted to the CDC which then shared the information with affected states on a daily basis.

HBO₂ facilities were asked to report information on individual cases and incidents in which multiple persons were poisoned by the same exposure, the date of presentation to the HBO₂ facility, state of residence, source of exposure, and the source of HBO₂ treatment. Of the 35 HBO₂ facilities (Alabama: five, Mississippi: 10, and Louisiana: 20), four (one, two, and one, respectively) reported treating patients. The extent of underreporting of treated patients is unknown.

Finding(s)

A total of 51 cases of CO poisoning among residents of Alabama, Louisiana, and Mississippi were reported by the HBO₂ facilities during the period August 29--September 24. These cases included 46 nonfatal CO poisoning cases and five deaths. Among the nonfatal cases, 16 occurred in residents of Louisiana, 24 in residents of Alabama, and six in residents of Mississippi. Among the 46 nonfatal CO poisoning cases, 37 occurred in patients who were treated with HBO₂, and nine in patients who received high flow oxygen. None of the patients treated with HBO₂ died. All five decedents were Louisiana residents. One exposure incident accounted for four of the deaths and one nonfatal case. Another incident accounted for one

death and two nonfatal exposures. Two incidents each involved seven nonfatal cases. A total of 38 (74.5%) of the cases occurred within the first week after the hurricane; the other 13 (25.5%) occurred during September 6--24.

The source of exposure for all but one of the nonfatal cases was exhaust from a portable generator. One nonfatal case was associated with use of a gasoline-powered pressure washer. The incident in which four deaths and one nonfatal CO poisoning occurred involved use of a generator in a house. The single death with two nonfatal CO poisoning cases involved use of a generator in a garage. The locations of the generators for the other cases were: under a deck (28.6%), near a window (26.2%), in a shed (16.7%), in a garage (11.9%), in a carport (9.5%), and in a basement (7.1%).

Since March 15, 2003, CDC and the American Association of Poison Control Centers (AAPCC) have collaborated to facilitate the early detection of chemical exposures of public health importance. Carbon monoxide is one of several exposures monitored. During August 29--September 24, AAPCC reported a total of 58 calls regarding CO exposure: eight in Mississippi, 21 in Alabama, and 29 in Louisiana. No deaths were reported from these exposures.

RRL- 0263

Title Infectious Disease and Dermatologic Conditions in Evacuees and Rescue Workers After Hurricane Katrina --- Multiple States, August--September, 2005

Author(s) Centers for Disease Control and Prevention
Morbidity and Mortality Weekly Report, 2005 Vol 54

Key theme(s) Infectious diseases, Dermatologic conditions, Hurricane Katrina

Summary

On August 29, 2005, Hurricane Katrina struck states along the Gulf Coast of the United States. In the days after the hurricane struck, approximately 750 evacuation centers were established in at least 18 states to accommodate more than 200,000 evacuees. State and local health departments, with assistance from CDC, initiated enhanced infectious disease surveillance and outbreak response activities, implemented by teams of public health and rescue workers, including military personnel. Outbreak monitoring included direct reporting of conditions of public health significance to public health agencies; daily contact between CDC and local public health officials; canvassing of reports from CDC, public health departments, and news media for potential infectious disease outbreaks; and investigation of reports of infectious disease with outbreak potential. This report summarizes infectious disease and dermatologic conditions reported during the first 3 weeks after the hurricane, before effective local surveillance was fully implemented. One outbreak of norovirus was reported among evacuees in Texas; no other outbreaks requiring unusual mobilization of public health resources were reported among evacuees or rescue workers.

Research Objective

Review of the infectious disease and dermatologic conditions reported during the first 3 weeks after the hurricane.

Research Methodology

Reviewing of reported clinical data.

Finding(s)

Dermatologic Conditions

A cluster methicillin-resistant *Staphylococcus aureus* (MRSA) infection was reported in approximately 30 pediatric and adult patients at an evacuee facility in Dallas, Texas. Three of the MRSA infections were confirmed by culture. In addition, 24 cases of hurricane-associated *Vibrio vulnificus* and *V. parahaemolyticus* wound infections were reported, with six deaths. Among rescue workers, CDC received reports of the following two types of skin lesions with infectious etiology: tinea corporis among military personnel from two locations working in the wet environment of early evacuation efforts, and an erythematous, papular, and pustular rash consistent with folliculitis among military personnel working in Mississippi. In addition, the following three rashes subsequently determined to be noninfectious were reported in rescue workers: 1) prickly heat (miliaria crystalline, rubra, and pustulosa); 2) two clusters of nonpruritic erythematous papular, nonfollicular lesions in exposed skin of 97 military rescue workers in Louisiana presumed to have been caused by arthropod (likely mite) bites; and 3) circumferential lesions, appearing as bands of macerated skin at the waist, attributed to excessive chafing.

Diarrheal Disease

There were reports of diarrheal disease among persons in evacuation centers in Louisiana, Mississippi, Tennessee, and Texas. Approximately 1,000 cases of diarrhea and vomiting were reported among adult and child evacuees in Mississippi and Texas; tests detected norovirus in stool specimens from patients in Texas. Sporadic nontyphoidal *Salmonella*, nontoxigenic *V. cholerae* O1, and other infections were identified. No confirmed cases of *Shigella* dysentery, typhoid fever, or infection by toxigenic *V. cholerae* O1 were reported in evacuees from Hurricane Katrina. Three weeks after the initial displacement caused by Katrina, few cases of diarrheal disease were being reported.

Respiratory Disease

Upper respiratory infections and pneumonias were reported among evacuees, including a case of pertussis in an infant aged 2 months. Appropriate antimicrobial prophylaxis was provided, and contact tracing identified no additional cases.

A homeless person without a previous diagnosis of TB was found to have TB. Eight other evacuees initially showing TB symptoms were subsequently determined to have other conditions (e.g., lung cancer and infection with nontuberculous mycobacteria).

Intense effort was exerted to locate the individuals who were undergoing TB treatment when Hurricane Katrina struck to check on their condition and assure them that the treatment will be continued.

RRL- 0264

Title Norovirus Outbreak Among Evacuees from Hurricane Katrina --- Houston, Texas, September 2005
Morbidity and Mortality Weekly Report, 2005 Vol 54 ISN 40

Key theme(s) Norovirus, Hurricane Katrina

Summary

During the week after Hurricane Katrina struck the Gulf Coast on August 29, 2005, an estimated 240,000 persons, mostly from Louisiana, evacuated to Houston, Texas. On August 31, an estimated 24,000 evacuees were sheltered temporarily at facilities in Reliant Park, a sports and convention complex that includes Reliant Astrodome, Reliant Center, and Reliant Arena. All evacuees to these three facilities were provided with cots, bedding, food, water, and access to lavatories and showers. A medical facility was set up initially to provide emergency care to evacuees and subsequently to serve as a comprehensive outpatient clinic staffed largely by personnel from the Harris County Hospital District (HCHD), Baylor College of Medicine (BCM), and Texas Children's Hospital (TCH). On September 2, 2005, physicians and staff from Harris County Public Health and Environmental Services (HCPHES) noted a substantial number of adults and children with symptoms of acute gastroenteritis (defined as diarrhea and/or vomiting) at the medical clinic in Reliant Park. In collaboration with HCPHES, CDC and medical personnel of HCHD, BCM, and TCH conducted enhanced surveillance to improve identification of acute gastroenteritis, investigate the apparent outbreak, identify the infectious agent, and implement measures for its control. This report summarizes the preliminary epidemiologic data from this investigation and underscores the challenges to managing a large and rapidly spreading outbreak of norovirus in crowded evacuee settings.

Research Question(s)

To summarize the preliminary epidemiologic data from this investigation.

Research Methodology

A simple checklist of symptoms was used by HCPHES to collect data on a triage intake form. Data were used as an index of medical problems and care delivered. This information was gathered and entered into a centralized database nightly by HCPHES staff members, and results were distributed to the surveillance team each morning.

Finding(s)

During September 2--12, 2005, approximately 6,500 of the estimated 24,000 evacuees visited the Reliant Park medical clinic, and 1,169 (18%) persons reported symptoms of acute gastroenteritis. Three fourths of the patients with acute gastroenteritis symptoms were adults (aged ≥ 18 years) residing in the three facilities housing evacuees at Reliant Park or in smaller shelters and hotels in Houston. The number of acute gastroenteritis cases peaked on September 5, when 211 persons reported acute gastroenteritis symptoms, and cases declined slowly thereafter. A total of 511 (44%) patients reporting acute gastroenteritis symptoms had

diarrhea alone, 342 (29%) reported vomiting, and 316 (27%) reported both diarrhea and vomiting. During September 2--12, approximately 14% of adult visits to the medical clinic and 28% of pediatric visits were for acute gastroenteritis; on peak days, these figures reached 21% and 40%, respectively (other common reasons for visits were chronic diseases and medication refills). In addition, medical personnel, police officers, and volunteers who had direct contact with patients reported acute gastroenteritis symptoms, suggesting substantial secondary spread, presumably by person-to-person contact or fomite transmission. The number of hospitalizations was unknown; no deaths were reported.

To determine the etiologic agent, stool samples (i.e., either rectal swabs or bulk stools) were sent to one of several laboratories of HCHD, BCM, and TCH for diagnosis of bacterial, parasitic, and viral enteropathogens. In stool samples from 44 patients tested by reverse transcription-polymerase chain reaction, norovirus was confirmed in 22 (50%) specimens; no other enteropathogen was identified. Sequencing to determine viral strains is being conducted but is not yet complete.

At the onset of the outbreak, health authorities implemented extensive infection-control measures. Patients with acute gastroenteritis who were dehydrated were rehydrated in a separate observation area reserved for patients with suspected infectious illness and then transferred to an isolation area for at least 48 hours after vomiting and diarrhea had ended. In addition, alcohol-based gel hand sanitizers were distributed throughout the facilities and near lavatories, and a bank of portable sinks was installed inside the medical clinic. Medical staff, disaster relief personnel, volunteers, and evacuees were all alerted to the heightened need for using proper hand-washing techniques through medical staff meetings, posters, banners, and newsletters distributed to all evacuees. Despite these timely interventions, the outbreak continued for more than 1 week but declined before the evacuees vacated Reliant Park in late September.

RRL- 0265

Title Health Concerns Associated with Mold in Water-Damaged Homes After Hurricanes Katrina and Rita — New Orleans Area, Louisiana, October 2005
Morbidity and Mortality Weekly Report, 2006 Vol 55 ISN 2

Key theme(s) Damaged housing, health concerns, hurricane Katrina and Rita

Summary

After Hurricanes Katrina and Rita made landfall on August 29 and September 24, 2005, respectively, large sections of New Orleans (Orleans Parish) and the three surrounding parishes (Jefferson, Plaquemines, and St. Bernard) were flooded for weeks, leading to extensive mold growth in buildings. As residents reoccupied the city, local health-care providers and public health authorities were concerned about the potential for respiratory health effects from exposure to water-damaged homes. On October 6, CDC was invited by the Louisiana Department of Health and Hospitals (LDHH) to assist in documenting the extent of potential exposures. This report summarizes the results of that investigation, which determined that 46% of inspected homes had visible mold growth and that residents and remediation workers did not consistently use appropriate respiratory protection. Public health interventions should emphasize the importance of safe remediation practices and ensure the availability of recommended personal protective equipment.

Research Question

What is the potential for respiratory health effects from exposure to water-damaged homes?

Research Methodology

1. Housing Assessment for Mold and Mold Exposure

During October 22–28, a team representing CDC and LDHH assessed a cross-section of the 440,269 households in the four-parish area (on the basis of the 2000 U.S. Census). Sampling was restricted to blocks with more than 20 housing units (areas with fewer housing units are likely to be sparsely populated and to contain mostly industrial buildings or parks) and areas where residents were permitted entry, yielding 239,949 potential households (Figure). Blocks were classified into three strata (mild, moderate, and severe) on the basis of Federal Emergency Management Agency flood and damage maps. Geographic information system (GIS) mapping software was used to select a random number of waypoints (latitude and longitude) proportionate for each stratum (1). A sample size of 88 homes was required to obtain estimates within 10% accuracy. Global positioning system (GPS) units were used to locate each waypoint as the random starting point to locate the nearest home at or north of the waypoint.

2. Survey of Residents and Workers Regarding Mold

During October 18–23, the assessment team conducted interviews with residents and remediation workers in recently flooded communities at three sites (i.e., the FEMA Disaster Recovery Center in St. Bernard, a home improvement store in West Jefferson, and a grocery store in East Jefferson) and at worker gathering places (e.g., work sites, campsites, and social venues). A convenience sample of

residents and remediation workers with potential exposure to mold were asked questions about their knowledge, attitudes, and practices regarding mold; nonidentifying demographic information was also collected. A total of 332 persons (workers and residents combined) were approached for interviews; 235 (70.1%) participated. Interviews were conducted in English and Spanish. A display of respirators was used for reference during the interviews.

Finding(s)

1.

Of 112 homes inspected, flood levels had been high (>6 feet) in 21 (18.8%) homes, medium (3–6 feet) in 19 (17.0%), and low (<3 feet) in 72 (64.3%) (including 44 [39.3%] homes with no flooding). Seventy-six (67.9%) homes had roof damage with water leakage. Visible mold growth occurred in 51 (45.5%) homes, and 19 (17.0%) had heavy mold coverage (>50% coverage on interior wall of most-affected room). The distribution of homes with heavy mold coverage was 10 (52.6%), seven (36.8%), and two (10.5%) in high, medium, and low flood areas, respectively. Participants reported being indoors doing heavy cleaning an average of 13 hours since the hurricanes (range: 0–84 hours) and 15 hours doing light cleaning (range: 0–90 hours). Sixty-eight (60.7%) participants reported inhabiting their homes overnight for an average of 25 (standard deviation: +13.7) nights since the hurricanes. Indoor air samples were collected nonrandomly at 20 (16%) homes; outdoor air samples were also collected for 11 of these homes. Predominant fungi indoors and outdoors were *Aspergillus* spp. and *Penicillium* spp. Geometric mean (1→3, 1→6)-D-glucan air levels were 1.6 µg/m³ (geometric standard deviation [GSD]: 4.4) indoors and 0.9 µg/m³ (GSD: 2.0) outdoors; endotoxin levels were 23.3 EU/m³ (GSD: 5.6) indoors and 10.5 EU/m³ (GSD: 2.5) outdoors. Glucan and endotoxin levels were significantly correlated (correlation coefficient $r = 0.56$; $p = 0.0095$). The geometric mean glucan and endotoxin levels were higher indoors compared with outdoors but the differences were not statistically significant.

2.

Nearly all (96.2%) residents responded affirmatively to the question, “Do you think mold can make people sick?” One hundred eight (67.9%) correctly identified particulate-filter respirators as appropriate respiratory protection for cleaning of mold. Sixtyseven (42.1%) had cleaned up mold; of these, 46 (68.7%) did not always use appropriate respirators. Reasons for not using respirators included discomfort (10 [21.7%] respondents) and lack of availability (10 [21.7%]). For public communications about potential risks from exposure to mold and the use of personal protective equipment, 139 (87.4%) respondents recommended the use of television or radio. Seventy-six persons who self-identified as remediation workers were interviewed. Of these, 14 (18.4%) were self-employed, and 62 (81.6%) worked for a company doing remediation. Of the 76 workers, 70 (92.1%) were male; the mean age of respondents was 33 years (range: 18–57 years); 40 (52.6%) spoke only Spanish. Seventy-two (94.7%) thought mold causes illness. Sixty-five (85.5%) correctly identified particulate filter respirators as appropriate protection for cleaning of mold. Sixty-nine (90.7%) had already participated in mold remediation activities at the time of the interview. Of these, 34 (49.3%) had not been fit tested for respirator use and 24 (34.8%) did not always use appropriate respirators; 13 (54.2%) cited discomfort as the reason for not using respirators. For worker communications about potential risks from exposure to mold and the use of personal protective equipment, 36 (47.4%) recommended use of television or radio and 17 (22.4%) recommended communication through employers.

RRL- 0266

Title Two Cases of Toxigenic *Vibrio cholerae* O1 Infection After Hurricanes Katrina and Rita --- Louisiana, October 2005
Morbidity and Mortality Weekly Report, 2006 Vol 55 ISN 2

Key theme(s) *Vibrio cholerae*; Hurricane Katrina and Rita

Abstract / Summary

Louisiana was struck by Hurricane Katrina on August 29, 2005, and by Hurricane Rita on September 24, 2005. The two hurricanes caused unprecedented damage from wind and storm surge to the Louisiana Gulf Coast region, and levee breaks resulted in flooding of large residential areas in and around New Orleans. With the flooding, an immediate public health concern was the potential for outbreaks of infectious diseases, including cholera. Nearly all *Vibrio* infections in the United States are caused by noncholerae *Vibrio* species (e.g., *V. parahaemolyticus*, *V. vulnificus*, and non-O1, non-O139 *V. cholerae*) (1,2). Cases of cholera rarely occur in the United States, and cholera epidemics, such as those reported in certain developing countries, are unlikely, even with the extreme flooding caused by the two hurricanes (2). This report describes the investigation by the Louisiana Office of Public Health and CDC into two cases of toxigenic *V. cholerae* O1 infection in a Louisiana couple; the cases were attributed to consumption of undercooked or contaminated seafood. Although noncholerae *Vibrio* illnesses were reported in 22 residents of Louisiana and Mississippi after Hurricane Katrina (1), no epidemic of cholera was identified, and no evidence exists of increased risk to Gulf Coast residents.

Research Question(s)

This report describes the investigation by the Louisiana Office of Public Health and CDC into two cases of toxigenic *V. cholerae* O1 infection in a Louisiana couple.

Research Methodology

In Louisiana, cases of notifiable diseases, including *V. cholerae* infections, are reported through the Internet-based Reportable Disease Database (RDD). All health-care providers and diagnostic facilities throughout the state submit reports through this system. A 24-hour telephone line is available to report emergencies. Although the 24-hour telephone line was disrupted immediately after hurricane Katrina, the Internet-based RDD never stopped functioning. In addition, after the hurricanes, morbidity surveillance systems were implemented in acute-care facilities in severely damaged areas and in evacuee centers throughout the state. During August 29--October 30, 2005, a total of 81 reports were investigated by Louisiana infectious-disease epidemiologists; 33 (41%) of these investigations were related to diarrheal illnesses. Five suspected cases of cholera were reported in Louisiana on the basis of presumptive laboratory results from clinical laboratories. However, of the five stool specimens sent to the Louisiana State Public Health Laboratory, only two were confirmed as containing toxigenic *V. cholerae* O1.

Finding(s)

The two cases of toxigenic *V. cholerae* O1 infection were identified in a Louisiana couple approximately 3 weeks after Hurricane Rita. On October 15, 2005, in southeastern Louisiana, a man aged 43 years and his wife aged 46 years had onset of diarrhea. The husband had a history of high blood pressure, alcoholism, diabetes, brain tumor, and chronic renal failure that required dialysis three times a week. On October 16, 2005, he was hospitalized for fever, muscle pains, nausea, vomiting, abdominal cramps, and severe diarrhea and dehydration; subsequently he experienced complete loss of renal function and respiratory and cardiac failure. However, after treatment with ciprofloxacin and aggressive rehydration therapy, the man recovered to his previous state of health. His wife had mild diarrhea and was treated as an outpatient with ciprofloxacin and extra fluids.

Because the couple's residence had been severely damaged and flooded by Hurricane Rita, both patients had waded in coastal flood waters in late September, 2--3 weeks before their illness onset. Five days before onset of illness, both had eaten locally caught crabs. On October 14, the day preceding illness onset, both had eaten shrimp purchased from a local fisherman. The shrimp were boiled for 5 minutes; however, at least some of the boiled shrimp were returned to a cooler containing raw shrimp and were eaten later. Two other persons who ate the shrimp reported mild diarrhea and abdominal discomfort; they did not seek medical attention, and no stool or serum specimens were collected from them for testing.

Toxigenic *V. cholerae* O1, serotype Inaba, biotype El Tor, was isolated at the hospital from stool specimens of the two patients and was confirmed at the Louisiana State Public Health Laboratory and the Foodborne and Diarrheal Diseases Laboratory at CDC. Both isolates were susceptible to all antimicrobial agents tested and were hemolytic on sheep blood agar, two characteristics of the strain of toxigenic *V. cholerae* O1 that is endemic to the U.S. Gulf Coast. By pulsed-field gel electrophoresis, the isolates were indistinguishable from each other and from other isolates previously associated with the Gulf Coast.

RRL- 0267

Title Incidence and molecular analysis of *Vibrio cholerae* associated with cholera outbreak subsequent to the super cyclone in Orissa, India

Author(s) G. P. Chhotray, B. B. Pal, H. K. Khuntia, N. R. Chowdury,
Epidemiology and Infection, 2002 Vol 128

Key theme(s) *Vibrio Cholerae*, diarrhoea, antibiotics

Abstract

An epidemiological study was carried out to find out the aetiological agent for diarrhoeal disorders in the cyclone and flood affected areas of Orissa, India. Rectal swabs collected from 107 hospitalized diarrhoea patients were bacteriologically analysed to isolate and identify the various enteropathogens. Detection of toxic genes among *E. coli* and *V. cholerae* was carried out by polymerase chain reaction (PCR) assay. Of the 107 rectal swabs analysed, 72±3% were positive for *V. cholerae* O1 Ogawa, 7±2% for *V. cholerae* O139, 1±2% for *E. coli* (EAggEC) and 1±2% for *Shigella flexneri* type 6. Using multiplex PCR assay it was found that all *V. cholerae* isolates were *ctxA* positive and El Tor biotype. Strains of *V. cholerae* 1 were observed to be resistant to nalidixic acid, furazolidone, streptomycin, co-trimoxazole and ampicillin. Except for nalidixic acid, the resistance pattern for O139 was identical to that of O1 strains. Representative strains of *V. cholerae* were further characterized by randomly amplified polymorphic DNA (RAPD) analysis and ribotyping. Both O1 and O139 *V. cholerae* strains exhibited the R3 pattern of ribotype and belonged to a similar pattern of RAPD compared with that of Calcutta strains. Early bacteriological and epidemiological investigations have revealed the dominance of *V. cholerae* O1 among the hospitalized patients in cyclone affected areas of Orissa. Drinking water scarcity and poor sanitation were thought to be responsible for these diarrhoeal outbreaks. Timely reporting and implementation of appropriate control measures could contain a vital epidemic in this area.

Research Question(s)

- To establish the aetiopathologic agents responsible for the sporadic outbreaks of the
- diarrhoea in the cyclone-affected areas.
 - To identify the clonality and source of this outbreak.

Research Methodology

During the period between 8 November 1999 and 8 December 1999 (post-cyclone period), 107 rectal swabs were collected from freshly admitted cases having acute diarrhoeal symptoms from different hospitals, Primary Health Centres (PHCs) in the cyclone-affected areas before any treatment was instituted by the local Government health authorities.

Finding(s)

The data collected from the Health Department, Government of Orissa revealed that, there were 97934 diarrhoea related attacks with 81 deaths during 1 month post-cyclonic period in the 6 affected districts as compared to 551 attacks with 43 deaths due to the same cause

during the corresponding month of the preceeding year. However, there were clustering of cases of *V. cholerae* occurred in the worst affected Cuttack, Jagatsinghpur and Puri districts of Orissa.

One hundred and seven rectal swabs collected during the post cyclonic period were bacteriologically and serologically analysed using standard methodology. The analysis revealed 83 culture positive cases with *V. cholerae* O1 Ogawa (72±3%), O139 (7±2%), *E. coli* (19±3%), *Shigella Flexneri* (1±2%). Twenty-four samples (22±4%) remained culture negative for all the tested enteric bacteria (Table 3). *V. cholerae* O1 were isolated more from males (53±03%) than from females (46±97%). The adults were more affected (75±76%) by *V. cholerae* than the paediatric age group (24±24%).

Fifty-nine *V. cholerae* O1 Ogawa and five O139 strains were analysed using the specific primers for the detection of A-subunit of the cholera toxin gene, *ctxA* and toxin coregulated pili gene *tcpA*, classical and El Tor by multiplex PCR. It was observed that all the tested *V. cholerae* O1 strains belonged to El Tor biotype and were positive for the *ctxA* and *tcpA* gene. All the *V. cholerae* O139 strains harboured the *ctxA* and *tcpA* specific for El Tor biotype. The primers 1281 and 1283 were used for the RAPD analysis to detect their clonality, if any. Strains exhibiting identical antibiogram but representing different cyclone-affected areas were randomly selected for molecular epidemiological study using ribotyping and RAPD analysis. The antibiogram of *V. cholerae* O1 and O139 were ACoFzNaS and AFzNS respectively. When tested with 16S and 23S rRNA probe, all the strains of *V. cholerae* exhibited ribotype R3 pattern. Like ribotyping results, all the *V. cholerae* O1 strains exhibited similarity with Calcutta strains especially with *V. cholerae* O1 that appeared after the O139 epidemic. Both the *V. cholerae* O139 strains exhibited similarity with SG 24; the strain isolated in Calcutta during O139 epidemic during 1992. Two strains of *V. cholerae* did not agglutinate with O1 and O139 antisera. When tested by PCR for *ctxA* and O139 *rfb* genes, these were positive for both the genes. It would be worthwhile to characterize these strains, as they might have a defective *rfb* gene with poor expression of O139 lipopolysaccharide or an altogether different serogroup that shares some homology with the O139 serogroup. Twelve *E. coli* isolates were tested by PCR using different primers for the detection of virulent genes to detect different groups of diarrhoeagenic *E. coli*. One strain of *E. coli* gave the expected amplicon specific for EAggEC (data not shown).

RRL- 0268

Title Deaths Related to Hurricane Andrew in Florida and Louisiana, 1992

Author(s) D.L. Combs, R. Gibson Parrish, S.J.N. McNabb, J.H. Davis,

International Journal of Epidemiology, 1996 Vol 25 ISN 3

Key theme(s) death investigation, disaster epidemiology, hurricanes, mortality, natural disasters

Abstract

Background. Information about circumstances leading to disaster-related deaths helps emergency response coordinators and other public health officials respond to the needs of disaster victims and develop policies for reducing the mortality and morbidity of future disasters. In this paper, we describe the decedent population, circumstances of death, and population-based mortality rates related to Hurricane Andrew, and propose recommendations for evaluating and reducing the public health impact of natural disasters.

Methods. To ascertain the number and circumstances of deaths attributed to Hurricane Andrew in Florida and Louisiana, we contacted medical examiners in 11 Florida counties and coroners in 36 Louisiana parishes.

Results. In Florida medical examiners attributed 44 deaths to the hurricane. In Louisiana, coroners attributed 11 resident deaths to the hurricane.

Conclusions. In addition to encouraging people to follow existing recommendations, we recommend emphasizing safe driving practices during evacuation and clean-up, equipping shelters with basic medical needs for the population served, and modifying zoning and housing legislation. We also recommend developing and using a standard definition for disaster-related deaths, and using population-based statistics to describe the public health effectiveness of policies intended to reduce disaster-related mortality.

RRL- 0268

Title Carbon Monoxide Poisoning During Natural Disasters: The Hurricane Rita Experience

Author(s) Jeffrey Cukor, MD, FACEP, Marc Restuccia, MD, FACEP

The Journal of Emergency Medicine, 2007 Vol 33 ISN 3

Key theme(s) carbon monoxide; Hurricane Rita; disaster; generator

Abstract

We report the incidence and mechanisms of carbon monoxide exposure during the first 5 days after Hurricane Rita, as experienced by a Disaster Medical Assistance Team staffing the only open health care facility in the Beaumont, Texas region after the storm. Improper placement of portable generators in indoor locations or proximate to home air conditioning intake systems were completely responsible for the 21 exposures including 5 fatalities, 1 brain dead, 2 transfers for hospitalization, and 13 treated and released. We discuss the clinical presentations and treatment approaches, provide a brief overview of carbon monoxide and offer novel preventive recommendations. Portable generator use after disasters represents a predictable risk to the public. Proper ventilation requirements for generators are not adequately appreciated and engineered safeties should be explored to mitigate illness.

Research Question(s)

- a. How was the incidence of carbon monoxide exposure during the first 5 days after Hurricane Rita and which consequences did it bring?
- b. Which reasons caused the carbon monoxide exposure?
- c. How can carbon monoxide exposure be treated and prevented?

Research Methodology

The Emergency Department of the Memorial Hermann Baptist Hospital in Beaumont, Texas was initially the only functioning medical facility and therefore provides a reliable glimpse of the health-related issues affecting the city's population after the hurricane. The DMATs augmented the hospital staff who had remained on duty despite the severe storm. Information regarding CO exposure was ascertained from direct interviews with patients and Emergency Medical Services providers.

Finding(s)

During the first 5 days of deployment, a total of 500 patients were treated; 21 were identified as CO-related visits. Although all 21 were known CO exposures, only 7 presented with exposure and symptoms. Our entire patient group ranged from no symptoms, to comatose, to death in 5 patients. CO levels are reported when known, but were not available from the hospital laboratory during the first 40 h after the storm. Often, entire families were involved after having all been exposed to the same CO source. All cases involved the use of generators indoors, without adequate ventilation, or placing generators too close to the intake area of air conditioning units.

Carbon monoxide poisoning is a predictable occurrence in disasters when portable generators are widely utilized. Disaster medical response teams such as DMATs and local health care providers need to be aware of the potential for CO poisoning after catastrophic destruction of a community's electrical infrastructure. Improved health care provider training, as well as education directed toward both consumers and vendors of portable generators, may be beneficial in decreasing CO poisoning. Better engineering and built-in safety features would likely have the greatest impact in decreasing CO morbidity and mortality. Although administration of 100% oxygen is clearly beneficial, further research on which patients would benefit from hyperbaric oxygen therapy is still needed. Hyperbaric services often require transportation of patients, and must be carefully weighed against the stability of the patient and the strain on potentially scarce Emergency Medical Services resources.

RRL- 0270

Title Burden of Disease and Health Status Among Hurricane Katrina– Displaced Persons in Shelters: A Population-Based Cluster Sample

Author(s) P. Gregg Greenough, Michael D. Lappi, Edbert B. Hsu, Sheri Fink

Annals of Emergency Medicine, 2008 Vol 51 ISN 4

Key theme(s) Natural disasters, displaced persons, health status

Abstract / Summary

Study objective: Anecdotal evidence suggests that the population displaced to shelters from Hurricane Katrina had a significant burden of disease, socioeconomic vulnerability, and marginalized health care access. For agencies charged with providing health care to at-risk displaced populations, knowing the prevalence of acute and chronic disease is critical to direct resources and prevent morbidity and mortality.

Conclusion: A population-based understanding of vulnerability, health access, and chronic and acute disease among the displaced will guide disaster health providers in preparation and response.

Research Question(s)

What were the demographic characteristics and acute and preexisting health problems of 499 displaced persons living in shelters in Louisiana 2 weeks after Hurricane Katrina?

Research Methodology

The authors performed a 2-stage 18-cluster sample survey of 499 evacuees residing in American Red Cross shelters in Louisiana 2 weeks after landfall of Hurricane Katrina. In stage 1, shelters with a population of more than 100 individuals were randomly selected, with probability proportional to size sampling. In stage 2, 30 adult heads of household were randomly chosen within shelters by using a shelter log or a map of the shelter where no log existed. Survey questions focused on demographics, socioeconomic indicators, acute and chronic burden of disease, and health care access.

Finding(s)

Two thirds of the sampled population was single, widowed, or divorced; the majority was female (57.6%) and black (76.4%). Socioeconomic indicators of under- and unemployment (52.9%), dependency on benefits or assistance (38.5%), lack of home ownership (66.2%), and lack of health insurance (47.0%) suggested vulnerability. One third lacked a health provider. Among those who arrived at shelters with a chronic disease (55.6%), 48.4% lacked medication. Hypertension, hypercholesterolemia, diabetes, pulmonary disease, and psychiatric illness were the most common chronic conditions. Risk factors for lacking medications included male sex (odds ratio [OR] 1.58; 95% confidence interval [CI] 0.96 to 2.59) and lacking health insurance (OR 2.25; 95% CI 1.21 to 4.20). More than one third (34.5%) arrived at the shelter with symptoms warranting immediate medical intervention, including dehydration (12.0%), dyspnea (11.5%), injury (9.4%), and chest pain (9.7%). Risk factors associated with presenting to shelters with acute symptoms included concurrent chronic disease with medication (OR 2.60; 95% CI 1.98 to 3.43), concurrent disease and lacking medication (OR 2.22; 95% CI 1.36 to 3.63), and lacking health insurance (OR 1.83; 95% CI 1.10 to 3.02).

RRL- 0271

Title The Effects of Hurricane Mitch on a Community in Northern Honduras

Author(s) C.K.Guill, Wayne X. Shandera

Prehospital Disaster Medicine, 2001 Vol 16 ISN 3

Key theme(s) cement block housing; disaster relief; Honduras; housing construction; hurricanes; Hurricane Mitch

Abstract

Introduction: Hurricane Mitch was an event described as one of the most damaging recent natural disasters in our hemisphere. This study examined its effects on a community of 5,000 residents in northern Honduras.

Methods: Survey responses of 110 attendants at an ambulatory clinic 4 months after the event were analyzed. Correlates were established between demographic and housing characteristics and morbidity and mortality.

Results: The availability of food, water, and medical care decreased significantly immediately after the hurricane, but by four months afterward returned to baseline values. Residents reported emotional distress correlated with the loss of a house or intrafamilial illness or mortality. Diarrheal illnesses were more commonly found in households with poor chronic access to medical care. The use of cement block housing correlated with availability of food or running water, with access to medical care and vaccinations, and with a reduced frequency of diarrhea or headaches in the immediate posthurricane phase.

Conclusions: Improvements in housing construction appear to be the most effective preventive measure for withstanding the effects of future hurricanes in tropical regions similar to northern Honduras.

RRL- 0272

Title Chronic Disease and Disasters - Medication Demands of Hurricane Katrina Evacuees

Author(s) Michael A. Jhung, MD, Nadine Shehab, PharmD, Cherise Rohr-Allegrini, PhD, Daniel A. Pollock, MD

American Journal of Preventive Medicine, 2007 Vol 33 ISN 3

Key theme(s) Chronic Diseases, Disasters, Hurricane Katrina

Abstract

Background: Preparing for natural disasters has historically focused on treatment for acute injuries, environmental exposures, and infectious diseases. Many disaster survivors also have existing chronic illness, which may be worsened by post-disaster conditions. The relationship between actual medication demands and medical relief pharmaceutical supplies was assessed in a population of 18,000 evacuees relocated to San Antonio TX after Hurricane Katrina struck the Gulf Coast in August 2005.

Methods: Healthcare encounters from day 4 to day 31 after landfall were monitored using a syndromic surveillance system based on patient chief complaint. Medication-dispensing records were collected from federal disaster relief teams and local retail pharmacies serving evacuees. Medications dispensed to evacuees during this period were quantified into defined daily doses and classified as acute or chronic, based on their primary indications.

Results: Of 4229 categorized healthcare encounters, 634 (15%) were for care of chronic medical conditions. Sixty-eight percent of all medications dispensed to evacuees were for treatment of chronic diseases. Cardiovascular medications (39%) were most commonly

dispensed to evacuees. Thirty-eight percent of medication doses dispensed by federal relief teams were for chronic care, compared to 73% of doses dispensed by retail pharmacies. Federal disaster relief teams supplied 9% of all chronic care medicines dispensed.

Conclusions: A substantial demand for drugs used to treat chronic medical conditions was identified among San Antonio evacuees, as was a reliance on retail pharmacy supplies to meet this demand. Medical relief pharmacy supplies did not consistently reflect the actual demands of evacuees.

RRL- 0273

Title Hurricane Katrina's Impact on Pediatric and Adult Patients with Sickle Cell Disease

Author(s) Nicole A. Karras, Charles S. Hemenway

Journal of Health Care for the Poor and Underserved, 2007 ISN 18
The Johns Hopkins University Press

Key theme(s) Hurricane Katrina, sickle cell disease, New Orleans, underserved populations, indigent care, medical home.

Abstract / Summary

Objective. Hurricane Katrina, making landfall in the U.S. in late August 2005, disrupted the medical infrastructure of New Orleans. We hypothesized that Hurricane Katrina measurably affected the ability of patients with sickle cell disease (SCD) to receive necessary and adequate health care. Differences in health care delivery among children and adults in New Orleans prior to the hurricane prompted our interest in these two groups.

Methods. In May 2006, an anonymous survey was administered *via* either telephone or written questionnaire to patients in the greater New Orleans, Louisiana area with SCD and/or their guardians. The survey was intended to gauge patients' access to and satisfaction with specialized health care in the months following Hurricane Katrina.

Conclusions. Adult patients with SCD who relied almost exclusively on New Orleans' main public hospital (Charity Hospital) for specialized sickle cell services reported significant frustration/dissatisfaction with their medical care eight months after the storm. In contrast, pediatric patients with SCD and their guardians, who rarely received care within the public hospital system, reported more satisfaction with their care. There was a statistically significant difference between the two groups in their responses to the perception of quality of their health care.

RRL- 0274

Title Physical Symptoms of Chronic Fatigue Syndrome Are Exacerbated By the Stress of Hurricane Andrew

Author(s) S.L Lutgendorf, M.H. Antoni, G. Ironson, M.A. Fletcher

Psychosomatic Medicine, 1995 Vol 57

Key theme(s) chronic fatigue, natural disaster, stress, illness burden, social support, health.

Summary

This study examined the effects of Hurricane Andrew on physical symptoms and functional impairments in a sample of chronic fatigue syndrome (CFS) patients residing in South Florida. Based on our model for stress-related effects on CFS, we tested the hypothesis that the patients who had the greatest exposure to this natural disaster would show the greatest exacerbation in CFS symptoms and related impairments in activities of daily living (illness burden). In support of this hypothesis, we found that the Dade county patients showed significant increases in physician-rated clinical relapses and exacerbations in frequency of several categories of self-reported CFS physical symptoms as compared to the Broward/Palm Beach county patients. Illness burden, as measured on the Sickness Impact Profile, also showed a significant increase in the Dade county patients. Although extent of disruption due to the storm was a significant factor in predicting relapse, the patient's posthurricane distress response was the single strongest predictor of the likelihood and severity of relapse and functional impairment. Additionally, optimism and social support were significantly associated with lower illness burden after the hurricane, above and beyond storm-related disruption and distress responses. These findings provide information on the impact of environmental stressors and psychosocial factors in the exacerbation of CFS symptoms.

Research Objective

To examine the effects of Hurricane Andrew on physical symptoms and functional impairments in a sample of chronic fatigue syndrome (CFS) patients residing in South Florida.

Research Methodology

In the months after Hurricane Andrew (September 15-December 31, 1992), 49 CFS patients were assessed for psychosocial and physical functioning with questionnaires, interviews, and physical examinations. This sample was made up of 25 CFS patients living in Dade county, a high impact area, and 24 patients in Broward and Palm Beach counties, areas less affected by the hurricane.

Finding(s)

The hurricane was associated with an increase in clinically assessed relapses in CFS patients and with exacerbations in the frequency of a wide variety of CFS-related physical symptoms in this group. Patients in Dade county, the high Hurricane exposure region, had significantly more relapses and increases in CFS symptom frequency than those in neighboring Broward county,

which was less storm-affected. Disruption and emotional distress responses were significant predictors of relapse, with distress responses emerging as the stronger correlate. Social support and optimism did not predict relapse, and the relationship between disruption and relapse was most apparent in people with low social support. Emotional distress responses were also a strong predictor of posthurricane physical difficulties in daily functioning as defined by the SIP, even when prehurricane levels of functional impairment were taken into consideration. Social support and optimism were each independently associated with less functional impairment after the hurricane, although this relationship was less robust when prehurricane levels of impairment were taken into account; these findings should therefore be viewed as cross-sectional and not as predictive.

RRL- 0275

Title Katrina-Related Health Concerns of Latino Survivors and Evacuees

Author(s) DeAnne K. Hilfinger Messias, Elaine Lacy

Journal of Health Care for the Poor and Underserved, 2007 Vol 18
The Johns Hopkins University Press

Key theme(s) Latino health, health care access, disaster preparedness, uninsured.

Summary

This article examines health concerns identified by Latinos who resided in the path of Hurricane Katrina in New Orleans and Mississippi. Data were collected for this qualitative descriptive study through individual, open-ended interviews with 93 Latino survivors and evacuees in Louisiana, Mississippi, and Georgia. Findings describe health concerns and experiences, including hunger, environmental health risks, sleep disturbances, and access to health care for acute and chronic conditions. Health and illness factored into personal and family decisions on whether or not to stay, evacuate, or return home following the storm. Problems accessing health care were compounded for the undocumented and uninsured. The findings have implications for further disaster research and may inform emergency preparedness policy development and the planning and implementation of disaster-related health care services for Latinos and other minority and underserved groups.

Research Methodology

This was a qualitative descriptive study¹⁷ aimed at exploring the experiences of Latino survivors and evacuees of Hurricane Katrina. In the weeks immediately following Katrina's landfall, we formed an interdisciplinary, bilingual, multi-state research team to explore the initial experiences of Latino survivors and evacuees of the storm. The research was approved by university Institutional Review Boards and by local community groups who collaborated in the recruitment process. Data for the analysis presented in this paper were collected between October 2005 and March 2006 through face-to-face interviews with 93 Latino survivors and evacuees. To capture a wide range of survivor and evacuee experiences, we conducted interviews in Atlanta (October 2005), New Orleans (November 2005 through March 2006), and Biloxi and Gulfport, Mississippi (March 2006). Throughout this period we also monitored the media for reports on Latinos affected by Katrina.

Finding(s)

In our analysis of health concerns, seeking and obtaining access to formal health care services was a salient theme. There was substantial evidence, however, that these Latinos relied primarily on informal social networks for information, assistance, and support prior, during, and after Katrina. In the course of dealing with the disaster, new informal networks formed, some of which were transitory. The examples of selfless assistance to others in need and the prevalence of expressions of thankfulness in the face of adversity must be noted.

Another significant finding was the extent to which respondents reported they were not prepared and/or did not anticipate the potential strength of the storm and the implications of staying put or evacuating. Lack of adequate preparation and provisions were a problem for those who stayed as well as for those who evacuated. The results of this study support reports from the lay press indicating that language, lack of information, lack of transportation, and poverty were significant barriers to evacuation among Latino residents. Our findings also highlight the role that health and health care access concerns played in deciding whether or not to stay or evacuate. A major challenge to local disaster preparedness and evacuation policies is to balance awareness of danger and the economic and social costs of preparedness to minority individuals, families, and communities, without running the risk of "crying wolf." Among Latinos, a lack of a preventive mentality and low expectations of formal assistance are formidable barriers to disaster preparedness.

This research confirms common knowledge that disasters exacerbate existing restrictions and limitations to health care access among the poor and underserved.

RRL- 0276

Title Impact of Hurricane Mitch on Central America
Epidemiological Bulletin – Pan American Health Organization, 1998 Vol 19 ISN 4
Pan American Health Organization
Pan American Sanitary Bureau, Regional Office of the
WORLD HEALTH ORGANIZATION

Key theme(s) Hurricane Mitch

Summary

During the two-week period from 22 October to 2 November, Central America was battered by Hurricane Mitch, a gale that became a maximum force hurricane with winds of nearly 290 km per hour. Hurricane Mitch struck when Central America was just recovering from the economic effects of El Niño 1997-1998 phenomenon, whose floods, forest fires, and droughts had weakened the countries' productive systems. Beyond the irreparable toll in human lives lost, the impact on the region's production and its sustaining infrastructure represents a severe setback for the development of the region and will increase the already high dependence on external assistance and financing. Due to the damage in some countries to the health services, water and sanitation networks, to overcrowding in shelters, or to population movements between neighboring countries, the incidence of cholera and other waterborne diseases, leptospirosis, dengue, and malaria has increased, particularly in urban areas and among the more impoverished and marginal groups. Initial health activities have been directed toward the immediate treatment of cases, epidemiological surveillance, solid waste management, water disinfection, food protection, and vector control.

Research Question(s)

- a. Which impacts had Hurricane Mitch on Central America (social, health, economy)?
- b. Where there regional differences? Which countries were affected most?

Finding(s)

Based on the reports received, Honduras and Nicaragua were the countries most damaged by Hurricane Mitch, followed by Guatemala and El Salvador and, to a lesser extent, Costa Rica and Belize.

Cholera

Guatemala has the worst cholera problem with 59 (pre-Mitch-period) to 485 patients per week (November). In Nicaragua, the weekly average increased from 16 to 95 cases. The other countries only counted single cases, if at all, but always with an increasing number during the Mitch-period. The studies on outbreaks suggest that the source of infection for virtually all the reported outbreaks and cases has been contaminated food.

Leptospirosis

Only in Nicaragua epidemic outbreaks have been reported. During the month of November,

there was a marked weekly increase in reported cases, with a cumulative total of 540 for the four weeks of that month, with 7 deaths.

Malaria

There were no major changes in Belize, El Salvador and Honduras. In Nicaragua and Guatemala (during the second and third weeks), the number of reported cases was much higher than the weekly average reported during the pre-Mitch period.

Food Availability and Food Consumption

Hurricane Mitch has undermined the already deficient food security of the people of Central America and not just the population directly affected by the storm, but the rest of the population as well, mainly of those with limited resources. Hurricane Mitch was responsible for losses in agricultural production in every country in Central America, but in particular in Honduras. The total losses are estimated at more than 2.3 billion dollars.

Food Aid

Food aid was provided by the World Food Program (WFP).

Effects on Basic Sanitation

As a result of the damage to the basic sanitation infrastructure, approximately 80% of the population in the most affected countries have faced difficulties associated with the drinking water supply, in rural, urban, and especially peri-urban areas. There has also been a dramatic deterioration in sanitation and waste control conditions in all the countries.

Mobilization of International Resources

Initial assessments of the impact of the hurricane on health were done a few hours after the disaster occurred. This evaluation was shared with agencies of the United Nations and Inter-American Systems and was also made available to the UNDAC teams that arrived a few days later. Further coordination, measures to identify the damages and needs as well as help-initiatives were initiated.

RRL- 0277

Title The Impact of a Series of Hurricanes on the Visit of two Central Florida Emergency Departments

Author(s) Elke Platz, Herbert P. Cooper, Salvatore Silvestri, Carl F. Siebert

The Journal of Emergency Medicine, 2007 Vol 33 ISN 1

Key theme(s) hurricane; emergency department visits; injuries; CO intoxication; disaster preparedness

Abstract

We analyzed the impact of three consecutive hurricanes in 2004 on two central Florida Emergency Department (ED) patient volumes and types of presentations. Data were extracted from the hospital database and compared to the previous year. At both EDs visits dropped significantly on the day of all three hurricanes compared to 2003. The decrease in patient volume was even greater during the second and third hurricane compared to the first one. Once weather conditions improved, a dramatic rise in patient census was noted. During the aftermath of the first hurricane a significantly higher number of patients with injuries and carbon monoxide (CO) intoxications was seen, as well as ED visits due to lack of oxygen, electricity or hemodialysis. During the aftermath of a hurricane, EDs should be staffed and equipped to treat greater numbers of patients with acute injuries.

Research Question(s)

To evaluate the effect of three consecutive hurricanes on two central Florida EDs and determine if the effect of a second or third hurricane in a series differs from the effect of the initial one.

Research Methodology

This study was a retrospective analysis of three different cohorts extracted from an electronic ED database. Each of the cohorts corresponded to the timeframe of each of the three hurricanes. The study was conducted at the EDs of the only level I trauma center in central Florida with a yearly patient volume of 80,000 visits, and a community hospital with a similar patient volume but lower acuity. Both hospitals are located in Orlando, Florida, and operate within the same hospital system. The primary outcome measure was the daily patient volume in the EDs of the two study centers. For patient census, our study periods were the days of maximal impact of each of the three hurricanes, with the main weather impact in Orange County, Florida (August 13, September 5, September 26, 2004), as well as the three previous and three subsequent days. These were for Charley, August 10–16, 2004; for Frances, September 2–8, 2004; and for Jeanne, September 23–29, 2004. We compared 24-h patient volumes from these days to the same weekdays in August and September 2003. We chose the same weekdays rather than the same calendar days in 2003 to control for the fluctuating patient volume depending on the day of the week. The time interval of 3 days before and 3 days after the hurricane was empirically chosen to assess the effects most closely associated with the days of maximal hurricane impact. A secondary outcome measure included the ED patients' presentations at the level I trauma center on the day of each hurricane and the

following 3 days. These days were analyzed and compared to corresponding ones in 2003.

Finding(s)

Both the decrease during and overall increase in patient visits to EDs after the hurricane were observed. The drop in patient visits during the main weather impact can be explained by the inability to travel to the hospital during this time by car, public transportation, or EMS due to weather and road conditions. In accordance with a previous study by Brewer et al., our data showed that more male adults presented to the ED. This group was more likely to be involved in these activities and therefore more prone to injuries. Damaged traffic lights, flooded streets, and debris resulted in traffic accidents. Road conditions, gasoline shortage, and damaged personal vehicles may have contributed to the decreased number of patients arriving in the ED by means of their own transportation.

Lack of electricity might have caused exacerbation of medical conditions, such as congestive heart failure and chronic obstructive pulmonary disease, especially in the elderly. Our data showed a slightly older population on average in the ED compared to the previous year. However, this could also have been due to more adults being involved in repairing damaged property. Finally, many local physicians were unable to open their offices for several days after a hurricane. Therefore, EDs became the only source of medical care during this time period. The even greater decrease of patients presenting to the ED during the second and third hurricane could be explained by a better-prepared population.

RRL- 0278

Title Outbreak of leptospirosis after the cyclone in Orissa.

Author(s) SC Sehgal, AP Sugunan, P Vijayachari.

National Medical Journal of India, 2002 Vol 15 ISN 1
All India Institute of Medical Sciences, Ansari Nagar
New Delhi 110029, INDIA

Key theme(s) Cyclone, leptospirosis, febrile illness, Orissa

Summary

Two weeks after the cyclone during October-November 1999, several persons in Orissa suffered from a febrile illness with haemorrhagic manifestations. Serum samples from a few such patients tested positive for anti-leptospiral IgM antibodies. We conducted a study in four villages that were flooded after the cyclone to examine the possibility of leptospirosis being the cause of the outbreak.

The results indicate that there was an outbreak of leptospirosis in the flooded villages and the attack rate was high. A carrier state might have existed in the animal population and the cyclone and floods changed the environment drastically making it conducive for transmission of infection. Large numbers of persons were continuously exposed to flood waters and this resulted in the outbreak.

Research Methodology

One hundred forty-two persons living in four flooded villages in the Jaipur district of Orissa were interviewed for their disease history and possible risk factors after the cyclone. Blood samples were collected and tested for anti-leptospiral antibodies using the microscopic agglutination test, IgM ELISA and lepto-dipstick. Follow up samples were collected from those who had inconclusive results on the first test and the microscopic agglutination test was repeated on these samples.

Finding(s)

Eighty-four of the 142 study subjects had suffered a febrile illness and 40 of them had positive results in one or more IgM-based tests and 28 had a positive microscopic agglutination test result as well. Thus, 19.2% of the study subjects (28/142) had serological evidence of symptomatic leptospiral infection after the cyclone. Also, 8.5% of the subjects had low levels of antibodies indicative of the level of background seroprevalence.

RRL- 0279

Title Epidemiology of Tropical Cyclones: The Dynamics of Disaster, Disease, and Development

Author(s) James M. Shultz, Jill Russell, Zelde Espinel

Epidemiologic Reviews, 2005 Vol 27

Key theme(s) Cyclones, public health consequences

Summary

Public health consequences associated with tropical cyclones include storm-related mortality, injury, infectious disease, psychosocial effects, displacement and homelessness, damage to the health-care infrastructure, disruption of public health services, transformation of ecosystems, social dislocation, loss of jobs and livelihood, and economic crisis. These outcomes disproportionately befall developing nations, and human factors strongly influence the observed disparities.

The authors of the article conducted a review of the epidemiologic literature on the public health consequences of tropical cyclones.

Research Question(s)

Review of the epidemiologic literature on the public health consequences of tropical cyclones.

Research Methodology

Keyword search on the Internet using a variety of academic search engines and websites, including MEDLINE, PubMed, the National Center for PTSD PILOTS database, the National Hazards Center database, and the National Oceanic and Atmospheric Administration/National Hurricane Center website, using combinations of the terms "tropical cyclone," "cyclone," "hurricane," "typhoon," "natural disasters," and "epidemiology." We also conducted keyword searches directly on the websites of Morbidity and Mortality Weekly Report and major medical and emergency medicine journals. Checks of the bibliographies of key references in the psychosocial and sociologic literature expanded the search. Analyses of windstorm data using the Emergency Disasters Database (EM-DAT) of the Center for Research on the Epidemiology of Disasters (Brussels, Belgium) were conducted.

Finding(s)

Recent advances in construction, forecasting, warning systems, evacuation, and sheltering have sharply reduced tropical cyclone-associated mortality and morbidity in developed nations. Lacking this complement of mitigation technologies, developing nations remain vulnerable to devastating harm and loss, but the prevention potential is apparent. Behavioral health consequences are prominent regardless of level of development but are understudied in epidemiologic investigations. Among natural disasters, tropical cyclones are uniquely amenable to multidisciplinary, analytical epidemiologic investigation using prospective study designs, with the potential for significant advancement of the science of disaster epidemiology.

RRL- 0280

Title Floodwater Exposure and the Related Health Symptoms Among Firefighters in New Orleans, Louisiana 2005

Author(s) SangWoo Tak, Bruce P. Bernard, Richard J. Driscoll, Chad H. Dowell

American Journal of Industrial Medicine, 2007 Vol 50

Key theme(s) floodwater; firefighter; hurricane; Katrina; respiratory symptoms; skin rash; response workers

Abstract

Background: Concerns over increased reports of physical health symptoms thought to be related to floodwater exposure among New Orleans firefighters prompted a health hazard evaluation of firefighters following Hurricane Katrina.

Methods A questionnaire assessing health symptoms possibly related to the response to Hurricane Katrina was administered to all New Orleans Fire Department (NOFD) personnel within 3 months of the disaster. Descriptive statistics were compiled and prevalence ratios (PR) were estimated for covariates using generalized linear models with Log link and Poisson distribution.

Results: Of the 525 firefighters who completed the questionnaire (77% participation), 201 (38%) reported one or more new-onset respiratory symptoms, such as sinus congestion (145 [28%]), throat irritation (92 [17%]), and cough (124 [24%]). Skin rash was reported by 258 (49%) of respondents, 414 (79%) reported skin contact with floodwater, and 165 (32%) reported contact with floodwater on multiple days. In multivariate analyses adjusting for age, gender, and smoking, firefighters who had floodwater contact with skin and either nose/mouth or eyes (224, 44%) had an increased rate of new-onset upper respiratory symptoms (PR 1.9; 95% confidence interval [CI], 1.1, 3.1), and skin rash (PR 2.1; 95% CI, 1.4, 3.2) compared to those not exposed to the floodwater.

Conclusions: Response workers involved with floodwater should minimize direct skin and mucosal contact with floodwater if possible through the use of appropriate personal protective equipment, such as goggles, safety glasses with side shields, or full-face shields.

RRL- 0281

Title of article Leptospirosis, India: Report of the investigation of a post-cyclone outbreak in Orissa, November 1999

Weekly epidemiological record, 2000 Vol 75 ISN 27

Key theme(s) Leptospirosis, Orissa, cyclone, transmission

Summary

This article demonstrates that Leptospirosis should not be considered as a minor problem compared to other infectious diseases, and should be taken into consideration on particular in areas with a warm and humid climate and in areas that have suffered natural disasters. Leptospirosis could be emerging or re-emerging, for instance as a result of environmental changes favouring the transmission of Leptospirosis. Also, in many areas where Leptospirosis was unknown, infections animal reservoirs are found and humans appear to be exposed.

Research Question(s)

To investigate into the possibility of a post-cyclone outbreak of Leptospirosis in the villages.

Research Methodology

Fours villages were selected for investigation. All those villages are close the river Baitarani and are served by the primary health care center located at Korai village. A sample of 142 persons was selected from the villages and interviewed for history of fever after the cyclone, other symptoms, work-related practices, activities, after the post-cyclone days, etc. Blood samples were collected and taken to the regional medical centre.

Finding(s)

An outbreak of Leptospirosis occurred in the villages following the cyclone in which at least 14,1 % of the population was affected. Another 14,1% had serological evidence of possible infection. The high attack rate signifies the epidemic potential of Leptospirosis when conditions favour widespread transmission, as in the case of floods.

Environmental Pollution and Disasters

RRL- 0282

Title Chemical Quality of Depositional Sediments and Associated Soils in New Orleans and the Louisiana Peninsula Following Hurricane Katrina

Author(s) Craig Adams, Emmitt C. Witt, Jianmin Wang, David K. Shaver
Environmental Science and Technology, 2007 Vol 41 ISN 10

Key theme(s) Hurricane Katrina, Depositional Sediments, Soils

Summary

Hurricane Katrina made landfall on the Louisiana peninsula south of New Orleans on Aug 29, 2005. The resulting storm surge caused numerous levee breaches in the parishes of New Orleans as well as on the Louisiana peninsula. This study was conducted to determine the concentrations of inorganic and organic constituents in sediments and associated soils in New Orleans parishes and the Louisiana peninsula after the floodwaters had been removed and/or receded following Hurricane Katrina. A total of 46 sediment and soil samples were analyzed that were collected throughout New Orleans and the Louisiana peninsula. Approximately 20% of the sediment samples were analyzed, including shallow sediment samples from locations that included the top and beneath automobiles, in residential and commercial areas, and near refineries. Gasoline constituents, pesticides, and leachable heavy metals were analyzed using headspace gas chromatography/mass spectrometry (GC/MS), organic extraction GC/MS, and inductively coupled plasma/mass spectrometry, respectively. A significant number of samples had leachable As and Pb concentrations in excess of drinking water standards. The remaining metals analyzed (i.e., Cd, Cr, Cu, Hg, and V) generally had much lower leachable levels. Of the gasoline constituents, only benzene was observed above the limit of detection (of 5 µg/kg), with no samples observed as being above the method detection limits of 10 µg/kg. For the 18 pesticides analyzed, most were in the nondetectable range and all were in trace amounts that were orders of magnitude below regulatory guidelines.

Research Question(s)

- a. Which were the storm's effects on structures?
- b. How did the storm cause of levee failures?
- c. What happens when new contaminants mix with those already associated with the sediments of the New Orleans levee canals and Lake Pontchartrain?

Research Methodology

Samples were collected over the period Oct 6-18, 2005, in New Orleans and along Highway 23 on the Louisiana peninsula. In this preliminary study, a total of 46 of 238 samples collected were analyzed. Two procedures were used for sample collection: a coring procedure and a surface sediment collection procedure. In the coring procedure, a 2 cm diameter hand-held soil

corer was used to take a “shallow” core (0-10cm deep), in addition to a “deep” core (10-20 cm) collected only as a subset of sites. The coring samples were taken to allow assessment of how contaminants may have penetrated into the ground and/or the baseline concentrations of contaminants not caused by the flooding. Sediment samples were also taken from the top 1 cm of sediment on the ground, from the tops of and beneath automobiles, from sidewalks, and from the insides and outsides of structures. All soil and sediment samples were placed in 60 mL amber glass vials with Teflon-lined caps. The samples were labeled and immediately double-bagged into plastic bags and placed in the dark in a cooler. Samples were kept cold and in the dark until analysis in the Environmental Research Center at UMR. Of the 238 samples collected, a subset of 46 selected samples was analyzed using the organic and inorganic chemical methods described below with at least one surface (shallow and/or surface sediment) sample included from each location. Furthermore, at the time of sample collection, sediment depth was measured and recorded so an estimate of the amount of deposition could be calculated.

Finding(s)

1) Inorganic Contaminations: As, Cd, Cr, Cu, Hg, Pb, and V were all observed in the 44 soil and sediment leachate samples analyzed with median concentrations of 10, <0.5, 9, 11, <0.5, 7, and 11 $\mu\text{g/L}$, respectively, and maximum concentrations of 294, 0.9, 177, 52, 0.4, 72, and 229 $\mu\text{g/L}$, respectively. Approximately 30% of samples had Pb concentrations equal to or greater than the 15 $\mu\text{g/L}$ drinking water action level, and approximately 50% of the leachate samples had arsenic concentrations equal to or greater than the 10 $\mu\text{g/L}$ drinking water maximum contaminant level (MCL). However, no sample concentrations exceeded the toxicity characteristic leaching procedure (TCLP) regulatory reference level of 5000 $\mu\text{g/L}$ for both As and Pb (U.S. EPA, 2005).

2) Pesticide Contaminants: Of the 18 pesticides analyzed, 16 pesticides were detected at least one location. Most of the concentrations of the 18 pesticides analyzed were in the nondetectable range or at trace levels. These data suggest that localized pesticide concentrations may be present, but that general contamination with pesticides does not appear to have occurred.

3) BTEX Contaminant: BTEX concentrations were generally very low in all samples tested. No toluene, ethylbenzene, or xylenes were detected above the MDL. Benzene was observed in 78% of the samples, but only very near the MDL of 10 $\mu\text{g/kg}$ of soil. These data do not suggest widespread contamination by BTEX gasoline compounds of either New Orleans or the Louisiana peninsula.

4) Levy breaches, precipitated by Hurricane Katrina and the associated storm surge, caused heavy sediment deposition in New Orleans and along the peninsula where the eye of the hurricane itself passed. A key concern was how contaminated were the sediments that now cover large sections of the city and peninsula.

5) Further research is warranted that focuses on analysis of sediments in New Orleans to determine the presence of bound heavy metals that are not readily leachable.

RRL- 0283

Title Schadstoffbelastung in Hochwassersedimenten (Contaminant Load in Flood Water Deposits)

Author(s) Ursula Anacker, Ulrich Gutteck, Matthias Welker

Presentation at a seminary of the Landesamt für Umweltschutz Sachsen-Anhalt, 2003

Key theme(s) Elbe flood – pollution – flood water deposits

Summary

Carrying out of a special measurement programme in order to evaluate the load of contaminants in flood water deposits in inundated areas after the flood catastrophe of Sachsen-Anhalt (Germany) in August 2002.

Research Question(s)

What influence did the floods have on the pollution of soils in Sachsen Anhalt in 2002?

Research Methodology

Sampling of districts which had already been analysed before the flooding.

Analysis of the presence of heavy metals, arsenic and selected organic pollutants.

Finding(s)

The results indicated that the floor loading had not deteriorated with the flooding of Elbe and Mulde rivers in August 2002. Both analyses, before and after the flooding, did not vary significantly.

Critical pollutants such as arsenic and heavy metals were already identified before August 2002 in flood areas. In the areas flooded because of crevasses no such critical data were registered. Organic pollutants were merely registered in flood areas of the Mulde affluent.

These results contribute to a better knowledge of contaminant dispersion.

RRL- 0284

Title Environmental pesticide exposure in Honduras following hurricane Mitch

Author(s) Lina Balluz, Deborah Moll, Maria Georgina Diaz Martinez, Julio Enrique Merida Colindres

Bulletin of the World Health Organization, 2001 Vol 79
World Health Organization

Key theme(s) Insecticides; Drinking water/chemistry; Water pollutants, Natural disasters; Environmental monitoring

Abstract

Objective: To investigate whether environmental contamination occurred in the wake of hurricane Mitch (30– 31 October 1998), we conducted a population-based cross-sectional household survey in the barrio of Istoca, Department of Choluteca, Honduras. The goals were to evaluate chemical contamination of potable water and the extent of human exposure to chemicals as a result of extensive flooding.

Methods: The survey consisted of an environmental exposure assessment, which included assaying water and soil samples for contaminants, and taking blood and urine samples from 45 adolescents aged 15–18 years. We also made a subjective questionnaire assessment of 155 households.

Findings: There was significant contamination of the soil in Istoca, but no water contamination in the aftermath of hurricane Mitch. The soil levels of chlopyrifos and parathion were 30- and 1000-times higher, respectively, than the Environmental Data Quality Level. However, the most striking finding was the detection of elevated levels of chlorinated and organophosphate pesticides in adolescents. Toxicological analyses of serum specimens showed that 51% of the samples had elevated levels of 1,1-dichloro-2,2-bis-(p-chlorophenyl) ethylene (p,p-DDE) (range, 1.16–96.9 ng/ml) (US reference mean = 3.5 ng/ml) in adults). Dieldrin levels >0.2 ng/ml were also present in 23% of the serum specimens (serum levels of this analyte in US adolescents are <0.2 ng/ml). Of 43 urine samples analysed for organophosphatemetabolites, 18.6% contained diethyl phosphate (DEP) at levels which were greater than the reference mean of 6.45 mg/g creatinine. We also detected elevated levels of p-nitrophenol (p-NP) and of 3,5,6-trichloro-2-pyridinol (3,5,6-TCPY) in 91% and 42% of the samples, respectively

Conclusions: The elevated levels of chlorinated pesticides were surprising, since although these substances were banned in Honduras 15 years ago it appears that they are still being used in the country. Moreover, elevated levels of organophosphates were detected in the study adolescents even three weeks after the hurricane. Since these chemicals are usually cleared from the body quickly, our data suggest that the adolescents face an ongoing threat from pesticide exposure.

RRL- 0285

Title Elevated methylmercury concentrations and loadings during flooding in Minnesota rivers

Author(s) Steven J. Balogh, Edward B. Swain, Yabing H. Nollet
Science of the Total Environment, 2006 Vol 368

Key theme(s) Methylmercury; Flood

Abstract

Previous studies have identified flooded landscapes (e.g., wetlands, impoundments) as sites of elevated methylmercury (MeHg) production. Here we report MeHg and total Hg (THg) concentrations and mass loadings in rivers in Minnesota during major flooding episodes in the summer of 2002. Frequent intense precipitation events throughout the summer resulted in extraordinarily wet conditions in east-central and northwestern Minnesota. Streamflow remained at record-setting high levels in many rivers and streams in these regions for several weeks. We observed high concentrations of MeHg (N1.4 ng/L) accompanied by high MeHg/THg ratios (0.39 to 0.50) in the Roseau River in northwestern Minnesota and in the Elk and Rum Rivers in east-central Minnesota. Very high MeHg mass loadings were observed in the Mississippi River just upstream of Minneapolis on July 17 (51 g MeHg/day) and July 23 (42 g MeHg/day), when MeHg concentrations at this site were 0.89 and 0.99 ng/L, respectively. The elevated MeHg concentrations in the Roseau River were associated with low dissolved oxygen and high dissolved reactive phosphorus concentrations, both of which are characteristic of anoxic waters. These rivers drain landscapes containing varying amounts of wetlands, and some of the MeHg discharged is thought to have been flushed from anoxic wetland soils. In addition, the flooding of vast areas of normally dry land surfaces probably also resulted in increased MeHg production, adding to the quantities of MeHg exported from these watersheds. Changing climate patterns are expected to result in more frequent heavy precipitation and flooding events in Minnesota. Our results suggest that as flooding and wet conditions in this region increase, the production of MeHg and its export from terrestrial areas to surface waters will increase also.

Research Question(s)

What effects on MeHg concentrations and loads in rivers are found after extraordinary flooding and discharge events?

Research Methodology

Our sampling sites on the rivers were located at USGS streamflow monitoring stations 05286000 (Rum River near St. Francis) and 05275000 (Elk River near Big Lake). The Rum and Elk Rivers were each sampled 11 times between July 23 and October 29, 2002. Samples were collected at Malung and Caribou on the Roseau River four times each between July 8 and October 14, 2002. Only unfiltered samples from these four sampling sites were analyzed for THg and MeHg due to time and resource constraints. Sampling of the Mississippi River at Anoka took place monthly from January through March, and then three or four times per month through October. Both filtered and unfiltered samples were analyzed for THg and MeHg at this site. Samples were always collected between 8:00 and 11:00 AM at all sites. MeHg was

determined by aqueous phase ethylation/ Tenax trap preconcentration/gas chromatography with atomic fluorescence detection. THg was determined by cold vapor atomic fluorescence with single gold trap amalgamation (Liang and Bloom, 1993). Total suspended sediments (TSS), volatile suspended sediments (VSS), and sulfate were determined in separate samples obtained at the same time as the samples for Hg analysis. Additional determinations of dissolved reactive phosphorus (DRP) and dissolved oxygen (DO) were carried out on samples from the Roseau River. All analyses were by standard methods (American Public Health Association, 1998). Stream discharge data were obtained from the United States Geological Survey (USGS, 2003).

Finding(s)

The Elk and Rum rivers

1) Concentrations of THg and TSS in the Elk River remained relatively low. Total Hg concentrations in the Elk River did not exceed 4.50 ng/L (Fig. 3a), and concentrations of TSS ranged only from 3 to 15 mg/L, indicating that sediment inputs from soil erosion were small, despite the very high discharge. Results were similar in the Rum River, where THg concentrations were less than 4.30 ng/L (Fig. 3b) and concentrations of TSS were also low (range: 3–18 mg/L).

2) Concentrations and loads of MeHg were high in the Elk River during these high discharge events in the summer of 2002, then decreased greatly by the end of October.

3) The hydrograph for the Rum River is similar to that for the Elk River. The major difference was that an earlier event (peak daily mean discharge=66.0 m³/s on July 1) and a later event (peak daily mean discharge= 73.6 m³/s on October 13) were almost as large as the two main summer events.

4) Episodes of elevated MeHg concentrations in the Rum River and two of its tributaries were also observed during high discharge events in July, 2003 (Balogh et al., 2004, 2005).

5) Concentrations of MeHg were negatively correlated with sulfate concentrations in the Elk River ($\text{MeHg}=0.139\text{SO}_4+1.62$; $r^2=0.79$, $n=11$) and in the Rum River ($\text{MeHg}=0.161\text{SO}_4+1.10$; $r^2=0.60$, $n=11$).

Roseau river

1) High MeHg concentrations and loads were also observed in the Roseau River under high discharge conditions in July 2002, but they decreased substantially by mid-October.

2) The unfiltered THg concentration was only 3.10 ng/L, yielding a MeHg/THg ratio of 0.50.

3) Our sampling was initiated almost a full month following peak discharge at this site, and it is possible that we missed sampling this site when MeHg concentrations were higher. The highest unfiltered MeHg concentration observed was 0.59 ng/L on July 8 (Fig. 4b) when the discharge was 8.2 m³/s, below the 80th percentile discharge for that date (8.7 m³/s, 55 year record; USGS, 2003). Later unfiltered MeHg concentrations were all less than 0.2 ng/L. The MeHg load at Malung on July 8 was only 0.44 g/day, then decreased to less than 0.04 g/day for the last three sampling dates. The unfiltered THg concentration at Malung was 3.21 ng/L on July 8, then decreased to less than 1.7 ng/L for the remaining sampling dates. The MeHg/THg ratio at

Malung did not exceed 0.18 during our brief study (range: 0.07–0.18). It is possible that higher MeHg concentrations and loads may have obtained at Malung in mid- to late June, prior to the initiation of our brief sampling effort.

4) The elevated MeHg concentrations in the Roseau River at Caribou in July 2002 were associated with low DO concentrations and high DRP concentrations (Fig. 5a and b, respectively), both of which are characteristic of anoxic waters.

Mississippi river at Anoka

1) Concentrations and loads of MeHg were elevated in the Mississippi River at Anoka in July on the recessional limb of the hydrograph following the major precipitation events of late June and early July (Fig. 6a). The highest MeHg concentration we observed was 0.99 ng/L on July 23. The discharge on that date (492 m³/s) was above the 95th percentile value of 466 m³/s (69 year record; USGS, 2003). The in-stream MeHg loading on July 23 was 42 g/day. The highest in-stream MeHg loading we observed was 51 g/day (concentration= 0.89 ng/L) on July 17. The discharge on that date was 671 m³/s, above the 99th percentile level (641 m³/s, 69 year record; USGS, 2003).

2) Total Hg concentrations at Anoka varied widely throughout the sampling period, responding to climate-driven changes in hydrological inputs (Fig. 6b). Total Hg was primarily associated with the particulate phase as soil materials entered the river in runoff and TSS levels increased.

3) The MeHg/THg ratio was elevated throughout much of the summer, with values exceeding 0.1 for the unfiltered samples and 0.2 for the filtered samples.

Conclusion

The results presented here for four rivers in Minnesota show that MeHg export from these watersheds is primarily event-driven, with large amounts of MeHg carried in streams during summertime periods of high discharge. Concentrations of MeHg and in-stream MeHg loadings were much lower at lower discharge conditions. The data also indicate that, during these hydrological events, additional sources of MeHg within the watershed are accessed, probably including the flushing of pre-existing MeHg from wetlands and other source-areas. Where these events resulted in the inundation of floodplain soils, additional MeHg may have been produced as the soils turned anoxic and sulfate-reducing microbial activity increased. These findings indicate that flooding and wet conditions are on the increase in some regions, and based on our results, this could mean that the production of MeHg and its export from terrestrial areas to surface waters are also increasing.

RRL- 0286

Title of article Heavy metal pollution of soils affected by the Guadiamar toxic flood

Author(s) F. Cabrera, L. Clemente, E. Díaz Barrientos, R. López

The Science of the Total Environment, 1999 Vol 242

Key theme(s) Soil; Heavy metals; Pollution; Floods

Summary

Total heavy metal concentrations were determined in soil samples of seven selected areas along the Guadiamar river valley affected by the toxic flood, after removal of the deposited sludge. Mean total concentrations of nine elements As, Au, Bi, Cd, Cu, Pb, Sb, Tl and Zn. out of the 23 As, Au, Ba, Be, Bi, Cd, Co, Cr, Cu, In, Mn, Mo, Ni, Pb, Sb, Sc, Sn, Th, Tl, U, V, Y and Zn. analysed were higher in sludge-covered soils than in unaffected soils. Mean values of total As, Au, Pb, Sb, Tl and Zn in sludge-affected soils were higher than the upper limits for normal soils world-wide. Mean concentrations of Bi, Cd and Cu were within these ranges, although some individual values exceeded the upper limits. In all sampling areas, severe heavy metal pollution was observed in the superficial layers 0]20 cm. of most of the affected soils, which decreased downward in the soil profile. Generally, in soils with more than 25% of clay, concentration of heavy metals below the 20-cm depth decreased to values close to those of the background level of the Guadiamar valley soils, while in coarser soils, heavy metal pollution penetrated below this depth, being noticeable down to a depth of at least 50]80 cm.

Research Question(s)

How was the the degree and the penetration of the heavy-metal pollution in the profiles of the affected soils after the flood?

Research Methodology

Between the 8th and 15th of May 1998, soil samples were taken at different depths 0]5, 5]10, 10]15, 15]20, and 20]50 cm. at sampling sites in seven areas along the Guadiamar valley Fig. 1., all of them on land devoted to extensive agriculture. At sites S3, S4, A2, A3, L3 and L4, soil samples were also taken at a depth of 50 cm. The soils were classified as Typic Xerofluvent D, L1, L2, PA1, PA2, A1 and Q., Vertic Xerofluvent M2 and M3., Typic Xerochrept A2 and A3., Calcixerollic Xerochrept S1]S4., Typic Haploxeralf L3 and L4. and Aquic Haploxerert M1. Soil Survey Staff, 1994. Sampling of the affected soils was carried out by digging a pit 50 cm deep after removing the deposited sludge and cleaning the surface. Soil and sludge samples were oven-dried 508C. and crushed to pass through a 2-mm sieve, and then ground to -60 mm. Soil samples 2 mm were analysed for pH in saturated paste Hesse,1971., total carbonate content was determined by the manometric method Demolon and Leroux,1952., and size particle distribution by the hydrometer method Gee and Bauder, 1979. Heavy metal and other trace element contents in the soil -60 mm. and sludge samples were determined by ICP-MS after digesting the samples with a mixture of concentrated HNO3 and HF to dryness and redissolving in 4% concentrated HNO3. Total heavy metal concentrations were calculated on a dry weight basis. The accuracy and precision of the method were assessed by carrying out analyses of two BCR reference samples: CRM 141 and CRM. The degree and the penetration of heavy metal

pollution in the affected soils were measured and compared using the Pollution Load Index PLI. of Tomlinson et al. 1980.

Finding(s)

- 1) The pH of the unaffected soils ranged from 7.0 to 7.8, while the pH of the affected soils ranged from 5.8 to 7.8. Minima of the pH range of some samples of affected soils S2, S4, L1, L2, A3, M2, and M3. were lower than those of the corresponding unaffected soils S1, S2, A2, and M1.. Generally, the lowest pH coincided with the lowest CaCO₃ contents. The lowest mean values of pH in the studied soils were found in the sample of Las Doblas D., which had the lowest mean values of CaCO₃ and clay content.
- 2) Available data on the composition of the acidic water of the slurry indicated that soils affected by the flood received large amounts of dissolved heavy metals. Mean concentrations of As, Au, Bi, Cd, Cu, Pb, Sb, Tl and Zn in the 0]50-cm layer of affected soils were higher than in unaffected soils Table 4.. Mean concentrations of As, Au, Pb, Sb, Tl, and Zn in sludge-affected soils were also higher than the upper limits of the ranges of normal soils shown in Table 3 Bowen, 1979.. Mean concentration values of Bi, Cd and Cu in affected soils were within the ranges of normal soils, although some individual values of these elements exceeded the upper limit of those ranges.
- 3) Background values of Cd, Cu, and Pb were very close to the median for normal soils (Bowen, 1979), but those of As, Bi, Sb, Tl and Zn, were respectively 3.2, 2.5, 1.8, 3.5, and 1.2 times higher than the median for normal soils.
- 4) The clay content of soils S2, S4, L1]L3, PA2, A3, and M2 open points. was higher than 25%, while most of the points belonging to soils D, A1, and M3 solid points. are below 25% of clay.
- 5) At all sampling sites, severe heavy metal pollution was observed in the superficial soil layers 0]20 cm of most of the sludge-affected soils, and that heavy metal pollution decreased downward in the soil profile.
- 6) A programme of monitoring the bioavailability of pollutants in 'cleaned' soils would be an important tool to provide a warning of pollutant transfer between components of the air-water-soil-plant-animal system.

RRL- 0287

Title Effects of flooding on lead and cadmium speciation on sediments from a drinking water reservoir

Author(s) V. Chrastny, M. Komarek, P. Tlustos, J. Svehla

Environmental Monitoring and Assessment, 2006 Vol 118

Key theme(s) Bottom sediment, cadmium, chemical fractionation, flood, lead, sequential extraction, water reservoir

Summary

Rimov water reservoir on the river Malse is the main source of drinking water for the town of Ceske Budejovice and for the majority of inhabitants in the South Bohemian region; Czech Republic. Changes in cadmium and lead contents in bottom sediments before and after an extensive flood on the river Malse in August, 2002 were therefore determined. A five-step sequential extraction procedure was used in order to obtain more detailed information about the influence of the flood on heavy metal retention. In order to determine the mobility of lead and cadmium, the mobility factor for these metals was calculated. The mobility factor of cadmium showed a significant decrease in the upper parts of the sediment profiles after the flood caused by a release of cadmium especially from the exchangeable fraction. There were no significant changes in the lead mobility factor after the flood, but a decrease of lead concentration in the exchangeable fraction was observed. Presented results show that the flood led to a leaching of the heavy metals present in bottom sediments into the environment.

Research Question(s)

What is the effect of the flash flood on the river Malse in relation to changes in lead and cadmium speciation in bottom sediments from the Rimov water reservoir?

Research Methodology

The sampling sites were selected to represent different parts of the reservoir. Samples were collected using a gravity corer and the sediment profile was divided into 10 cm parts. In order to determine lead and cadmium speciation the classical sequential extraction technique by Tessier was used. The determination of Pb and Cd concentrations was performed using a mass spectrometer with inductively coupled plasma under standard conditions with a Meinhard concentric nebulizer.

Finding(s)

There were no significant changes in the lead mobility factor after the flood, but a decrease of lead concentration in the exchangeable fraction was observed. The results show that massive flash floods can cause an intensive release especially of cadmium present mainly in the mobile fraction. The release effect is important for a consecutive migration of heavy metals into other compartments of the environment. Catastrophic floods can therefore trigger heavy metal leaching from contaminated bottom and lake sediments into the environment and can therefore present a potential risk especially for the drinking water quality.

RRL- 0288

Title Post-Hurricane Katrina passive sampling of ambient volatile organic compounds in the greater New Orleans area

Author(s) Kuenja C. Chung, Thomas H. Stock, Luther A. Smith, Masoud Afshar
Environmental Research, 2009 Vol 109

Key theme(s) Hurricane Katrina, Passive samplers, Ambient air quality, Volatile organic compounds (VOCs), Method evaluation, Temporal and spatial analyses

Summary

On August 29, 2005, Hurricane Katrina made landfall near New Orleans, Louisiana, a major metroplex with petroleum industries. In response to the potential impact of the storm on air quality and to assess the exposures to toxic air pollutants of public health concern, the United States Environmental Protection Agency conducted passive monitoring of air toxics for three months, starting in late October 2005 through early February 2006, at up to 18 sites in the New Orleans area affected by Hurricane Katrina. The overall results of the passive ambient monitoring are summarized with the concentrations for the twenty-nine observed volatile organic chemicals, which include benzene, toluene, ethylbenzene, and xylenes, and the measured concentrations are compared with available health-based screening levels. The results of passive monitoring are also compared with those of the collocated canister sampling at one of the sites. The overall results showed that the outdoor levels of atmospheric volatile organic chemicals in the post-Katrina New Orleans area were very low and far below the available screening levels. The results also confirm the effectiveness of passive monitoring in a large geographical area where conventional methods are not feasible, electrical power is not available, and the need for sampling is urgent, as in the aftermath of natural disasters and other catastrophes.

Research Question(s)

How did the indoor VOC levels change in the aftermath of the hurricane?

Research Methodology

1. Passive VOC measurements: Originally, EPA/ERT considered twenty sites in the greater New Orleans area as locations for air sampling devices. In the end, eighteen sites were actually employed. For ambient field sampling, the samplers were placed away from local pollution sources or obstructions such as roads, buildings, or trees to prevent restricted air flow as required by EPA siting criteria (US EPA, 2008). In the case of Site 6 (Kenner site), since there was no hurricane damage, the existing platform built previously by the Louisiana Department of Environmental Quality (LDEQ) was used. In the case of Site 14 (Water Purification Plant site), sampling occurred on concrete walkways between treatment ponds. For the remaining 16 sites, sampling occurred on a raised temporary wooden platform specially built and secured behind a fence for hurricane aftermath air sampling. Also, a protective piece of plywood was installed on a corner of the platform railing to protect the samplers from direct exposure to precipitation.

2. Sampling method and protocol: The passive VOC monitoring was part of a larger EPA effort to monitor air quality in the aftermath of Hurricane Katrina. Because of storm damage (e. g., lack of electrical power), air quality could not be ascertained by conventional monitoring equipment in most of the area in and around New Orleans. The passive samplers chosen for this project were 3M 3500 Organic Vapor Monitor (OVM) badges. Subject to logistical and safety concerns, passive sampling began as soon as possible after the hurricane. The first samplers were placed in service on October 24, 2005, and the last samples were removed on February 7, 2006. As was expected due to the nature of the post-hurricane environment, sampling was initiated at different times at different sites. For logistical reasons, the sampling scheme was changed midway through the project. From October 24, 2005, through December 22, 2005, samples were collected over 72-h (Monday–Thursday) and 96-h (Thursday– Monday) time periods (Stock et al., 2008). A total of 411 valid field samples were collected, with an additional 58 duplicate samples.

3. Quality assurance and quality control: For quality assurance and quality control, a Quality Assurance Project Plan (QAPP) and necessary Standard Operating Procedures (SOPs) were developed along with chain of custody forms for sample handling and sample shipping.

Finding(s)

1) Isoprene was never detected in any sample.

2) In addition to isoprene, the maximum observed values for tetrachloroethylene, naphthalene, p-dichlorobenzene, and d-limonene were all less than 1.0 mg/m³.

3) Only ten of the twenty-nine chemicals had maximum concentrations above 10 mg/m³. Five of these ten compounds had only one observed value over 10 mg/m³. Table 5 lists by compound all observations exceeding 10 mg/m³; again, the table is based on data over all sites and all sampling periods.

4) And most significantly, even the maximum measurement concentration was far below the EPA screening levels for all fourteen VOCs and throughout the entire post-hurricane sampling period of three months. However, it must be noted again that these measurements are ambient atmospheric measurements and do not reflect indoor VOC concentrations

5) All monitored VOCs in the greater New Orleans area were found only at low levels, if detected at all. In fact, more than 50% of the VOCs, except for benzene, toluene, and carbon tetrachloride, were often reported to be less than the method detection limit, or even analytically nondetectable. These results, of course, only apply to outdoor air quality levels; indoor concentrations, which may have been much higher, were not monitored.

6) All measurements of all VOCs were below any available EPA health-based screening levels. The overall outcome confirms good performance of this relatively inexpensive and easy-to-use passive monitoring methodology for ambient monitoring of VOCs, especially in the determination of air quality in a large geographical area, because of the ability to collect a large number of cost-efficient simultaneous samples without power and shelters. Moreover, it demonstrates that passive monitoring is uniquely suited for use in an area where conventional methods are not feasible and when there is an urgent need for air quality assessment, as in the aftermath of natural disasters and other catastrophes, e.g., the case of Hurricane Katrina.

RRL- 0289

Title Mobilization of Pesticides on an Agricultural Landscape flooded by a Torrential Storm

Author(s) David B. Donald, Fraser G. Hunter, Ed Sverko, Bernard D. Hill

Environmental Toxicology and Chemistry, 2005 Vol 24 ISN 1

Key theme(s) Pesticides, Precipitation, Flooding, Agriculture landscape

Summary

Mobilization of pesticides into surface waters of flooded agricultural landscapes following extreme precipitation events has not been previously investigated. After receiving 96 mm of rain in the previous 45 d, the Vanguard area of southeastern Saskatchewan, Canada, was subjected to a torrential storm on July 3, 2000, that produced as much as 375 mm of rain in 8 h. The majority of herbicides, but no insecticides, would have been applied to crops in the Vanguard area during the four weeks preceding the storm. After the storm, 19 herbicides and insecticides were detected in flooded wetlands, with 14 of them detected in 50% or more of wetlands. Average concentrations ranged from 0.43 ng/L (endosulfan) to 362 ng/L (2,4-dichlorophenoxyacetic acid). The pesticides probably were from long-range transport, followed by deposition in rain, and from herbicides applied to crops within the area subjected to the storm (1,700 km²). In the following year, when only 62 mm of rain fell in the same 45 d, only five pesticides were detected in 50% or more of wetlands. The authors estimated that for the 1,700-km² storm zone, 278 kg of herbicide were mobilized into rain and by runoff into surface waters, and 105 kg were removed from the Vanguard area by discharge into Notukeu Creek. Significant quantities of herbicides are mobilized to aquatic environments when prairie agricultural landscapes are subjected to torrential storms. In these circumstances, flooded wells and small municipal reservoirs used as sources of drinking water may be compromised by 10 or more pesticides, some at relatively high concentrations.

Research Question(s)

Consequence of extreme precipitation events on the mobilization of pesticides into surface waters of flooded agricultural landscapes.

Research Methodology

Herbicide concentrations were measured in three 15-d samples of rainwater collected before the Vanguard storm on a farm near Neville (SK, Canada) from May 20 to June 30, 2000 (Fig. 1). A fourth sample was collected on July 9, after the storm, from rain that fell from July 1 to July 5. Rainfall samples were collected using two identical funnels (inner diameter, 25 cm) set up 60 cm above the ground over 4-L amber bottles (a 10-mm rainfall yielded a 500-ml sample in each collection bottle).

Rain samples were shipped to the Lethbridge Research Centre (Lethbridge, AB, Canada) and analyzed for 2,4-dichlorophenoxyacetic acid (2,4-D), bromoxynil, dicamba, dichlorprop, diclofop, fenoxaprop, 4-chloro-2-methylphenoxyacetic acid (MCPA), triallate, and trifluralin using methodology adapted from that described by Bruns et al..

Finding(s)

The results indicate that torrential storms mobilize high concentrations of pesticides into surface waters in prairie agricultural regions. The authors estimated that 62% of the pesticides mobilized into surface waters by the Vanguard storm were retained on the landscape and that 38% were discharged to Notukeu Creek. These low-relief landscapes have a huge capacity to retain contaminated storm waters. Consequently, wildlife habitat (wetlands) and drinking-water supplies provided by wells and small municipal reservoirs may be compromised by agricultural contaminants.

RRL- 0290

Title

The Elbe flood 2002—toxic effects of transported contaminants in flatfish and mussels of the Wadden Sea

Author(s)

S. Einsporn, K. Broeg, A. Koehler

Marine Pollution Bulletin, 2005 Vol 50

Key theme(s)

Elbe flood; German Bight; Organochlorines; Polychlorinated biphenyls; Biomarker; Mussel; Flatfish

Summary

Cellular changes in livers from flounder (*Platichthys flesus* L.) and digestive glands of blue mussels (*Mytilus edulis*) were analyzed whether the Elbe flood catastrophe had deleterious effects on animal health. Internationally used core biomarkers (lysosomal membrane stability, biotransformation enzymes) were applied to assess the toxic effects of putatively increased pollution levels. In comparison to earlier data from long-term studies at the same stations, we found a significant impairment in the function of cell organelles (lysosomes) involved in the detoxification and elimination of pollutants in fish liver. Concentrations of relevant contaminants (organochlorines, polychlorinated biphenyls) were analyzed in parallel with cellular biomarkers, and conspicuously raised concentrations of insecticides metabolites were detected. Cell recovery and a clear reduction in contaminant concentrations were observed in fish livers five months after the flood at all sampling sites except the Helgoländer Tiefe Rinne.

Research Objective

To assess the impact of the flood on fish and mussels of the German coast and to determine the toxic contaminant impact by the use of biomarker responses.

Finding(s)

After the Elbe flood we found a significant impairment of lysosomal membrane stability in fish at certain sampling sites in the Elbe estuary and German Bight in comparison to earlier data from long-term studies (Broeg et al., 2002). Disorders of lysosomal function were detected in mussel digestive glands as well.

RRL- 0291

Title Public health impacts of floods and chemical contamination

Author(s) Euripides Euripidou, Virginia Murray

Journal of Public Health, 2004 Vol 26 ISN 4

Key theme(s) flooding, chemical, health, contamination, risk, pollution

Abstract

Introduction: Flooding accounts for about 40 per cent of all natural disasters that occur worldwide. In 2002–2003 many counties in England experienced severe floods. Floods are particularly important in public health terms as they may have multiple environmental consequences.

Methods: Details of floods reported to Chemical Hazards and Poisons Division, London [CHaPD(L)] were analysed and a literature review was undertaken to identify published reports of flood-related chemical incidents that have had an impact on public health.

Results: Epidemiological evidence shows that chemical material may contaminate homes and that in some cases flooding may lead to mobilization of dangerous chemicals from storage or remobilization of chemicals already in the environment, e.g. pesticides. Hazards may be greater when industrial or agricultural land adjoining residential land is affected. Less evidence exists to support the hypothesis that flooding that causes chemical contamination has a clear causal effect on the pattern of morbidity and mortality following these flooding events.

Conclusion: In the light of this evidence, a checklist/pro forma for public health response to and investigation of flooding events that may result in chemical contamination was needed. This is available from CHaPD(L).

RRL- 0292

Title The spatial and temporal trends of Cd, Cu, Hg, Pb and Zn in Seine River floodplain deposits (1994–2000)

Author(s) C. Grosbois, M. Meybeck, A. Horowitz, A. Ficht

Science of the Total Environment, 2006 Vol 356

Key theme(s) Seine River; Metallic elements; Greater Paris; Particulate fraction; Temporal trends

Summary

Fresh floodplain deposits (FD), from 11 key stations, covering the Seine mainstem and its major tributaries (Yonne, Marne and Oise Rivers), were sampled from 1994 to 2000. Background levels for Cd, Cu, Hg, Pb, and Zn were established using prehistoric FD and actual bed sediments collected in small forested sub-basins in the most upstream part of the basin. Throughout the Seine River Basin, FD contain elevated concentrations of Cd, Cu, Hg, Pb and Zn compared to local background values (by factors 2 to 10 fold).

In the Seine River Basin, trace element concentrations display substantial downstream increases as a result of increasing population densities, particularly from Greater Paris (10 million inhabitants), and reach their maxima at the river mouth (Poses). These elevated levels make the Seine one of the most heavily impacted rivers in the world. On the other hand, floodplain-associated trace element levels have declined over the past 7 years. This mirrors results from contemporaneous suspended sediment surveys at the river mouth for the 1984–1999 period. Most of these temporal declines appear to reflect reductions in industrial and domestic solid wastes discharged from the main Parisian sewage plant (Seine Aval).

Research Question(s)

- a. To better define the spatial and temporal trends in trace element (Cd, Cu, Hg, Pb and Zn) concentrations in Seine River Basin FD since 1994
- b. To identify areas of substantial anthropogenic impact
- c. To compare the temporal variations detected in the FD with those identified in contemporaneous suspended sediment surveys carried out by the national river monitoring program.

Research Methodology

Since 1994, FD have been collected after winter high-flow events at 11 key sites. Due to sampling difficulties (hydrological variations, absence of flood deposits), some key locations within the basin have to be represented by multiple stations, separated by 1–2 km. Paris is the most complex of these sites as it represents a 30-km river segment between 6 stations.

Finding(s)

Based on the trace element concentrations associated with a variety of solid-phase sample media, the Seine River Basin probably was among one of the most anthropogenically impacted basins in the world in the early 1980s (Meybeck et al., 2004). Subsequently, there has been a

marked decline in Cd, Cu, Pb, and Zn, and a moderate decline in Hg in the mainstem Seine River, especially at the river mouth at Poses. Second order variations, especially for Cu, Pb, and Zn, appear to be related to seasonal hydrological variations and/or the drilling of a new Paris Metro line (Meteor line).

This marked temporal reduction in sediment-associated trace element levels in the Seine River Basin probably can be related to a contemporaneous decline in the trace element levels from both industrial and domestic sources as reflected in the treated sludges from the main Paris sewage treatment plant (Seine Aval).

There appears to be a major upstream–downstream (lower to higher) trace element concentration gradient in the Seine River Basin. This gradient remains substantial, despite the overall temporal reduction in numerous anthropogenic trace element sources. The most substantial increase in the gradient appears to take place in the 40 km river reach encompassing Greater Paris (between KP 210 and 170). However, specific finer-scaled spatial variations in trace element impacts are difficult to detect using just fresh floodplain deposits because the Seine River Basin drains such a large area (65,000 km²). Sediment-associated trace element levels in the lower Oise and Marne Rivers are lower than those found in the Seine River mainstem; further, there has been little or no substantial change in concentrations between 1994 and 2000.

The sediment associated trace element temporal trends observed at the mouth of the Seine River Basin at Poses, based only on 15 FD samples collected over a 7-year period, closely match the trends determined from bimonthly SPM samples.

Hence, when resource limitations preclude the maintenance of a full SPM survey, limited FD surveys may be adequate to establish valid annual temporal trends. However, additional caution must be used when performing FD surveys because only a limited number of samples represent each hydrological year.

RRL- 0293

Title Origin of Polycyclic aromatic hydrocarbons in lake sediments of the Mackenzie Delta.

Author(s) John V. Headley, Philip Marsh, Christine J. Akre, Kerry M. Peru

Journal of Environmental Science and Health, Vol A37 ISN 7

Key theme(s) PAHs; Mackenzie River; Alkylated PAHs; Sediment; Mass Spectrometry

Summary

The concentrations and distribution of polycyclic aromatic hydrocarbons (PAHs) were assessed in sediment cores from among 14 lakes from three regions comprising a transect across the central Mackenzie Delta. PAHs were consistently found in the lake sediments, with parent concentrations in the 20–200 ng/g range. Concentrations were generally independent of depth in the sediment cores and this pattern was similar among the 3 regions of the delta. Concentrations increased in a westerly direction among the regions. For some lakes, the concentration of PAHs decreased with decreasing flooding frequency, and decreasing sedimentation rates. For the latter, maximum concentrations occurred at shallower depths within the sediment cores as flooding frequency among the lakes decreased. The distributions of C0–C4 alkylated 2- and 3- ring PAHs were consistent with a petrogenic origin, while the corresponding distribution of 4-ring PAHs appears to be more consistent with a biogenic or pyrogenic origin. Based on relative contributions to the overall PAH budget, a petrogenic source appears to be dominant. However, the pyrene/fluoranthene ratio is more consistent with a source derived from peat. The alkylated PAH profiles are inconsistent with those in the Athabasca River system, and supports a previously published hypothesis that the contribution of PAHs from the Athabasca oil sands to the lower Mackenzie River is minimal. A double ratio plot of chrysene vs dibenzothiophene, diagnostic of weathering, suggests most weathering occurred before the sediments were deposited in the lakes, while a double ratio plot of dibenzothiophene vs phenanthrene suggests a common source of PAHs across the delta, despite differing water sources from east to west across the delta. PAH inputs to the delta appear to mirror sediment inputs documented in previous work, where high sediment input from the Mackenzie mainstem during high floods dominates the delta sediment influx and masks any influence of the Peel River.

Research Question(s)

- a. To assess present and historical levels of PAHs in the lake sediments
- b. To assess possible relations between lake flooding frequency and sources of delta water versus PAH content.
- c. To assess the relative importance of PAH contributions potentially among biogenic, petrogenic, and other anthropogenic sources.

Research Methodology

The authors utilized mass spectrometry to identify the predominant polycyclic aromatic hydrocarbons, and their potential sources, among sediment cores from lakes in the Mackenzie Delta. Sediment cores were obtained by Marsh et al.[2] from 88 lakes along two transects located in the Upper and outer Mackenzie Delta (Figure 1) to assess trends in lake sedimentation rates. The gas chromatography/mass spectrometry (GC/MS) experiments utilised Fisons (now Micromass) AutospecQ mass spectrometer equipped with OPUS software and a VAX workstation.

Finding(s)

It is shown that concentrations and distribution of polycyclic aromatic hydrocarbons (PAHs) in sediment cores from among 14 lakes from three regions comprising a transect across the central Mackenzie Delta, were generally independent of depth in the sediment cores. Likewise, it is shown that inputs of PAHs are predominantly petrogenic to the delta and generally mirrored sediment inputs, with concentrations in lake sediments decreasing with decreasing flood frequency, and decreasing sedimentation rates among the lakes. This work documents that the degree of anthropogenic influence on the present PAH load in the delta is small.

RRL- 0294

Title Chemical Hazards and Poisons Report - Issue 10 Emergency Planning and Preparedness, 2007 ISN 10
Chemical Hazards and Poisons

Key theme(s) Chemical Hazards and Poisons, Emergency Planning and Preparedness

Summary

In this issue, our incident response section focuses on the public health impact of a fire at a fireworks warehouse, flooding, contaminated land, odours, carbon monoxide and WWII incendiary devices. Topics are some recent significant incidents including: the widespread flooding across England; a fire at a fireworks depot; an incident involving WWII grenades; and a land contamination incident which resulted in the use of novel technology for remediation.

Research Question(s)

- a. Which Chemical Hazards and Poisons are currently new and important to discuss?
- b. What approaches in Emergency Planning and Preparedness are suggested?

Finding(s)

EMERGENCY PLANNING AND PREPAREDNESS

1) Chemical agents have wide-ranging effects on the body systems but are immediately lifethreatening as a result of actions on the respiratory system, blocking the upper and lower air passages to the lungs (the airways). Blockage may be physical due to the production of massive secretions and the inhalation of vomitus or due to pharmacological effects causing narrowing or closure (a situation that might be termed 'chemical asthma'). Chemical agents also affect the neural control of the breathing mechanism causing a failure of chest movement and the central brain control of breathing. Organophosphate nerve agents and pesticides are examples of such agents. In addition to this double chemical attack on airway and breathing many chemical agents cause the lung sacs (alveoli) to fill with fluid - a condition called toxic pulmonary oedema which stops the passage of oxygen from the lungs to the blood.

Antidotes such as atropine and oximes have long been considered to be the mainstay of the emergency response to nerve agent chemical attack on the respiratory system but in severely injured patients, antidote therapy alone is not enough. There must be provision of airway clearing and support and of artificial ventilation to ensure survival. For patients trapped in a contaminated zone, the conventional management was to wait until decontamination had been completed before starting advanced life support in the cold zone. However the delays enforced by decontamination in persistent chemical releases may be life-threatening for those with developing toxic respiratory failure. The rationale of TOXALS is to provide such essential care inside a contaminated zone before and during contamination.

To address the problems associated with managing potentially contaminated casualties, the UK Department of Health (DH) Emergency Preparedness Division has created a special paramedic taskforce trained and equipped to operate in difficult and dangerous surroundings called 'Hazardous Area Response Teams (HART)'. The initial aim of the DH initiative was to be able to provide advanced essential life support in chemically – contaminated zones. However, the HART concept has now been expanded to allow paramedic teams to operate as Urban Search and Rescue (USAR) teams for victims of conventional physical trauma with entrapment.

The Department of Health HART and USAR initiatives allow specially trained paramedic teams to operate safely in contaminated zones and in sites where patients are trapped. This means that essential life support can be provided before casualties are transported on to hospital care. Following pilot studies in London and Yorkshire which are being carefully evaluated, the HART and USAR programme will be extended to a number of other locations in England and Wales during 2007 – 2008.

2) The mass media provides an excellent resource for CHaPD and indeed all of public health, often following up and summarising an incident in a way that the HPA cannot due to resource constraints. It is important to note that although the print media may be relevant today, the world of mass media is changing, with more and more people turning to the internet for their news, with blogs, online discussion forums and community websites becoming important as alternative sources of news information.

3) There appears to be a near consensus among the Public Health staff on the Health Protection on-call rota within the coastal counties of the Eastern Region for a need to organise a training session on flooding.

4) The need for a quality standard in sample collection, distribution and processing is an

essential part of the service the Health Protection Agency, Department of Health and the NHS should provide in the case of an acute (or chronic) incident involving chemical exposure of the public.

RRL- 0295

Title Chemical and Microbiological Parameters in New Orleans Floodwater Following Hurricane Katrina

Author(s) JH Pardue, WM Moe, D McInnis, LJ Thibodeaux
Environmental Science and Technology, 2005 Vol 39 ISN 22

Key theme(s) Hurricane Katrina, contamination, floodwater

Summary

Hurricane Katrina, rated as a Category 4 hurricane on the Saffir-Simpson scale, made landfall on the U. S. Gulf Coast near New Orleans, Louisiana on Monday, August 29, 2005. The storm brought heavy winds and rain to the city, and several levees intended to protect New Orleans from the water of Lake Pontchartrain were breached. Consequently, up to 80% of the city was flooded with water reaching depths in excess of three meters in some locations. Research described in this paper was conducted to provide an initial assessment of contaminants present in floodwaters shortly after the storm and to characterize water pumped out of the city into Lake Pontchartrain once dewatering operations began several days after the storm. Data are presented which demonstrate that during the weeks following the storm, floodwater was brackish and well-buffered with very low concentrations of volatile and semivolatile organic pollutants. Dissolved oxygen was depleted in surface floodwater, averaging 1.6 mg/L in the Lakeview district and 4.8 mg/L in the Mid- City district. Dissolved oxygen was absent (<0.02 mg/L) at the bottom of the floodwater column in the Mid-City district 9 days after the storm. Chemical oxygen demand (Mid- City average) 79.9 mg/L) and fecal coliform bacteria (Mid- City average) 1.4 _ 10⁵ MPN/100 mL) were elevated in surface floodwater but typical of stormwater runoff in the region. Lead, arsenic, and in some cases, chromium, exceeded drinking water standards but with the exception of some elevated Pb concentrations generally were typical of stormwater. Data suggest that what distinguishes Hurricane Katrina floodwater is the large volume and the human exposure to these pollutants that accompanied the flood, rather than very elevated concentrations of toxic pollutants.

Research Question(s)

To present a snapshot of the chemical and microbiological characteristics of the water immediately following the flood caused by Hurricane Katrina.

Research Methodology

Sampling. Floodwater samples were collected from two Orleans Parish “East Bank” locations: in the West End and Lakeview neighborhoods of the Lakeview district on Saturday, Sept. 3, 2005 and in the Tulane-Gravier neighborhood of the Mid-City district on Wednesday, Sept. 7, 2005 (Figure 1).

Sampling locations in the Lakeview district are denoted by points numbered 1-21 in Figure 1, and sampling locations in the Mid-City district are denoted by points labeled as NO-1-NO-9. The Lakeview district is bound by Lake Pontchartrain to the north and the 17th Street Canal to the west. The Lakeview district is composed of newer residential neighborhoods and is near one of the larger canal breaches at the 17th Street Canal. It was selected for sampling strictly based on accessibility and safety issues immediately after the flood.

Once these analyses were completed, a second area was targeted for sampling that would provide contrast to the Lakeview district with respect to land use, contact time with the floodwaters, and distance from the levee breaks. The Tulane-Gravier neighborhood in the Mid-City district was selected to provide this contrast. It is a mixed-use area that includes low-income residential, light industry, and a healthcare education complex. It is located 6-8 miles from any of the levee breaks and possesses some of the lowest elevations within New Orleans’ bowl-shaped topography. Both the Lakeview and Mid-City locations are located within the leveed “East Bank” of Orleans Parish. This contiguous urban area had the highest population of the flooded areas of the city and had the greatest number of residents exposed to the floodwater.

Additional samples for some constituents were collected in Lake Pontchartrain on Saturday, September 3 for comparison purposes. Sampling locations in Lake Pontchartrain are labeled as LP-1-LP-3 in Figure 1. Samples were obtained using a flat-bottomed boat equipped with a small outboard motor. Samples were collected at street intersections using the cross-street patterns as a makeshift grid. When approaching an intersection targeted for sampling, the motor was turned off and the boat was allowed to drift in, minimizing mixing of water that was collected. For the Lakeview sampling event, surface samples were collected. For the Mid-City sampling event, surface and bottom samples were collected. Bottom samples were obtained using a low-flow peristaltic pump with collection tubing placed on the bottom of the floodwater column at street level. These data were supplemented by dissolved oxygen profiles, fecal coliforms, and chemical oxygen demand (COD) sampling along the 17th Street Canal (Figure 1 points labeled as C1-C15), the location of a major levee breach and, after the levee repair, one of the routes of floodwater discharge into Lake Pontchartrain. Samples collected along the length of the 17th Street Canal on Sept. 6, 11, and 13, 2005, were obtained by surface sampling along the bank and by boat. GPS data were recorded for all sampling locations. Data presented in this paper met all quality control criteria and sample preservation requirements described in the referenced methods.

Finding(s)

Data indicate that Hurricane Katrina floodwater in these two neighborhood “snapshots” is brackish, well-buffered water with low concentrations of volatile and semivolatile organic pollutants. Chemical oxygen demand and nutrients are elevated, but similar in magnitude to

those of normal stormwater. Several metals, including Pb, As, and Cr, approached, and in some cases exceeded, drinking water standards. Fecal coliforms were very elevated compared with primary contact water standards but, again, were similar in magnitude to what is found in typical stormwater runoff from the area. Collectively, these data indicate that Katrina floodwater is similar to normal stormwater runoff but with reduced levels. Of these fate mechanisms, only evaporation will be considered further here. The evaporation chemodynamics of both the soluble and sheen fractions is expected to be very rapid. For surface water low in total suspended solids and of depth h (m), the evaporation half-life of chemicals can be estimated by eq 1 where h is the floodwater depth and K_e is the evaporation mass-transfer coefficient (MTC) in m/h. Typical values for the MTC in lake surface water range from 0.10 to 0.15 for BTEX hydrocarbons (13). MTC chemical dependence exists in that higher molecular weight species have slightly lower MTCs; however, BTEX hydrocarbons have similar molecular weights, in the range of 78 to 106, so the variations are 10% or less. In comparison to lakes, the quiescent floodwaters appeared less turbulent, so MTCs in the range of 0.01-0.05 m/h are conservatively assumed. For a grab sample depth of 0.3 m, the estimated evaporation half-lives range from 4 to 20 h. This is a short time period suggesting that significant losses to air result quickly upon placing these chemicals in solution. Even in the case of a steady-state subsurface chemical source where elevated concentrations may exist at depth (i.e., ~ 3 m in floodwater depth) enhanced mixing in the surface layer results in it experiencing reduced concentration levels in comparison. Presence of a hydrocarbon sheen on the floodwater surface complicates modeling of the evaporation process, but in the case of the BTEX fraction, the effect is likely small. The films are very thin but contribute significantly to the mass retrieval in water grab samples. On the basis of laboratory experiments using thin oil layers, h_o (mm), the 1st order evaporation rate constant can be estimated by eq 2 where P is the vapor pressure of the hydrocarbon in atmospheres and K_e is in min⁻¹ (13). Similar to eq 1, the evaporation half-life may be estimated as $t_{1/2} = 0.7/K_e$. Assuming a 1-mm-thick hydrocarbon sheen (likely a gross overestimate of the floodwater hydrocarbon sheen thickness), the $t_{1/2}$ values of benzene, toluene, and ethylbenzene are 1.6, 4.4, and 10 min, respectively. From this approximation, it is evident that evaporation from the surface layer water is not significantly retarded by the presence of a hydrocarbon layer. On the basis of these estimates it is not surprising that the floodwater displayed low levels of BTEX constituents and related petroleum hydrocarbons. In addition to concerns over direct human exposure to floodwater, the effect of floodwater discharge on aquatic life in Lake Pontchartrain is also of concern. On the basis of our results, two potential adverse impacts should be considered: (1) the depletion of DO in the lake as a result of oxygen demand exerted by the biodegradation of organic materials entering the lake, and (2) the potential for metal toxicity to fish. Although the COD levels measured in the floodwater are lower than those of typical municipal wastewater (14) and stormwater (15), it is not clear from the data collected what fraction of COD is due to soluble components and what fraction was associated with particulate matter, and it is not clear what fraction is biodegradable. With relatively high turbidity (Table 1) a fraction of the COD was likely due to particulate matter. Regardless of the exact fraction of COD corresponding to particulate matter, it is clear from the OUR and DO measurements that some fraction is biodegradable. Low DO concentration in the floodwater combined with residual biological oxygen demand has the potential to adversely impact aquatic life following discharge in Lake Pontchartrain, the water body to which the floodwater has been pumped. It should be noted however, as depicted in Figure 2, that the pumping operation aerates the water to some degree and allows consumption of at least a portion of the COD prior to discharge in the lake. From this perspective, it is clear that the pumping system provided some degree of treatment prior to

floodwater discharge into the lake, but determining adverse effects of low DO within the lake (e.g., fish kills) will require further monitoring. Metal toxicity to fish can be evaluated conservatively by comparing floodwater metal concentrations with U.S. EPA national recommended water quality criteria (16) for freshwater and saltwater ecosystems (Table 6), recognizing that Lake Pontchartrain is an estuarine system lying between these two endpoints. Average copper and zinc concentrations in both Lakeview and Mid-City floodwater greatly exceed both acute and chronic criteria for freshwater and saltwater ecosystems (Table 6). Concentrations of Pb, Cd, Ni, and As in the Lakeview and Mid-City district exceed some of the criteria, but not all. Clearly, there is the potential for metal toxicity in Lake Pontchartrain resulting from floodwaters pumped into the lake. Long-term bioconcentration and biomagnification of metals in aquatic species is also possible but can only be ascertained from long-term monitoring. Caution should be exercised when extrapolating the results presented here to other flooded parishes and districts within New Orleans because of differences in land use in these and other areas. These data represent water quality conditions in these neighborhoods between 5 and 9 days after the inundation from the flood, but prior to significant pumping of the floodwater back into Lake Pontchartrain. Importantly, these areas represent locations where many first-responders and residents were exposed to floodwaters. Although some conclusions can be drawn about the quality of the floodwater based on this data set, more detailed human exposure, waste load allocation, and ecological risk assessment calculations for Lake Pontchartrain should be conducted prior to reaching ultimate conclusions regarding the environmental impacts of Hurricane Katrina.

RRL- 0296

Title Water Quality Assessment and Monitoring in New Orleans Following Hurricane Katrina

Author(s) William E. Roper, Kevin J. Weiss, James F. Wheeler

Unpublished Paper for the Environmental Protection Agency, 2006

Key theme(s) Hurricane Katrina recovery, New Orleans, water quality, sediment sampling, expedient pollution controls, dewatering operations

Summary

Following the passage of Hurricane Katrina, New Orleans was left with eighty percent of its land area flooded. In some locations the flood waters were over thirty feet deep. In the heat and stagnation that followed the waters quickly became heavily polluted with petroleum products, industrial chemicals, raw sewage, dead animals etc. In addition, a super fund cleanup site was flooded and contributed to the water pollution problem. Pump out operations began in early September 2005 as a high priority to get the city dried out and on the road to recovery. Lake Pontchartrain was the primary receiving water body with the Mississippi River as a secondary receiver. A variety of approaches and technologies were evaluated to achieve treatment with minimal impact on pumping operations. Some of these

methods and technologies included; sorbet booms in the channels and the lake near outfalls, oil and debris removal skimmers in channels and near outfalls, floating and bottom anchored containment screens around outfalls, sediment control devices for hot spots within the city, application of flocculation chemicals in contained areas, aerators in the channels and near the outfalls, application of specialized bacteria, etc. Over 100 water quality sampling sites were setup throughout the city to characterize water conditions as the pump out proceeded. High risk areas were identified in a dynamic process and decisions made for best corrective action. Lake Pontchartrain continues to be monitored and long term rehabilitation efforts will be predicated on water quality monitoring results. Lessons learned from a water quality perspective during this massive disaster are presented with the goal of assisting future recovery efforts.

Research Question(s)

What is the consequence of Hurricane Katrina on water quality?

Research Methodology

EPA in coordination with the Louisiana Department of Environmental Quality performed chemical sampling of New Orleans flood waters for over one hundred priority pollutants such as volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), total metals, pesticides, herbicides, and polychlorinated biphenyls (PCBs). More than 190 water quality data parameters are constantly being updated, reviewed and validated through an EPA quality assurance process to ensure scientific accuracy. Example results are shown in tables 1 – 4 for testing of Primary pollutants. Table 1 lists the one pollutant, lead, that was found in this testing data that exceeded the EPA standard. Table two lists pollutants that were present but did not exceed EPA standards. Lead was the one pollutant most often found at measurement sites. However, when measured it was at locations that have historically been high in lead content. Table three lists material present but there are no standards at this time. Table four lists pollutant that was not present. Concerns about potential water-quality issues prompted discussions among the U.S. Environmental Protection Agency (EPA), Louisiana Department of Environmental Quality (LDEQ), and the LWSC to coordinate sampling locations and constituents sampled. The LWSC sampled fecal-indicator bacteria in Lake Pontchartrain in support of the LDEQ monitoring effort and water and bed-sediment samples from those areas in the lake not sampled by LDEQ. Dewatered sediments deposited by floodwaters were sampled in New Orleans and St. Bernard Parish as floodwaters retreated to determine what chemicals were in these sediments. At the same time high water marks along the north shore of Lake Pontchartrain, and in St. Bernard and Plaquemines Parishes were collected.

EPA, USGS and the State of Louisiana assessed Lake Pontchartrain as part of the broad, multi-agency assessment of damages to the region. Many of Katrina's impacts will emerge over different time spans and this mid- to long-term monitoring plan has been designed to detect effects as they appear. Most Pontchartrain sampling was done by the USGS and the State in collaboration with EPA. The Louisiana Department of Environmental Quality sampled Lake Pontchartrain and found no exceedances of water quality standards for organic and toxic compounds. Dissolved oxygen and bacterial impacts were most pronounced along the North Shore, while toxicity testing of New Orleans floodwaters showed little effect on fish and invertebrates.

Understanding why the floodwaters were not the toxic “witches brew” reported in the media depends on consideration of where the floodwaters came from. Perhaps 20 billion gallons (BG) of the New Orleans floodwater was rainfall, carrying little or no contamination. Human waste in the form of raw sewage was certainly present, but the total volume of effluent is not likely to be much beyond the 0.22 BG daily capacity of New Orleans’ Dunbar WWTP. An additional small volume (with disproportionately large potential water quality impact) can be attributed to petroleum products and household wastes leaking out of cars and containers. The remainder - nearly 40 BG - must have been a combination of Lake Pontchartrain waters and the storm surge from the Gulf of Mexico.

The waters entering from outside the levees are likely to have been heavily laden with resuspended bottom sediments. However, extensive pre-1990 shell dredging covering two-thirds of Lake Pontchartrain may have helped bury deposited metals and other toxics, making these waters comparatively clean from a human health risk standpoint (Mannheim). If so, the 1+ BG of sewage, petroleum products, and household wastes inside New Orleans were mixed with 60 BG of comparatively clean water. The 1300 BG volume of Lake Pontchartrain also acted as a buffer to water quality impacts, providing an additional opportunity for dilution.

Finding(s)

The flooding in New Orleans resulted in the potential for unparalleled exposure to toxics and contaminants. Initial concerns about a “toxic gumbo,” however, have not been supported by sampling and analyses to date. Although floodwaters did contain significant short-term biological hazards that posed risks to stranded residents and relief workers, they did not contain chemical toxicants at levels that are expected to lead to long-term impacts on the surroundings beyond the impacts expected of a similar volume of stormwater from the city. The floodwaters undoubtedly redistributed some contaminants, but the contaminant burden in soils and sediments appears to have generated few concerns for acute exposure and risk. However, although acute generalized hazards have not been identified, the population of New Orleans faces localized areas of more serious contamination, such as the neighborhoods impacted by failure of a crude-oil storage tank in St. Bernard Parish. The most serious continuing issue facing most residents is the presence of high concentrations of mold and airborne mold spores. However, respiratory protection during the removal of all mold-contaminated materials and reconstruction can mitigate the risk. Ultimately, the lessons learned from Katrina should be crystallized in a generic form so that the country as a whole will be better prepared for the next natural disaster, major industrial accident, or act of terrorism. Thus, every effort should be made to focus on the way information is processed in emergency situations and to make sensible, safe, and equitable cleanup/habitability decisions in an environment of great uncertainty. Because existing institutions were largely unprepared for a disaster of the scale of Katrina, it may not be possible to implement these principles in New Orleans. However, we can learn from Katrina and provide more effective responses to future catastrophes.

RRL- 0297

Title of article Microbial and Chemical Assessment of Regions within New Orleans, LA Impacted by Hurricane Katrina

Author(s) Schwab KJ, Gibson KE, Williams DL, Kulbicki KM

Environmental Science and Technology, 2007 Vol 41

Key theme(s) Hurricane Katrina, microbiological impact

Summary

The city of New Orleans, LA was severely impacted by flooding and wind damage following landfall of Hurricane Katrina in August 2005. The city's drinking water infrastructure was severely compromised and massive amounts of sediment were redeposited throughout the flooded region. Thousands of homes were water-damaged resulting in the rapid growth of mold. In September and October 2005 a convenience sample of selected homes, tap water, surface water, and sediment within New Orleans was assessed for mold contamination, microbial contamination, and heavy metal concentrations. At selected sites, indoor mold spore concentrations were compared to outdoor concentrations. The purpose of this study was to conduct a baseline environmental assessment in an effort to identify public health threats caused by wind and flood damage. Surface waters contained high concentrations of bacterial indicators whereas no bacteria were detected in tap water, even from taps containing no chlorine residual. Sediment samples contained concentrations of lead and arsenic similar to pre-Katrina concentrations. Outdoor total spore (sp) concentrations ranged from >6500 to 84 713 sp/m³. Indoor concentrations ranged from 6142 to 735 123 sp/m³. For the 13 locations with matched indoor/ outdoor samples, the mean indoor/outdoor spore ratio was 4.11 (ranging from 0.27 to >11.44). Inside 5 of the 13 homes, total spore counts/m³ exceeded 100 000, with measurements in the moldiest home exceeding 700 000 sp/ m³. In conclusion, surface waters had high concentrations of bacterial contamination but no bacterial indicators were present in tap water. Sediment samples did not have appreciable increases in lead or arsenic. Flooded homes, however, contained substantial concentrations of mold which could present a public health exposure route to individuals repopulating and restoring the City of New Orleans.

Research Question(s)

Members of the Johns Hopkins Bloomberg School of Public Health traveled to the Gulf Coast in September and October 2005 to conduct environmental assessments in an effort to identify public health threats.

Research Methodology

Water, air, and sediment samples were collected and analyzed for human indicator bacteria (enterococci, fecal coliforms, and *E. coli*), airborne mold, and metals (lead, and arsenic), respectively, as indicative of environmental contamination. Within New Orleans, sampling sites were identified based on empirical evaluations of the level of flooding and the availability of access. The results presented here provide a benchmark for microbial assessment of the New Orleans area following post- Katrina dewatering.

Finding(s)

Water Samples. The presence of high concentrations of bacterial indicators in surface water samples collected from flooded regions of the city were indicative of the large volumes of human waste that were present in the sewer system of a large metropolitan region. Interestingly, although four of the tap water samples contained very low concentrations of residual chlorine (>0.1 mg/L) none of the tap water samples contained bacterial indicators (Table 2) suggesting a low immediate bacterial risk associated with the drinking water. The massive amount of drinking water and wastewater infrastructure damage resulted in thousands of leaks throughout the distribution system. Maintenance of adequate water pressure and residual disinfectant concentrations was extremely difficult and in many areas of the city an absence of residents led to decreased water use. Pre-Katrina, the New Orleans Carrollton drinking water treatment plant normally yielded about 115 million gallons per day of finished water for the east bank of Orleans Parish. The Algiers drinking water treatment plant, which served the predominantly residential west bank portion of the parish, treated about 10 million gallons per day of water. The treated water at the two plants was pumped through more than 1610 miles of mains to more than 160,000 service connections. It was delivered to approximately 440,000 people on the east bank of Orleans Parish and approximately 57,000 people on the west bank (15). Following Katrina, it was estimated that roughly 85-100 million gallons of treated water were wasted each day through water pipe leaks created when trees uprooted during Katrina. That is more than four times the amount of water lost pre-Katrina, when the system then considered antiquated was leaking 20 million gallons every day (16). Due to the magnitude of leaks in the distribution system and continued renovation efforts, continued and enhanced vigilance of potable water quality is strongly recommended.

Sediment/Soil. Elevated Pb and As concentrations in soils are indicators of anthropogenic activities that often place communities at risk for hazardous environmental exposures. The presence of Pb and As in soil may be due to cumulative deposition over many years and may be unequally distributed across a community. The massive movement of water across the city raised the potential for a significant redistribution of soil contaminants throughout New Orleans. Mielke et al. have described soil lead concentrations in New Orleans from an extensive monitoring campaign conducted in the mid 1990s (17). As organized by census tract, they report widely diverse soil Pb concentrations across the city with the highest concentrations, 600-1125 $\mu\text{g/g}$, found in an area similar to Region 1 of this study and the lowest concentrations, 0-200 $\mu\text{g/g}$, in areas similar to Regions 3 and 4. Although our sample collection was much more limited in scope, we also found the highest soil Pb concentrations in Region 1 and the lowest concentrations in Regions 3 and 4, suggesting that a massive redistribution of Pb did not result from the flooding. No samples were found to have a concentration greater than 1200 $\mu\text{g/g}$, the U.S. EPA standard for lead in bare soil outside of a children's play area, although one sample from Region 1 exceeded the 400 $\mu\text{g/g}$, the average allowable for lead concentrations in areas where children play (18). Similar geographical data for As soil concentrations do not exist. The U.S. EPA Region 6 reports background soil As concentrations for Region 6, which includes Louisiana, to range from 1 to 17 $\mu\text{g/g}$ (19). Across our study regions we did not find a statistically significant difference in soil As. In addition, only one sample reported an As concentration, 31.8 $\mu\text{g/g}$, outside of the background range. Again, this suggests that the flooding did not have a significant impact on soil concentrations and so did not cause a greater risk from these contaminants to the public than was present before Katrina occurred.

Airborne and Surface Mold. Twelve of the 13 homes evaluated for airborne mold were located in either Region 2 or Region 4. One home was located in Region 1. Two of the 13 homes sampled did not show evidence of either flooding or water damage. Using water lines as indicators for the level of water intrusion, 4 homes were found to have suffered flooding to volumes ranging between 2 and 10 cm covering only the first floor of the residence or present only in the basement. Five homes showed evidence of flooding that ranged between 0.3 and 1.5 m of water. Two homes showed indications that they were inundated with over 5 m of water with one of the homes completely covered and the other having 1.5 m of water in the second story. Although there are no set criteria for determining the level of hazard due to the presence of mold in an indoor environment, Baxter et al. provide guidance for judging the hazard presented by mold intrusion. The suggested airborne mold acceptance or rejection criteria for clean and moldy residential buildings were <1200 total spore counts/ m^3 and >1300 total spore counts/ m^3 , respectively. Clean and moldy buildings were defined according to a specified set of criteria covering factors such as visible mold, visible water staining, a history of flooding or other water damage, and sewage damage. According to these criteria all homes in this study, including the homes that did not show evidence of flooding or water damage, would be considered "moldy" at the time of testing. On average, total mold concentrations were 4-fold higher indoors as compared to concentrations measured outside. Inside five of the 13 homes, total spore counts/ m^3 exceeded 100 000 sp/ m^3 , with measurements in the moldiest home exceeding 700 000 sp/ m^3 . This home, with all of its contents, had been closed since the hurricane. Four of the five high mold homes had the contents remaining in the home. Area concentrations of surface mold are consistent with airborne mold results. The lowest area surface mold concentration, 80 sp/ m^2 , was found in a home which had no visible flood or water damage. The high surface concentration, 2.0×10^7 sp/ m^2 , was found in the home with the second highest airborne mold concentration. Although this home had been flooded with only 10 cm of water inside, this home had black mold covering most of the floors. At the time sampling was conducted in these homes, 6 weeks had passed since the storm. In the months since the hurricanes, homeowners have been returning to remediate or permanently vacate water-damaged homes potentially placing them at risk for dangerous mold exposures. The CDC report on mold prevention strategies and possible health effects (21) repeatedly stressed that individuals should minimize mold exposure that could result in adverse health effects by avoiding areas where mold contamination is obvious, using environmental controls and personal protective equipment while cleaning in areas contaminated with mold, and keeping hands, skin, and clothing clean and free from mold-contaminated dust. Given the magnitude of mold infestation many of these recommendations become very challenging but clearly are beneficial for maintaining public health.

RRL- 0298

Title The Elbe Flood in August 2002---Organic Contaminants in Sediment Samples Taken After the Flood Event

Author(s) Burkhard Stachel, Eckard Jantzen, Wilhelm Knoth, Frank Krüger

Journal of Environmental Sciences and Health, 2005 Vol 40

Key theme(s) Elbe flood; Sediments; Dioxins; Xenoestrogenic plasticizers and detergents; Musk fragrances; PBDE; Chloralkylphosphates; Organochlorine compounds; PAH; Organotin compounds; Ecotoxicological investigations.

Summary

The aim of the study was to document the sediment contamination throughout the Elbe in respect of mainly persistent contaminants directly following the flood. The basis of this investigation constituted sediment samples taken about one month after the event from the section of the river affected by flooding. This was between Obristvi (Czech Republic) and the Wadden Sea (North Sea, Trischendamm) on the German coast. A large number of organic contaminants was investigated.

The results show that only a few weeks after the flood, contaminant concentrations in solid matter were comparable to those prevailing beforehand.

Research Objective

To document the sediment contamination throughout the Elbe in respect of mainly persistent contaminants directly following the flood.

Research Methodology

In the course of this study 37 sediment samples were analyzed. They were taken after the flooding in September 2002 along the Elbe and at the mouths of its major tributaries. The sampling program covered the entire river stretch that was affected by the floods, from Obristvi (Czech Republic) to the Elbe estuary (North Sea) on the German coast. Analyses were performed for dioxins, nonylphenols, nonylphenol ethoxylates, bisphenol A, DEHP, musk fragrances, polybrominated diphenylethers, chloroalkylphosphates, organochlorine compounds, PAH, and organotin compounds.

Finding(s)

The results show that only a few weeks after the flood, contaminant concentrations in solid matter were comparable to those prevailing beforehand. Significant sources of contaminant input proved to be the tributaries Vltava (Moldau), Bilina (both in the Czech Republic), and the Mulde (Germany), as well as industrial and municipal sewage treatment works (STW) located along the Elbe. Further point sources are to be found in still water zones such as harbors and abandoned channels. These sources are activated when erosive action stirs up older sediments. Statistical analyses of the congener distribution of the dioxins provided evidence on the sources of these contaminants and freight levels in different river sections. The chemical

analyses were complemented by results of ecotoxicological investigations with two sediment organisms (*Chironomus riparius* and *Potamopyrgus antipodarum*).

RRL- 0299

Title Effects of Hurricanes Katrina and Rita on the Chemistry of Bottom Sediments in Lake Pontchartrain, La.

Author(s) Peter C. Van Metre, Arthur J. Horowitz, Barbara J. Mahler, William T. Foreman

USGS Circular 1306

Key theme(s) Environmental contamination

Summary

Concerns about the effect of pumping contaminated flood waters into Lake Pontchartrain following the hurricanes of 2005 prompted the U.S. Geological Survey (USGS) to sample street mud, canal-suspended sediment, and bottom sediment in Lake Pontchartrain. The samples were analyzed for a wide variety of potential inorganic and organic contaminants. Results indicate that contamination of lake sediment relative to other urban lakes and to accepted sediment-quality guidelines was limited to a relatively small area offshore from the Metairie Outfall Canal (popularly known as the 17th Street Canal) and that this contamination is probably transient.

Research Question

What is the effect of the discharge of flood waters from New Orleans on the sediment chemistry of Lake Pontchartrain?

Research Methodology

Locations were selected to characterize the sources (street mud: 4 sites), transport (suspended sediment: 5 sites), and fate (bottom sediment in the lake: 27 sites) of sediment-associated contaminants pumped from the city (fig. 1). Sampling and analytical methods and complete chemical data are presented in Van Metre and others (2006a), and additional interpretations are presented in Van Metre and others (2006b). All samples were collected between September 20 and October 21, 2005. A wide variety of chemical constituents were measured, including radionuclides, major and trace elements, nutrients, organochlorine pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), urban waste-indicator (UWI) compounds, and current-use pesticides. A short-lived (half life of 53.3 days), naturally occurring radionuclide known as beryllium 7 (^7Be) was measured to determine whether surficial bottom sediments were recent (from pumpage of floodwaters).

Finding(s)

Field observations and radionuclide activities indicate extensive sediment redistribution during Hurricane Katrina followed by deposition of a new layer of material adjacent to the mouths of some canals as a result of pumping flood waters from the city.

Among the 63 compounds analyzed by the new current-use pesticide method, 13 were detected at least once. The most frequently detected were chlorpyrifos and three fipronil degradates (fipronil sulfide, fipronil sulfone, and desulfinyl-fipronil), which were detected in 40 percent or more of the samples.

In most cases, suspended sediment samples had much higher concentrations of the wastewater compounds than did bottom sediment and street mud samples, indicating transport of wastewater compounds to the lake by pumping of flood waters.

The low mean PEC quotients for the other samples and the overall distribution of quotients indicate the limited spatial extent of human effects on sediment quality in Lake Pontchartrain.

The results of this study indicate that relatively contaminated sediment was discharged from New Orleans into Lake Pontchartrain by the pumping of flood waters but that deposition of contaminated sediment in Lake Pontchartrain was spatially and perhaps temporally limited.

RRL- 0300

Title The effect of floods on the transport of suspended sediments and contaminants: A case study from the estuary of the Dese River (Venice Lagoon, Italy)

Author(s) Roberto Zonta, Flaviano Collavini, Luca Zaggia, Aleardo Zuliani
Environment International, 2005 Vol 31

Key theme(s) Floods; SPM; Dese River; Hysteresis; Venice Lagoon

Summary

A flood event was investigated in a measurement section of the estuary of the Dese River, the major tributary of the Venice Lagoon (mean annual discharge=7.5 m³/s), to observe the variations induced by the flow on the physico-chemistry of the water column and the transport of particles and pollutants. The flood was generated by a typical summer storm, which had a return period of 2 years. The study was based on the continuous recording of the discharge and the measurement of both current speed and physico-chemical variables along the vertical profile. Water samples were also collected for the analysis of total and dissolved heavy metals (As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Zn), and nutrients (TKN, N-NO₃-, N-NO₂-, N-NH₃, total phosphorous, P-PO₄ 3-). The suspended particle matter (SPM) concentration increased in the water column during the flood, and the discharge versus SPM relationship showed a

counterclockwise hysteresis. The occurrence of hysteresis was related to the delayed response of the load, deriving from the runoff on the basin soils with respect to materials mobilized from the streambed in the initial phases of the flood. The transport of most of the analysed heavy metals was driven by the SPM. The increase in concentration of this parameter significantly affected the amount of Fe, Cu, Pb, Cr, Ni, and partially Zn transported by the stream. Among nutrients, N-NO₃⁻ concentration also increased significantly during the flood, due to the runoff on agricultural surfaces. The study allowed describing the mechanisms of load generation with high flow magnitudes, highlighting the importance of floods in the transport of materials and pollutants from the drainage basin to the Venice Lagoon.

Research Question

What are the variations induced by the flow on the physico-chemistry of the water column and the transport of particles and pollutants?

Research Methodology

Current speed was measured using two types of instruments: self-recording and hand-operated propeller-type current meters. The two self-recording instruments (InterOcean mod. S4, USA) were positioned in the central part of the section at 60 cm from the surface and at 50 cm from the streambed, respectively. A micro-current meter (OTT mod. C2 Small no. 10150005.B.E, Germany), equipped with a 30 mm diameter propeller, was instead used for detailed flow measurements in the 30 cm depth interval close to the streambed. The physico-chemistry of the water column along the vertical profile was investigated by means of a multiprobe (Hydrolab mod. H20, USA), which measured the values of temperature, conductivity, turbidity, dissolved oxygen, pH and redox potential. Hydrodynamics, physico-chemical measurements, and water samplings were performed at least on an hourly basis.

Finding(s)

Besides causing an increase of total Fe and SPM loads, the flood determined a considerable increase in the transport of total Cu, Pb, Cr, and Ni, which are metals of toxicological interest and may have a negative impact on the nearby shallow-water lagoon ecosystem. The observed increase of nitrate, related to the mobilisation from diffuse agricultural sources, is also of environmental significance. Even floods of moderate intensity, whether they occur immediately after soil fertilisation, can in fact deliver to the lagoon a noticeable load of nitrate in a very short period.

Surveillance, Risk Reduction and Public Health Response

RRL- 0301

Title An Earthquake Disaster in Turkey: An Overview of the Experience of the Israeli Defence Forces Field Hospital in Adapazari

Author(s) Bar-Dayana, Yaron, Mankuta, David, Wolf, Yoram, Levy, Yehezkel

Disasters, 2000 Vol 24 ISN 3

Key theme(s) Turkey, earthquake, field hospital, mass casualties, military assets, disaster management.

Summary

On 17 August 1999 at 3:04 a.m., an earthquake of 7.4 magnitude (Richter scale) struck the Marmara region in Turkey. The city of Adapazari suffered 2,680 fatalities with approximately 5,300 injured.

The Israeli Defence Forces (IDF) field hospital arrived at Adapazari, on day four after the quake. The team consisted of 102 personnel. The field hospital acted as a secondary referral centre. A total of 1,205 patients were treated in the field hospital between day four and day 14 of the earthquake. The frequency distribution of the medical problems seen in the field hospital was 32 per cent internal medicine, 13 per cent general surgery including plastic, 21 per cent orthopaedic surgery, 23 per cent paediatric disease, 10 per cent obstetrics and gynaecology and 1 per cent major psychiatric disorders. A mean number of 35 patients per day were hospitalised in the field hospital for between 24 hours to one week.

The rapid establishment of the field hospital enabled the local medical facilities to 'buy time' in order to organise and restore surgical and hospitalisation abilities in this disastrous situation.

Research Question(s)

To present an overview of the experience of the IDF field hospital in Adapazari and to describe the structure, management and performance of this hospital.

Research Methodology

Article written by members of the Israeli Defense Forces Medical Corps. Data collected while working as physicians in the IDF Hospital in Adapazari.

Finding(s)

During the first 48 hours the medical crew concurrently treated emergency medical situations while the logistics crew constructed the field hospital and organised the basic needs of the crew. On the third day, a work routine was established to relieve excess stress among the staff.

The field hospital acted as a secondary referral centre to the primary-care clinics in Adapazari, to several worldwide volunteering medical teams and to the town's reorganising four hospitals. A total of 1,205 patients were treated in the field hospital within 10 days between day four and day 14 of the earthquake.

The first three days

As the hospital settled down, different types of patients began to arrive, of whom, trauma, internal medicine and paediatric patients were the main groups. Although a high number of patients with internal complaints was not expected in these circumstances, the intense heat, excessive stress and physical activity triggered the development of food-borne infectious diseases, dehydration and various skin disorders. Trauma patients arrived who had not been treated in the first three days following the earthquake -- especially orthopaedic and plastic-surgery patients with limb fractures and minor infected soft-tissue injuries. By now the more severe earthquake casualties had either died or had been transferred to Istanbul by the local authorities before the arrival of the field hospital. The fact that the city had lost all surgical capabilities meant that the operating room of the field hospital was fully occupied, especially by caesarean sections, obstetrical cases, and plastic- and general-surgery cases. In 10 days a total of 40 major operations and many other minor surgical interventions were performed.

The sixth through eighth days

By this time the natural recovery of the earthquake trauma casualties and meteorological changes has changed the patient mix. Very heavy rains and cold temperatures were affecting the people living in tents. Most patients had diseases associated with cold weather and stress such as asthma, pneumonia and pulmonary oedema. Patients who suffered from chronic diseases lost their regular medications or forgot to use them because of the stressful experience. They then needed to be admitted due to exacerbation of their chronic illnesses. These illnesses included myocardial infarction, diabetes, ketoacidosis, hypertension and asthma. The extreme stress of the population sometimes resulted in fights and even shootings, resulting in abdominal injuries, hemothorax, liver lacerations and bowel perforations treated in the operating room.

The ninth and tenth days

By the middle of the second week after the earthquake, the area's own medical facilities had regained adequate capability, either in tents or buildings. There were a few operating rooms, and obstetrics units and in-patient services began to function. The local medical units at this point started to be self-sufficient and the contribution of the IDF hospital became less critical. At this stage, foreign ministry officials then decided that the IDF field hospital had completed its mission.

RRL- 0302

Title A Multidisciplinary Field Hospital as a Substitute For Medical Hospital Care in the Aftermath of an Earthquake: The Experience of the Israeli Defense Forces Field Hospital in Duzce, Turkey, 1999

Author(s) Yaron Bar-Dayana, Adi Leiba, Pinar Beard, David Mankuta,
Prehospital and Disaster Medicine, 2005 Vol 20 ISN 2
[World Association for Disaster and Emergency Medicine](#)

Key theme(s) after-shock; earthquake; field hospital; Turkey

Summary

The damage created by an earthquake can overwhelm local health services, and damage to clinics and hospitals can render them useless. After an earthquake, even undamaged medical facilities cannot be used for a period of time if there is a risk of aftershocks and collapse. In such a situation, there may be calls for international health teams – but what constitutes the optimal medical aid a few days after the event? Does a military field hospital fill the "gap" in the local healthcare system? On 12 November 1999, a 7.2 magnitude earthquake struck Duzce, Turkey. All of the medical activities of the responding Israeli Defense Forces (IDF) mission team field hospital in Duzce, Turkey were recorded and evaluated. A total of 2,230 patient contacts occurred at the field hospital during the nine days it operated. Most of the patients who presented (90%) had non-traumatic medical, pediatric, or gynecological problems unrelated to the earthquake. The IDF hospital offered medical care provided by specialists, hospitalization, and surgical abilities, which Duzce's hospitals could not offer until two weeks after the earthquake. These results strengthen the importance of a multidisciplinary, versatile, field hospital as an aid to an earthquake-affected population during the first few weeks after an earthquake.

Research Question(s)

The medical activities of a military field hospital, operated by Israeli Defense Forces Medical Corps at Duzce, Turkey, were documented in order to examine its role in the help effort.

Research Methodology

The pre-disaster medical service in Duzce consisted mainly of three fully equipped, general hospitals: (1) the social security hospital; (2) the state hospital; and (3) the University hospital. Small district health institutes provided primary outpatient care services. All medical activities were documented and later were analyzed.

Finding(s)

In its nine days of activity, a total of 2,230 patients were assessed at the hospital in Duzce. The number of patients was rising to a peak level of 300 patients per day on the fourth day after beginning the operation, and similar numbers of patients were evaluated and treated on days 5–9. The field hospital served as a secondary referral center: patients were referred from the primary care clinics in Duzce, from several international medical teams, and from the three

partially functioning hospitals in Duzce. An outpatient clinic, using local medical volunteers, functioned at the field hospital from day 5 of the operation. The ages of the patients were highly variable, ranging from newborn to 89 years. The majority of patients were either <10 years old or 20–50 years old (Figure 2). Interestingly, 90% of patients had non-traumatic illnesses, and only 10% were due to trauma or the earth-quake. The low number of trauma victims was constant from the very beginning (third day post-event) and throughout the team's stay. Non-traumatic problems were: pediatric (37%); general (adult) medicine (32%); 21% were non-trauma surgical consultations (general, orthopedic, and plastic surgery); and 10% were obstetrics and gynecology (Figure 3). A total of 84 patients (3.8%) were hospitalized in the field hospital for >24 hours (up to one week). Hospitalizations were distributed as follows: 37% internal medicine, 30% pediatrics, 18% surgery and orthopedics, and 15% obstetrics and gynecology. A total of 39 patients were surgically operated on in the field hospital's OR. Of these, 15% (5 patients) received general surgery, 18% (6 patients) received orthopaedic surgery, 38% (15 patients) received surgery related to obstetrics and gynecology, and 29% (11 patients) received soft tissue and plastic surgery.

RRL- 0303

Title

Injury and Illness Surveillance in Hospitals and Acute-Care Facilities After Hurricanes Katrina and Rita --- New Orleans Area, Louisiana, September 25--October 15, 2005

Morbidity and Mortality Weekly Report, 2006 Vol 55 ISN 2

Key theme(s)

Injury surveillance, illness surveillance, hurricane Katrina, hurricane Rita

Summary

In response to Hurricane Katrina, CDC and the Louisiana Department of Health and Hospitals (LDHH) implemented active surveillance on September 9, 2005, to monitor for injuries and illnesses at functioning hospitals and other acute-care facilities in the greater New Orleans area (Jefferson, Orleans, Plaquemines, St. Bernard, St. Charles, and St. Tammany parishes). On September 20, the system was interrupted because of mandatory evacuation for Hurricane Rita. Surveillance was reestablished on September 24, and repopulation of Orleans Parish began on September 30. This report updates a previous report on injuries and illness surveillance during September 8--25, 2005, after Hurricane Katrina and describes frequencies of these events during the days after Hurricane Rita and during repopulation of the city. The results indicate that 17,446 visits occurred at participating facilities during this period. Whereas the proportion of relief workers who had acute respiratory illnesses and unintentional injuries was higher compared with residents, the proportion of falls and motor-vehicle crashes among relief workers was lower. Moreover, although the collection of detailed data using a paper-based active surveillance system was required in response to Hurricane Katrina, the burden of this system required the implementation of an electronic syndromic surveillance system, which is more sustainable.

Research Objective

To update a previous report on injuries and illness surveillance during September 8--25, 2005, after Hurricane Katrina and describes frequencies of these events during the days after Hurricane Rita and during repopulation of the city

Research Methodology

Data were collected prospectively for the period September 25--October 15, 2005. Eight hospitals and 19 acute-care clinics (i.e., staffed by disaster medical assistance teams [DMATs]) located in greater New Orleans participated in the system; one hospital and four acute-care clinics had been deactivated (i.e. closure of acute-care clinics staffed by DMATs) after Hurricane Rita. Because no access to electronic data was possible, a standardized paper case-report form (CRF) was used to collect patient-specific data regarding demographics, symptoms, clinical impressions, and mechanism of injury. CRFs were completed by health-care providers and entered into a computer database by surveillance staff. Data were analyzed every 24 hours for trends or aberrations in illness and injury categories and for single cases of select illnesses (e.g., rash illness), which were reported to city and state health authorities for investigation. With the assistance of infection-control professionals, follow-up investigations were conducted for any aberrations detected through daily analysis and review of the data.

Because baseline data were unavailable, the frequency and proportional morbidity of injury and illness categories were reported for September 25--October 15 for all six parishes. Proportion estimates for each illness and injury category were calculated by dividing the number of persons with a specific condition by all persons who reported an illness or injury, respectively. Analyses were stratified by relief worker status, with persons identified as relief workers 1) if they were coded as a relief worker on the CRF, or 2) if they reported to specific facilities that primarily served relief workers.

Finding(s)

During September 25--October 15, a total of 17,446 CRFs were recorded, including 8,997 (51.6%) for illness; 4,579 (26.2%) for injury, and 3,870 (22.2%) for nonacute (e.g., medication refill and follow-up visits) or undetermined reasons. A total of 178 CRFs recorded both injury and illness (1.0%). For patients whose disposition status was known ($n = 13,717$), a total of 11,169 (81.4%) were discharged, 1,500 (10.9%) were admitted to a hospital, 537 (3.9%) left without medical advice or treatment, 486 (3.5%) were transferred to another facility, and 25 (0.2%) died. The most common reasons for hospital admission were heart disease (26.6%), nondiarrheal gastrointestinal illness (e.g., gastritis or other gastrointestinal condition not including gastroenteritis) (12.3%), mental health condition (6.7%), and heat-related illness (6.1%). Of the 25 deaths, 23 occurred in patients who were seen for an illness (92%), and two occurred in patients seen for an injury (8%).

Of 13,576 visits for injuries and illnesses, 1,235 (9.1%) were reported among relief workers (e.g., paid military, paid civilian, self-employed, or volunteer), and 5,437 (40.1%) were among residents (i.e., those who were not relief workers). Relief worker status was unknown for 6,904 (50.9%) events. Among patients with a reported illness ($n = 8,997$), a higher proportion of acute respiratory events were observed among relief workers (25.5% versus 14.8%) than among residents. Among patients with a reported injury, residents had a higher proportion of

falls (25.0% versus 12.0%) and motor-vehicle crashes (9.0% versus 3.8%) and a lower proportion of unintentional injuries (51.9% versus 62.7%), when compared with relief workers. Unintentional injuries included cuts, blunt trauma, burns, and environmental exposures.

RRL- 0304

Title Morbidity Surveillance After Hurricane Katrina — Arkansas, Louisiana, Mississippi, and Texas, September 2005
Morbidity and Mortality Weekly Report, 2006 Vol 55 ISN 26

Key theme(s) Hurricane Katrina, morbidity, surveillance.

Summary

This report summarizes the challenges of conducting national surveillance after Hurricane Katrina, focusing on the role of CDC in coordinating surveillance and consolidating and interpreting morbidity data from jurisdictions that used diverse surveillance approaches. Aggregate morbidity data that were reported through Arkansas, Louisiana, Mississippi, and Texas to CDC during September 1–22, 2005 (before the Gulf Coast landfall of Hurricane Rita on September 24) are presented from ECs and health-care facilities (HCFs) that served affected populations in these states. Chronic diseases and injuries were the most common conditions reported by ECs and HCFs, respectively. To better prepare for future large-scale disasters with widespread impact, public health agencies and other partners are actively working to establish standardized guidelines and tools for morbidity surveillance.

Research Objective

To identify hurricane related morbidity and mortality among affected populations, especially among those with limited access to health care and those who were living in crowded conditions.

Research Methodology

After landfall of Hurricane Katrina, in collaboration with state and local health departments, CDC developed and disseminated guidelines and a form for reporting daily aggregate morbidity surveillance data for persons evaluated in ECs and HCFs (e.g., hospitals, emergency departments, clinics, and disaster medical assistance team [DMAT] sites*) (2). This morbidity surveillance form included categories for conditions such as infectious diseases, mental health conditions, injuries, and chronic diseases. In addition, a separate medical intake form was distributed to record individual-level data (2). The form included some of the same conditions and categories as the aggregate form but included additional (primarily noninfectious) conditions. The surveillance approach chosen by state and local health departments varied and depended on local conditions, information needs, number of facilities providing health-care services, feasibility of implementation, and overall surveillance capacity (e.g., staffing and

communications) (3–5). Health departments investigated possible disease outbreaks and identified resources for managing various health conditions. Although CDC received aggregate surveillance data from 12 states, this report presents data from the four states that reported regularly on the largest numbers of affected persons (Arkansas, Louisiana, Mississippi, and Texas). All four states reported morbidity surveillance data from ECs; Louisiana and Mississippi also collected and reported surveillance data from HCFs to determine the extent of injuries and acute conditions resulting from the hurricane and to monitor HCF capacity and needs. In Arkansas and Texas, because most evacuees were in ECs, routine HCF surveillance continued among health-care providers and laboratories as it had before the hurricane, with added encouragement from health departments to report adverse health events among evacuees.

Finding(s)

Morbidity data from Arkansas, Louisiana, Mississippi, and Texas indicated that chronic conditions and injuries were the most frequently reported conditions among affected populations in ECs and HCFs, respectively. This pattern is similar to that identified after floods and other hurricanes. Variations in the catchment populations, triage protocols, surveillance approaches, and educational background and training of staff members who were collecting data probably contributed to the differences in health conditions identified at ECs and HCFs. ECs likely served persons with less severe conditions, whereas HCFs likely served persons with acute and more severe conditions. Combined with reports from other federal agencies, the state-reported morbidity data helped CDC and the states target deployment of response personnel, prevent and control outbreaks (such as the norovirus outbreak in Texas), and reassure the public that no major epidemics were occurring.

RRL- 0305

Title Public Health Response to Hurricanes Katrina and Rita --- Louisiana, 2005
Morbidity and Mortality Weekly Report, 2006 Vol 55 ISN 2

Key theme(s) Public health activities; Hurricane Katrina

Summary

Special issue of MMWR on public health activities in Louisiana 1--2 months after Hurricane Katrina

RRL- 0306

Title Public Health Response to Hurricanes Katrina and Rita — United States, 2005
Morbidity and Mortality Weekly Report, 2006 Vol 55 ISN 9

Key theme(s) Hurricane Katrina, public health, response .

Summary

The economic and health consequences of Hurricanes Katrina and Rita extended beyond the Gulf region to affect states and communities throughout the United States. *MMWR* is highlighting the public health response to Hurricanes Katrina and Rita with two special issues. The first issue, published January 20, 2006, focused on public health activities in Louisiana. This second issue focuses on activities in other states directly or indirectly affected by the two hurricanes.

RRL- 0307

Title Surveillance for Illness and Injury After Hurricane Katrina—Three Counties, Mississippi, September 5–October 11, 2005
Morbidity and Mortality Weekly Report, 2006 Vol 295 ISN 17

Key theme(s) Hurricane Katrina; surveillance; infectious outbreaks, injury

Summary

Hurricane Katrina made landfall on the U.S. Gulf Coast on August 29, 2005, resulting in massive destruction from wind damage and storm surge. In Mississippi, the storm surge was an estimated 27 feet high at the Hancock County Emergency Operations Center and extended inland for 6-12 miles, causing extensive flooding in Biloxi and Gulfport and rendering approximately 80% of buildings in Waveland uninhabitable. The devastation was greatest in the coastal counties of Hancock, Harrison, and Jackson, where public infrastructure (e.g., electric power, communications networks, roads, sanitation systems, and water treatment plants) was severely disrupted. Multiple hospitals, health clinics, and public health facilities were either destroyed or nonfunctioning immediately after the hurricane. The Mississippi Department of Health (MDH) asked CDC to help conduct active surveillance at hospital emergency departments (EDs), federal Disaster Medical Assistance Team (DMAT)* operation sites, and outpatient health-care facilities in Hancock, Harrison, and Jackson counties. On September 4, a team of 17 CDC staff members was deployed to Mississippi to work with MDH and an Epi Strike Team from the Florida Department of Health to provide surveillance for injury and illness. This report describes those surveillance activities and their findings, which determined that no major outbreaks of infectious illnesses or clusters of preventable major injuries occurred after the hurricane. However, daily reports to MDH provided reassurance regarding outbreaks and data to help direct public health activities in the affected region.

Research Objective

To describe those surveillance activities and their findings, which determined that no major outbreaks of infectious illnesses or clusters of preventable major injuries occurred after the hurricane.

Research Methodology

Data were collected from a total of 15 EDs, DMATs, and outpatient health-care facilities in two phases, using two different systems. The number of facilities reporting varied daily; a maximum of 15 total facilities, including eight DMATs, were included in the reporting. During September 5-11, individual patient data were collected from each facility and entered into a database. Data collection was limited to the following variables that were consistently available: medical record number, sex, age, illness/injury diagnostic category, severity, disposition, and comments. Data were collected from patient ED records, paper logs of ED/DMAT visits, or electronic records of visits to the one facility equipped with electronic medical record-keeping. For each patient visit, an injury or illness diagnostic category for reason of visit was assigned by a reviewing epidemiologist, using both chief-complaint data and discharge diagnoses from the patient record and diagnostic categories from a standard injury and illness surveillance form designed by CDC. Data were forwarded to MDH in Jackson to create daily reports on illness and injury trends for MDH staff, reporting facilities, and CDC in Atlanta.

By September 10, DMAT operations had begun to scale down, shifting health-care services to operating EDs. As patient volumes declined and no major outbreaks of infectious disease were identified, the surveillance team simplified its system. On September 12, the team began collecting aggregate data by using a tally-based system that focused on 16 categories of syndromes[†] selected from illnesses and injuries most commonly observed during the first surveillance phase and conditions considered to be of greatest public health importance on the basis of severity, communicability, and preventability. Hospitals and DMATs faxed or e-mailed a daily tally sheet to MDH, where it was analyzed and reported back to the sites and CDC. Operation of this tally-based system was transferred to MDH on September 24 and continued until mid-October, when baseline surveillance activities were resumed gradually.

Finding(s)

During September 5-11, active surveillance data from 11,424 patient visits were reported daily from up to 15 facilities, an average of 1,632 visits per day. For the 10,999 visits with patient information available, 5,614 (51.0%) patients were female. At one facility, which included both an ED and a DMAT on site and where complete electronic patient records were recorded by the surveillance system, 2,235 patient visits were recorded during the 1-week period. This total was 83.6% greater than the number of visits to the same ED (1,217) during the 1-week period before the hurricane.

Of the 10,047 patient visits for which disposition information was available, 376 (3.7%) patients were admitted, and five (0.05%) died. Of the 11,424 visits for which the reason for visit was known, 6,550 (57.3%) were for illness (including 1,394 for medication refills only), and 4,391 (38.4%) were for injury (including 1,324 for tetanus vaccination with no further injury description). Trends in the most common types of illnesses (i.e., gastrointestinal, acute

respiratory, and skin infection/rash illness) were stable. Among illness visits, medication refills accounted for a decreasing proportion of visits during the 1-week period. Among injury visits, the proportion of visits for lacerations decreased and strains/sprains increased during the 1-week period. Five nonfatal post-hurricane carbon monoxide (CO) poisonings were detected by this surveillance system.

During the period after active surveillance, September 12–October 11, a total of 27,135 visits were reported from EDs, DMATs, and outpatient clinics, an average of 904 per day; 1,196 (4.4%) patients were children aged <5 years. Facility reporting varied, with seven to 13 facilities reporting daily. Among visits during this period, the greatest proportion, 5,907 (21.8%), were for injuries. Major injuries accounted for 497 (8.4%) of the total injuries; minor injuries accounted for 5,410 (91.6%). The most common illnesses were skin/wound infections (1,858 [6.8%]), followed by 1,769 (6.5%) upper respiratory infections, 1,212 (4.5%) rashes and insect stings/bites, and 761 (2.8%) lower respiratory infections. Among gastrointestinal conditions, nausea/vomiting was the most common syndrome (743 [2.7%]), followed by watery diarrhea (288 [1.1%]), and bloody diarrhea (16 [0.1%]). A total of 675 (2.5%) visits were for mental health concerns; 43 suicide attempts were reported. In addition, 13,655 (50.3%) were categorized as other illness. Although visits for particular conditions varied daily, no trends or outbreaks were noted.

RRL- 0308

Title Mass Casualty Management in Disasters

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Key theme(s) Mass Casualty Management in Disasters

Summary

Catastrophic disasters inevitably lead to large numbers of dead and injured in the immediate aftermath. This paper primarily reviews issues in regard to the management of mass casualties (focussing primarily on natural disasters) in the first days up to 2 weeks following the event.

Clearly this is just one aspect of an integrated emergency management plan for a disaster and the importance of population health strategies in maximising the benefits for the community as a whole cannot be underestimated. However, both clinical care and population health measures should be managed concurrently and in an integrated fashion (they are not mutually exclusive)

The immediate mass casualty management issues are primarily related to severe trauma and its medical and critical care consequences, in the context of a large acute casualty surge with

severely affected infrastructure.

Inevitably the ability to manage such a situation is dependent on the existing infrastructure and existing trauma and critical care systems in the affected nation. Similarly well tested emergency preparedness and response plans are necessary.

The well recognised trimodal distribution of deaths¹ from traumatic injury demonstrates that to reduce mortality and morbidity in the first hours and days following a disaster, local response capability and infrastructure management must be strengthened to ensure the best outcomes for those severely injured in an event.

In regard to trauma management, international teams/field hospitals are unlikely to be deployed within the scope of one or two days so that those with life-threatening injuries requiring emergent surgical intervention will not have survived. This also applies to large scale urban search and rescue deployments that arrive many days after the incident.

However, there is some utility in ensuring targeted clinical teams are deployed as soon as possible, with appropriate logistic infrastructure, configured on the basis of the known epidemiology of the disaster and the background national demographics/population health denominators. This process should occur with concurrent detailed needs assessment to further tailor the response. A multidisciplinary focussed task force should include a “whole of health” approach to the response phase.

WHO plays a key role in co-ordinating the health assets in both the pre and post disaster phases. A targeted expert incident team should be convened in the immediate post-disaster phase to advise on the best way to manage the clinical care issues.

While donor governments will inevitably provide offers of assistance to the affected nation, WHO remains well placed to provide expert advice to the sovereign nation.

Therefore, in general, the management of mass casualties following a disaster is best undertaken by strengthening local capacity during the pre-disaster phase and in terms of clinical care, international response is best focussed on the management of later trauma complications (eg sepsis, infectious disease, multiorgan failure, surgical debridement) as well as providing hospital and primary care infrastructure support.

The recommendations from the WHO Conference on the Health Aspects of the Asian Tsunami Disaster provide a very good strategic template for defining the way forward.

Further detail is required in terms of implementation actions.

RRL- 0309

Title (Special Report) Hurricane Katrina Response Initial Assessment, 2005
U.S. Environmental Protection Agency
Centers for Disease Control and Prevention

Key theme(s) Hurricane Katrina, environmental health issues.

Summary

Hurricane Katrina made landfall on Monday, August 29, 2005, as a category 4 hurricane and passed within 10 to 15 miles of New Orleans, Louisiana. The storm brought heavy winds and rain to the city, and the damage breached several levees protecting New Orleans from the water of Lake Pontchartrain. The levee breaches flooded up to 80% of the city with water reaching a depth of 25 feet in some places. Among the wide-scale impacts of Hurricane Katrina, the storm caused significant loss of life and disrupted power, natural gas, water, and sewage treatment, road safety, and other essential services to the city.

Early in the disaster response and recovery, federal, state, and local elected officials and public health and environmental leaders recognized the significant role of environmental health in the post-hurricane rebuilding of New Orleans.

At the request of the Secretary Michael Leavitt of the Department of Health and Human Services (DHHS) and Administrator Steve Johnson of the U.S. Environmental Protection Agency (EPA), the Director of the Centers for Disease Control and Prevention (CDC), Dr. Julie Louise Gerberding, created the Environmental Health Needs Assessment and Habitability Taskforce (EH-NAHT). The taskforce was charged with identifying the overarching environmental health issues faced by New Orleans to reinhabit the city.

Research Question(s)

- a. What are the core or fundamental environmental health issues to be addressed
- b. Which agencies and organizations at the federal, state, or local level are responsible for, or involved in, the various environmental health issues
- c. What progress has been made and what challenges exist

Research Methodology

The EH-NAHT collaborated extensively with a diverse group of federal, state, and local partners, including the New Orleans City Public Health Department, the Louisiana Department of Health and Hospitals (LADHH), and Louisiana Department of Environmental Quality (LDEQ), Federal Emergency Management Agency (FEMA), and U.S. Army Corps of Engineers (USACE).

The team identified 13 environmental health issues and supporting infrastructure to address. This initial assessment included drinking water, wastewater, solid waste/debris, sediments/soil contamination (toxic chemicals), power, natural gas, housing, unwatering/flood water, occupational safety and health/public security, vector/rodent/animal control, road conditions, underground storage tanks (e.g., gasoline), and food safety.

Finding(s)

The EH-NAHT has the following conclusions based upon our initial assessment:

- A complex array of environmental health problems exists in New Orleans.
- The unwatering of New Orleans is a critical first step.
- It is important to bring infrastructure systems in New Orleans back on line.
- The cleanup of debris (including housing debris) and potentially contaminated soil/sediment in New Orleans are rate-limiting factors.
- Intense interest will exist to reinhabit New Orleans.
- It is critical to address the housing issues in New Orleans.
- An immediate need exists to allow temporary or transient entry of recovery workers, residents, and business owners.
- Ensuring worker safety and health and public safety and security are essential.
- The criteria for short-term and long-term return to New Orleans should be tailored to the timeframe and population.

The EH-NAHT has the following recommendations based on our initial assessment:

- It is important to involve state, local, and other stakeholders in decision-making.
- Developing a shared vision for the rebuilding (including infrastructure) is critical.
- Federal, state, and local decision-makers should explore processes used by other areas in devastating circumstances.
- Maintaining collaboration with involved agencies is essential.
- Attending to the housing decisions is critical.
- It is necessary to maintain a systems-level perspective.
- Resolving potential toxic chemical exposures is important.
- Officials should ensure public safety and security and worker health and safety.
- Engage and communicate with the displaced population.
- Maintain a broad vision on issues affecting the rehabilitation of the city.
- Create a long-term habitability strategy.

RRL- 0310

Title Health and climatic hazards: Framing social research on vulnerability, response and adaptation

Author(s) R. Few
Global Environmental Change, 2007 Vol 17

Key theme(s) Social science of hazards and health; Adaptation to climate change

Summary

Floods, windstorms, drought and wildfires have major implications for human health. To date, conceptual advances in analysis of vulnerability and adaptation to climatic hazards from the environmental and social sciences have not been widely applied in terms of health, though key progress is being made particularly in relation to climate change. This paper seeks to take this conceptual grounding further, examining how key themes relate to health concerns, exploring connections with existing health literatures, and developing an organising framework to aid analysis of how vulnerability to health impacts varies within society and how actors make decisions and take action in relation to climatic hazards and health. Social science research on this theme is challenging in part because of the complex mechanisms that link hazard events to health outcomes, and the many-layered factors that shape differential vulnerability and response within changing societal and environmental contexts (including the dual effect of hazards on human health and health systems, and the combination of 'external', 'personal' and 'internal' elements of vulnerability). Tracing a 'health impact pathway' from hazard event through health risk effects to health outcomes can provide a research tool with which to map out where the different factors that contribute to vulnerability/coping capacity come into effect.

Research Question(s)

- a. How are vulnerability and adaptation to climatic hazards related to health concerns?
- b. How and why do the health impacts of hazards vary between individuals and groups in society and what shapes the ability of people and institutions to cope?
- c. How do actors make decisions and take action in relation to climatic hazards and health?

Finding(s)

In terms of health risk, social vulnerability can be shaped by people's ability to avoid infection as well as by the ability of health systems to continue functioning during hazard events.

In terms of individual human vulnerability to hazards, a fundamental distinction can be drawn between elements relating to individual characteristics such as household resources and behaviour, and elements relating to the wider, nonpersonal physical and social environment including climate, topography, economy, cultural norms and disaster management policies.

Coping capacity and hence the efficacy of responses to health impacts for individual people is shaped again by the three elements of vulnerability we have considered: external, personal and internal. Also social determinants play a role in the individual behavior.

Recognising the distinctive nature of human vulnerability to health impacts, one conceptual method seems useful — the tracing of health impact pathways — through which both quantitative and qualitative research on vulnerabilities, coping mechanisms and potential opportunities for adaptation can be organised.

Example:

Topography and settlement pattern (external) and maintenance of the family latrine (personal) are likely to influence the extent to which floodwater close to a household is contaminated with pathogens (risk effect). Chances of infection (mechanism) will in part be shaped by hygiene behaviour, linked both to the reach of health education (external) and routine practices in the home (personal). Development and progress of the disease (outcome) is then dependant not only on factors such as the quality of care available (external) and ability to access that care (personal), but also on the sufferer's existing health and nutritional status (internal).

Each step in the chain presents a locus for intervention, where individuals and institutions can act to break or weaken the chain and thereby prevent or reduce the severity of health outcomes.

A long-term view of risk reduction entails drawing on experience and taking efforts to break spirals of vulnerability. It therefore emphasises the need for sustainable rehabilitation efforts in the recovery phase that do not serve to 'reconstruct risk', such as integrating mitigation measures into the restoration of health facilities after flood or cyclone damage. It also entails consideration of longterm dynamics, and the need for adaptation to potential changes in the character of hazards and human vulnerability. A dynamic of particular importance in relation to climatic hazards is environmental change.

As for risk reduction against current hazards, the scope for adaptation to the health impacts of future hazards principally lies in the loci for intervention identified in the health impact pathway model—the links in the chain between hazard, proximity, risk effect, mechanism and outcome. Together with actions specific to the climate change problem, such as strengthening of climate prediction capabilities and protection against sea level rise effect for health infrastructure in coastal zones, the scope for adaptation against an intensification in health risks may well lie principally in efforts to strengthen underlying coping capacity through enhancing education, training and planning to face hazards (Grambsch and Menne, 2003; Scheraga et al., 2003; Street et al., 2005). Adaptation may be served by greater communication of knowledge, especially for areas that may become newly exposed to severe hazards as a result of climate change.

RRL- 0311

Title Chronic Disease in Health Emergencies: In the Eye of the Hurricane

Author(s) Earl S. Ford, MD, MPH, Ali H. Mokdad, PhD, Michael W. Link, PhD, William S. Garvin
Preventing Chronic Disease, 2006 Vol 3 ISN 2

Key theme(s) Chronic diseases, Hurricanes

Summary

Inadequately controlled chronic diseases may present a threat to life and well-being during the emergency response to natural disasters. An estimate of the possible numbers of people who may require treatment for chronic diseases should help in planning a response, but such information for local areas is not easily accessible. We explored how a current surveillance system could be used to provide estimates of the potential needs for emergency treatment of chronic diseases in the wake of a natural disaster.

Research Question

How can a current surveillance system be used to provide estimates of the potential needs for emergency treatment of chronic diseases in the wake of a natural disaster?

Research Methodology

Data was used from adults aged 18 years or older who participated in the Behavioral Risk Factor Surveillance System (BRFSS) in 2004 to estimate the prevalence and numbers of people with diabetes, heart disease, stroke, hypertension, and current asthma who lived in the New Orleans–Metairie–Kenner, La, metropolitan statistical area.

Finding(s)

About 9.0% of participants had diabetes, 4.6% had angina or coronary heart disease, 3.0% had had a myocardial infarction, 2.0% had had a stroke, and 6.3% had current asthma. About 25.4% adults had at least one of the above conditions.

A surveillance system such as the BRFSS can provide potentially useful baseline information about the numbers of people with chronic diseases and the treatment that they receive; this information can assist the medical and public health community in assessing the needs of people with chronic diseases after disasters and in planning relief efforts.

RRL- 0312

Title Reducing the impact of natural disasters: why aren't we better prepared?

Author(s) D. Guha-Sapir, M.F. Lechat
Health Policy and Planning, 1986 Vol 1 ISN 2

Key theme(s) Natural Diseases – predictability – scope - onset delay - lethality

Summary

Natural disasters can be classified into four main types: floods, earthquakes, cyclones and droughts.

This paper compares these types of natural disaster in terms of four characteristics: predictability, scope, onset delay and lethality. Special attention is paid to the last of these characteristics. It is found that the mortality and morbidity associated with natural disasters has changed over time and varies between regions. The variation between regions correlates with differences in socio-economic conditions, the impact of a disaster in a poor area being much greater than the impact of a disaster of similar physical characteristics in a richer area; it appears that the impact of a disaster is as much a function of the local conditions as it is of the nature of the disaster itself. The paper then goes on to consider the nature of the emergency aid that is offered following emergencies. It concludes that it is often wasteful and inappropriate, coming too late into a situation in which conditions have already dictated that mortality and morbidity will be high. Suggestions are made of ways in which funds allocated to disaster relief could be better focused so as to reduce population vulnerability in the face of natural disasters.

Research Question

Which factors influence mortality and morbidity of natural disasters?

Research Methodology

Compilation of data: ranking the four main disaster types on relative scales of lethality, predictability, onset time and impact scope; Comparative score of risk, development and adjustment capacity *vis-d-vis* natural disasters, mortality rates per 1000 exposed to disasters.

The data on morbidity (namely injuries and disease) after a disaster are remarkable by their absence or incomparability.

Finding(s)

External disaster relief should focus on reducing population vulnerability and invest in structural changes in health care organization and accessibility of the population. It should also provide training and education at the local level for emergency activities such as evacuation, first aid and so forth. This rationalization of policy would provide the communities with the tools and knowledge by which they could defend themselves against future hazards. Disaster assistance resources could be deployed to expand the primary health care structure and train

their personnel in emergency shelter management, rapid epidemiological surveillance and control, food distribution and needs assessment and recording and registration. Health workers are trained to do most of these activities in normal circumstances; the operating principles remain fundamentally the same in a crisis situation, requiring only a certain adjustment due to the urgency and peculiarities of crisis situations. Disaster policies along these lines would use existing, local infrastructure, use and create local human resources and reduce dependence on external emergency assistance.

RRL- 0313

Title Eight Months Later: Hurricane Katrina Aftermath Challenges Facing the Infectious Diseases Section of the Louisiana State University Health Science Center
Clinical Infectious Diseases, 2006 Vol 43

Key theme(s) Hurricane Katrina, response, health care, HIV, infectious diseases

Summary

The effects of Hurricane Katrina have caused the long-term sequelae of a diminished patient base, of a reduced number of available health care professionals, and of closing hospitals in New Orleans, Louisiana. These changes have substantially impacted the academic infrastructure of New Orleans. This article outlines the post-Katrina response of the Louisiana State University Health Science Center (LSUHSC) Infectious Diseases Section and Health Care Services Division to maintain existing HIV and infectious diseases programs. Although several challenges delayed the immediate reopening of the New Orleans location of the HIV Outpatient Program clinic, the LSUHSC Infectious Diseases Section and Health Care Services Division established clinics outside New Orleans for the care of HOP patients immediately following the hurricane. The HOP clinic reopened in New Orleans (in a temporary location) in early November 2005. Several recommendations for academic clinical, training, and research programs are outlined, to assist other centers that might face disaster aftermath challenges.

Research Methodology

Description of the hospital's experience.

Finding(s)

Hospitals and health care agencies must be able to address situations quickly, establish new facilities, and retain staff, to ensure quality care to effectively meet the standards of the Joint Commission on Accreditation of Healthcare Organizations and the regulations of the Occupational and Safety Health Administration. The New Orleans experience demonstrates these longterm challenges. Specific recommendations to assist other programs planning for unexpected disasters are outlined below.

1. Whenever possible, convert to server or Web-based electronic storage of data. Frequent back-ups of information on distant servers are critical for immediate information retrieval after the disaster, until local servers can be established.
2. All members should either routinely use laptop computers or back up data, so as to carry information with them during an evacuation.
3. Clinical programs should develop their own disaster plan for patients. Examples of information that can be given to patients include the following:
 - a. What to do if they are unable to access medications for several days. Instructions for the use of antiretroviral drugs, investigational drugs, and medications that may have withdrawal symptoms if abruptly discontinued are particularly important.
 - b. How to find future clinical care sites if an established clinic is nonfunctional (i.e., Web addresses, toll-free telephone numbers, etc.)
4. The program should take into account the impact of a lack of housing and schools and anticipate potential prolonged family disruptions.
5. The program should cultivate alliances with hospitals and clinics located inside the region but outside the immediate area. A citywide or regional consortium of programs and hospitals may be able to assist in the rapid placement of trainees in the aftermath of the disaster.
6. Adequate storage of clinical samples is of paramount importance. Unique clinical samples and/or laboratory-made reagents (unique strains, clones, constructs, etc.) should be stored in ultra-low freezers as well as in liquid nitrogen. Possible storage of unique and irreplaceable reagents in a colleague's laboratory at a distant site and last-minute overnight shipping of unique items to a distant site should be considered.

RRL- 0314

Title Lessons to be Learned from the 2002 Floods in Dresden, Germany

Author(s) D. Meusel, W. Kirch
[Extreme Weather Events and Public Health Responses](#);
ed. by Kirch, Menne, Bertollini, 2005

Key theme(s) Flooding; Dresden; lesson learned.

Summary

When severe floods occur, as in 2002, the following three points should be considered. Firstly, the public health community has to be prepared with regard to public hygiene. Secondly, important hospital equipment, such as electric power supply, has to be assembled in a "waterproof" environment. Finally, for general crisis management, the decision hierarchy between hospitals and administrative authorities should be set up prior to the crisis.

Research Question(s)

Which lessons can be learned from the 2002 floods in Dresden, Germany?

Finding(s)

In summarizing these events two years afterwards, the most important and most general lesson we learnt from the 2002 flood in Dresden in terms of public health can be seen in the insight that severe floods can take place and that we have to be prepared for it. Reviewing the handling of public hygiene during the weeks of flood and tide, we can state, as I outlined earlier, that general preparations were satisfactory.

The hospital evacuations should give reason to think over the general management of such a crisis. Here, I want to stress two central features: (1) the physical arrangement of hospital equipment; and (2) the preparation of crisis management.

To clarify the first: some severe problems resulting in the failure of the hospital's ability to keep up medical treatment during the flood were caused by the fact that the possibility of heavy floods had not been an issue of serious attention. Necessary technical equipment, such as electric power, telephone and computer network distribution devices, were installed mostly under earth basements because of space consideration. With the second flood wave, the rising groundwater level caused all this technical equipment to malfunction or to break-down completely. Some believe that these factors contributed to the arising necessity of evacuating hospitals in the course of flood events in the first place. In fact, a hospital with autonomous power supplies does not need to be evacuated at all.

The second point needs as much attention as the first: Dresden officials were surprised by both flood waves in terms of organizing smooth cooperation of all parties involved. A crisis management team was set up sporadically by necessity. In particular, dispute over respective areas of authority revealed a lack of planning in advance that could have been easily accomplished. Therefore, prior to any possible crisis caused by extreme weather events we should be prepared to manage it in a coordinated and settled way.

After all, threats to personal or public health is what we fear most of all when facing unforeseen situations.

According to the Dresden Flood Research Centre (2004), the following general Public Health recommendations for flood-risk reduction can be given:

1. Improving knowledge on flooding and damage processes in river and coastal zones
2. Further assessing the relationship between floods on the one hand and climate as well as social changes on the other
3. Providing flood warning systems together with improved weather forecasting
4. Availability of risk maps for endangered flood areas
5. Implementation of a multilevel flood disaster management plan coordinating the central and local decision making processes
6. Training of event handling with regard to flash flood risk
7. Political coordination of transboundary adjustments of flood mitigation between European countries
8. Prevention of new housing and potential toxic emissions in flood-prone areas

RRL- 0315

Title Chronic Diseases and Natural Hazards: Impact of Disasters on Diabetic, Renal, and Cardiac Patients

Author(s) Andrew C. Miller, Bonnie Arquilla

Prehospital and Disaster Medicine, 2009 Vol 23 ISN 2

Key theme(s) cardiac; chronic diseases; diabetes; disasters; emergency response; Renal Disaster Relief Task Force

Summary

Inadequately controlled chronic diseases may present a threat to life and well-being during the emergency response phase of disasters. Chronic disease exacerbations (CDE) account for one of the largest patient populations during disasters, and patients are at increased risk for adverse outcomes.

The objective of this study was to assess the burden of chronic renal failure, diabetes, and cardiovascular disease during disasters due to natural hazards, identify impediments to care, and propose solutions to improve the disaster preparation and management of CDE.

By recognizing and addressing impediments to the care of chronic disease exacerbations after natural disasters, the quality, delivery, and effectiveness of the care provided to diabetic patients during relief efforts can be improved.

Research Objective

To assess the burden of chronic renal failure, diabetes, and cardiovascular disease during

disasters due to natural hazards, identify impediments to care, and propose solutions to improve the disaster preparation and management of CDE.

Research Methodology

A thorough search of the PubMed, Ovid, and Medline databases was performed. Dr. Miller's personal international experiences treating CDE after disasters due to natural hazards, such as the 2005 Kashmir earthquake, are included.

Finding(s)

Chronic disease exacerbations comprise a sizable disease burden during disasters related to natural hazards. Surveys estimate that 25–40% of those living in the regions affected by hurricanes Katrina and Rita lived with at least one chronic disease. Chronic illness accounted for 33% of visits, peaking 10 days after hurricane landfall. The international nephrology community has responded to dialysis needs by forming a well-organized and effective organization called the Renal Disaster Relief Task Force (RDRTF). The response to the needs of diabetic and cardiac patients has been less vigorous. Patients must be familiar with emergency diet and renal fluid restriction plans, possible modification of dialysis schedules and methods, and rescue treatments such as the administration of kayexalate. Facilities may consider investing in water-independent extracorporeal dialysis techniques as a rescue treatment. In addition to patient databases and medical alert identification, diabetics should maintain an emergency medical kit. Diabetic patients must be taught and practice the carbohydrate counting technique. In addition to improved planning, responding agencies and organizations must bring adequate supplies and medications to care for diabetic, cardiac, and renal patients during relief efforts.

RRL- 0316

Title When Chronic Conditions Become Acute: Prevention and Control of Chronic Diseases and Adverse Health Outcomes During Natural Disasters

Author(s) Ali H. Mokdad, PhD, George A. Mensah, MD, Samuel F. Posner, PhD, Eddie Reed, MD

Preventing Chronic Disease, 2005 Vol 2 Special Issue

Key theme(s) Chronic Diseases, Natural Disasters, Prevention and Control

Summary

Natural disasters pose major public health challenges. Preparations for these disasters usually focus on how to evacuate people from affected areas; how to provide transportation, shelter, food, and water for the evacuees; and how to prevent injury and infectious diseases that may develop in crowded living situations after disasters (1-3). All of these preparations are important and necessary, but they are not enough. Also needed are preparations to care for populations whose health is already compromised and who are, therefore, more vulnerable

than healthy people to the stresses and disruptions caused by natural disasters. Populations affected by disasters may carry a large and measurable burden of disabilities and chronic diseases, especially heart disease, cancer, stroke, diabetes, and chronic respiratory disorders. Chronic illnesses are exacerbated by the conditions caused by a disaster (e.g., lack of food, lack of clean water, extremes of cold or heat, physical and mental stress, injury, exposure to infection). Natural disasters may also put people with limited mobility and women who are pregnant and their unborn fetuses at increased risk for adverse health outcomes. Elderly men and women, many of whom have multiple chronic conditions and comorbidities being treated with multiple medications, are particularly at risk. People of low socioeconomic status, people without health insurance, and people with mental illness or disabilities are other vulnerable populations who can experience higher morbidity and mortality during disasters. Similarly vulnerable are ischemic stroke survivors taking anticoagulants, people whose diabetes is controlled by insulin, heart attack survivors taking clot-preventing medications, people with severe lung disease receiving home oxygen therapy, people with hereditary blood disorders, and patients receiving hemodialysis for kidney failure.

Research Question

Which preparations and preventions are necessary to control chronic diseases and secure risk populations in the case of a natural disaster?

Finding(s)

1. Although individual patients and their families need to be well prepared and provided with clear and consistent recommendations to make preparations, many others must help them.
2. Preparations for the prevention and control of chronic diseases, of secondary conditions among people with disabilities, and of adverse pregnancy outcomes during disasters must be guided by 1) the predisaster rates of adverse health outcomes and disease burden, 2) awareness of the immediate needs of people with chronic diseases (including a plan for providing essential medications), 3) knowledge of the basic and surge capacity of health care delivery systems of the affected and surrounding areas to treat and manage chronic diseases, and 4) the areas' ability to rebuild the basic infrastructure needed to support care. A comprehensive strategy to address the overall health of disaster survivors must therefore include not only a plan for evacuation and emergency treatment but also a strategy to deliver care to vulnerable populations including pregnant women and people with chronic diseases or disabilities.
3. In accordance with established clinical and preventive services guidelines, disaster preparations must ensure the availability of everything necessary to control chronic diseases prevent acute events and complications related to chronic diseases, and protect the health and well-being of pregnant women and their fetuses.
4. The CDC, in partnership with the public health community, should consider developing surveillance tools to support disaster planning that adequately addresses the health care needs of the general population and of vulnerable populations, including pregnant women and people living with disabilities.
5. The lessons of Hurricane Katrina should stimulate action long overdue to consider the

importance of chronic diseases in disaster planning. It is time to carefully reflect on the chronic health needs of all populations and the health conditions that may be exacerbated during natural disasters. Although reducing the potential for infectious disease outbreaks is vital, minimum standards should be set to prevent and control morbidity and mortality among people with chronic diseases, people who are pregnant, and people with disabilities whose safety and quality of life may be adversely affected by a stressful interruption in their routine health care. It is time to develop and implement guidelines for both short- and long-term care before, during, and in the immediate aftermath of natural disasters.

RRL- 0317

Title Natural Disasters: Protecting the Public's Health
Scientific Publication, 2000 Publication 575
Pan American Health Organization (PAHO)

Key theme(s) Natural Disasters

Summary

This publication outlines the health sector's role in reducing the impact of disasters, laying out a framework that an administrator can rely on to make effective decisions in managing the health sector's activities to reduce the consequences of disasters. It describes the overall effects of disasters on health, highlighting myths and realities, and summarizes how the health sector must organize itself to cope with disasters. The book emphasizes the multisectoral nature of disaster preparedness and sets forth guidelines for preparing health sector disaster plans, means of coordination, and special technical programs before a disaster hits. The book also includes ground-breaking information on the management of supplies in a disaster.

The book's 14 chapters and 4 technical annexes describe the general effects of disasters on health, highlighting myth and realities. Although every disaster is unique, there are common features that can be used to improve the management of humanitarian assistance in health and the use of available resources.

Chapter 2 is one of the main innovations. It summarizes how the health sector must structure itself and work with other sectors to cope with disasters. The chapter covers the health sector's activities for reducing the consequences of disasters that affect response, preparedness, and mitigation phases, pointing out where these are interdependent.

Chapter 3 deals with disaster preparedness – its multisectoral nature and its specific application in the health sector. It sets forth guidelines for preparing health sector plans, means of coordination, and special technical programs that cover every aspect of normal

operations before a disaster hits.

Chapter 4 also includes new material. It deals with the disaster mitigation activities that the health sector must promote and put in place. Mitigation measures are designed to reduce the vulnerability to disasters in health establishments (including drinking water and sewerage systems) and to reduce the magnitude of the disaster's effects. Mitigation activities complement preparedness and response activities.

Chapter 5 deals with the response to disasters, as well as its coordination and the evaluation of health needs. Chapters 6 through 11, and Chapter 14, retain the organization of the 1981 guidelines, but they have been updated. Chapter 12, dealing with humanitarian supplies, and Chapter 13, dealing with humanitarian assistance also have been revised in-depth.

Finally, two of four annexes – the one dealing with the management of supplies and the one dealing with the national mitigation program – are entirely new; the remaining two have been updated.

The book is primarily aimed at health sector professionals who participate in disaster preparedness, response, and mitigation. Disaster management has become such an intersectoral enterprise, however, that anyone interested in disaster mitigation will find here a useful primer. Public health students and professors also can rely on this book in formal and informal courses.

Research Question(s)

- a. What is the health sector's role in reducing the impact of disasters?
- b. What effects do disasters have on health?

Finding(s)

Example of findings, Chapter 1

1) Effective management of health humanitarian aid depends on anticipating and identifying problems as they arise, and delivering specific materials at the precise times and points where they are needed. Cash is the most effective donation, particularly since it can be used to purchase supplies locally.

2) After a major natural disaster, behavior only rarely reaches generalized panic or stunned waiting. Spontaneous yet highly organized individual action accrues as survivors rapidly recover from their initial shock and set about purposefully to achieve clear personal ends.

3) Natural disasters do not usually result in massive outbreaks of infectious disease, although in certain circumstances they do increase the potential for disease transmission. In the short-term, the most frequently observed increases in disease incidence are caused by fecal contamination of water and food; hence, such diseases are mainly enteric.

4) When large spontaneous or organized population movements occur, an urgent need to provide humanitarian assistance is created. E.g., people may move to urban areas where public

services cannot cope, and the result may be an increase in morbidity and mortality.

5) Food shortages in the immediate aftermath may arise in two ways: Food stock destruction within the disaster may reduce the absolute amount of food available, or disruption of distribution systems may curtail access to food, even if there is no absolute shortage. Generalized food shortages severe enough to cause nutritional problem do not occur after earthquakes.

6) Drinking water supply and sewerage system are particularly vulnerable to natural hazards, and the disruptions that occur in them pose serious health risks.

7) Anxiety, neuroses, and depression are not major, acute public health problems immediately following disasters, and family and neighbors in rural or traditional societies can deal with them temporarily. A group at high risk, however, seems to be the humanitarian volunteers or workers themselves.

8) Natural disasters can cause serious damage to health facilities and water supply and sewage systems, having direct impact on the health of the population dependent on these services.

RRL- 0318

Title Safe Hospitals : A Collective Responsibility; A Global Measure of Disaster Reduction
Pan American Health Organization, 2005

Key theme(s) Safety of hospitals, disaster reduction

Abstract

Protecting critical health facilities, particularly hospitals, from the avoidable consequences of disasters, is not only essential to meeting the Millennium Development Goals set by the United Nations, but also a social and political necessity in its own right. This is the message that the report *Safe Hospitals—A Collective Responsibility, A Global Measure of Disaster Reduction*, prepared by PAHO/WHO for the UN World Conference on Disaster Reduction, puts forth.

According to the publication, the vulnerability of a hospital is more than a medical issue. Other factors must be taken into account: public health, socio-political significance, and the economic aspects. It is possible to reduce the vulnerability of a hospital by raising the levels of life, investment and operational protection not only in existing facilities, but in the plans for new installations as well. It has been proved time and again that disaster mitigation measures pay off when health facilities are able to withstand the effects of devastating disasters and continue to offer their services. Although the financial investment can be high (and it is not always possible to protect an installation against all kinds of disasters), the cost of ignoring the risks can be much higher, not only in terms of money, but more importantly on the loss of human life.

The importance of hospitals goes far beyond the role they play in saving lives after disasters. They are powerful symbols of social progress and a prerequisite for economic development, and as such, special attention must be given to reducing their physical vulnerability.

RRL- 0319

Title Management of dead bodies after disasters: a field manual for first responders
Pan American Health Organization, 2006

Key theme(s) Storage and disposal of dead bodies

Summary

This *Field Manual for First Responders* presents simple recommendations for non-specialists to manage the recovery, basic identification, storage and disposal of dead bodies following disasters. It also makes suggestions about providing support to family members and communicating with the public and the media.

RRL- 0320

Title	Drainage and stormwater management strategies for low-income urban communities
Author	Jonathan Parkinson
	Environment and Urbanization, 2003 Vol 15
Key theme(s)	<ul style="list-style-type: none">- Urban Development, Stormwater Runoff and Impacts of Flooding- Impacts of Flooding on the Urban Poor- Strategic Approaches to Urban Drainage and Stormwater Management- Non-Structural Strategies for Flood Prevention and Management- Non-Structural Strategies for Mitigation of Environmental Health Problems- Institutional Arrangements and Participation in Urban Stormwater Management- Potential Constraints to Implementation

Summary

Based upon a review of the literature, this paper focuses on the provision of drainage systems and stormwater management strategies in lowincome urban settlements. Although engineered infrastructure is a necessary component for drainage of urban runoff, non-structural approaches are important complementary measures, focusing on actions to prevent and mitigate problems related to flooding, as well as those related to pollution and deterioration in environmental health conditions. As these rely predominantly on behavioural changes to be effective, a participatory approach is recommended within a strategic framework of urban stormwater planning.

Research Question(s)

- Which physical and environmental impacts are caused by stormwater?
- Which impact does it have on the urban poor?
- How can stormwater be drained and men and environment prevented from floods?

Research Methodology

Review of literature

No more information given

Finding(s)

Physical Impacts:

Flooding can cause widespread disruption to transportation, power and communication systems, as well as structural damage to buildings and infrastructure. The disruption, damage to properties, loss of possessions, as well as financial worries and other stresses from living in damp houses mean that flood events can place a considerable strain on households. Due to the high intensities of rainfall during rainy seasons, the lack of drainage infrastructure and the failure to maintain existing systems, the impacts of flooding are widespread and, as described

below, it is the poor who are most susceptible and consequently suffer the most.

Environmental Impacts:

Flooding and poor drainage have a significant impact on the prevalence of illness, and that large-scale flooding may disrupt water supply and sanitation systems and result in disease epidemics. In poorly drained areas with inadequate sanitation, urban runoff mixes with excreta – spreading pathogens around communities and increasing risks to health from various waterborne diseases. Flooded septic tanks and leach pits, and blocked drains (see Photo 2) provide breeding sites for *Culex* mosquitoes, which transmit filariasis, a condition that can lead to elephantiasis and its painful swelling of the legs, for *Aedes* mosquitoes (yellow fever, dengue and dengue haemorrhagic fever) and for *Anopheles* mosquitoes (Malaria).

Impact Of Flooding On The Urban Poor:

The poor have fewer resources available for rebuilding and they generally receive little external support to recover from flooding (10). Their livelihoods are more vulnerable to the risks associated with flooding and are more susceptible to disruption. The location of poor neighbourhoods and the inferior construction materials used to build homes for the poor contribute to their greater vulnerability.(11) A lack of transportation may also prevent poor households from moving themselves and their possessions out of harm's way. Damage to homes caused by flooding places extra demands on the limited resources of the poor. There are also indirect effects, such as the loss of working days required to repair structural damage, or the increased prevalence of illness, causing families to redirect assets towards treatment. Also, even where filariasis is not a problem, *Culex* mosquitoes cause widespread irritation and the urban poor can spend relatively large portions of their income seeking temporary relief by buying mosquito coils. Groups that are at particular risk include children, the elderly and physically disabled people who experience particular difficulties in dealing with disasters and who may be particularly vulnerable to adverse health effects from floods. The problems of poor drainage and flooding of domestic properties tend to have a disproportionate effect upon women. Women have to deal not only with the economic devastation and disruption of livelihood systems but also are often left to cope with the social and emotional upheaval that comes from dealing with the death, disease and food shortages that invariably occur in the aftermath of floods. In addition to this, cultural practices in some countries require women always to be escorted in public by male relatives, which can increase women's vulnerability during flood events and may even result in women drowning if they are unable to leave their homes without being accompanied.(17)

Strategic Approaches To Urban Drainage And Stormwater Management

A combination of structural (infrastructure, houses) and non-structural (behavior changes) stormwater management strategies are considered to be complementary aspects of a comprehensive and integrated stormwater management strategy.

Flood prevention strategies

- Structural adaptations to constructions
- Relocation of houses that are on drainage pathways and floodplains
- Resettlement plans in cooperation with the affected groups

Flood mitigation strategies

- Warnings, operation of flood control works and emergency unblocking of blocked inlets and drains before and during a flood events

- Identification of potential events
 - Communication
- Flood recovery strategies
- Evaluation of damages
 - Rehabilitation of damaged properties
 - Provision of flood assistance to flood victims
- Pollution mitigation and solid waste management
- Control of disease vectors
- Institutional arrangements and participation in urban stormwater management
- Participation of stakeholders in the development and implantation of urban drainage plans
 - Urban runoff control programs with public backing
- Institutional responsibility for urban drainage is often narrow

RRL- 0321

Title Foreign Field Hospitals in the Recent Sudden-Onset Disasters in Iran, Haiti, Indonesia, and Pakistan

Author(s) Louis Riddez, Johan von Schreeb, Hans Samnegård, Hans Rosling
Prehospital and Disaster Medicine, 2008 Vol 23 ISN 2
World Association for Disaster and Emergency Medicine (WADEM)

Key theme(s) Foreign field hospitals, disaster medicine

Summary

Foreign field hospitals (FFHs) may provide care for the injured and substitute for destroyed hospitals in the aftermath of sudden-onset disasters. In the aftermath of sudden-onset disasters, FFHs have been focused on providing emergency trauma care for the initial 48 hours following the sudden-onset disasters, while they tend to be operational much later. In addition, many have remained operational even later. The aim of this study was to assess the timing, activities, and capacities of the FFHs deployed after four recent sudden-onset disasters, and also to assess their adherence to the essential criteria for FFH deployment of the World Health Organization (WHO).

The lack of available information and the reluctance to share data on the activities of FFHs following sudden-onset disasters due to natural hazards was the most striking finding of the study.

Research Objective

To assess the timing, activities, and capacities of the FFHs deployed after four recent sudden-onset disasters, and also to assess their adherence to the essential criteria for FFH deployment of the World Health Organization.

Research Methodology

Secondary information on the sudden-onset disasters in Bam, Iran in 2003, Haiti in 2004, Aceh, Indonesia in 2004, and Kashmir, Pakistan in 2005, including the number of FFHs deployed, their date of arrival, country of origin, length of stay, activities, and costs was retrieved by searching the Internet. Additional information was collected on-site in Iran, Indonesia, and Pakistan through direct observation and key informant interviews.

Finding(s)

Results: Basic information was found for 43 FFHs in the four disasters. The first FFH was operational on Day 3 in Bam and Kashmir, and on Day 8 in Aceh. The first FFHs were all from the militaries of neighboring countries. The daily cost of a bed was estimated to be US\$2,000. The bed occupancy rate generally was <50%. None of the 43 FFHs met the first WHO/Pan-American Health Organization (PAHO) essential requirement if the aim is to provide emergency trauma care, while 15% followed the essential requirement if follow-up trauma and medical care is the aim of deployment.

Discussion: A striking finding was the lack of detailed information on FFH activities. None of the 43 FFHs arrived early enough to provide emergency medical trauma care. The deployment of FFHs following sudden-onset disasters should be better adapted to the main needs and the context and more oriented toward substituting for pre-existing hospitals, rather than on providing immediate trauma care.

RRL- 0322

Title Ukrainian's Disaster Medicine Team Mission to India following the Earthquake of 2001

Authors George G. Roshchin, Oleg V. Mazurenko

Prehospital and Disaster Medicine, 2002 Vol 17 ISN 3
World Association for Disaster and Emergency Medicine

Key theme(s) Disaster medicine camp

Summary

This article describes the basic principles around establishing a Disaster Medicine Camp and the organization of the Ukrainian Disaster Medicine Mobile Hospital, which provided medical aid to victims of the 2001 earthquake in India. All of the information was obtained through direct observation and estimates based on empirical data gathered in the field.

Research Question

What are the basic principles around establishing a Disaster Medicine Camp and the

organization of the Ukrainian Disaster Medicine Mobile Hospital?

Research Methodology

The information related to the Ukrainian Disaster Medicine Team mission in India was obtained by direct observation and estimation based on empirical data gathered in the field. The observations are limited to description.

Finding(s)

Prior to the earthquake, 40,000 residents lived in Bhachau (Figure 1). Of these, 10,000 people were lost and 20,000 injured. All public health services were destroyed, and 70% of the local medical personnel were lost. There were further health risks created by the lack of sanitary facilities, clean water, and edible food. The Ukrainian Team was self sufficient, having brought food and clean water for drinking from the Ukraine. During the mission, medical aid was provided to 5,558 people, including 1,053 (18,9%) children. 216 surgical interventions were performed (including 69 (31.9%) in children), and 13 people gave birth in the hospital.

The following factors were considered when the site for the field hospital was chosen:

1. Ease of access for the population of the city and surrounding areas (distance, presence of roads etc.);
2. Security for people at the hospital; and
3. Presence of any epidemic conditions.

On the average, medical care was provided for 150 outpatients each day. During the 25 days that by the Team was operational at the site, medical care was provided to 2,313 outpatients, of which 513 (22.2%) were children.

The Ukrainian Team closely collaborated with the Spanish Red Cross and Indian Military Hospital. The local physicians who survived the earthquake, and physician-volunteers who arrived from other cities of India also participated in the services provided by the hospital.

From the basis of the experiences of the medical personnel who provided emergency medical aid to the victims of the earthquake, several common problems were identified:

1. Prior to the arrival of outside assistance, there was a general lack of sufficient numbers of medical personnel for providing emergency medical aid to the injured after earthquake;
2. The medical infrastructure was destroyed by the quake;
3. There was a shortage of the supplies medical equipment and medicines required for the treatment of the victims;
4. Requirements for food and water could not be met;
5. The ability to transport the victims with severe trauma to relevant centres was severely compromised principally due to destruction of the communications network;
6. Health risks for infectious diseases was increased due to the lack of sanitary facilities, clean water, and edible food;
7. In order to function in a foreign culture, possession of information about social, medical, and sanitary conditions in area of the disaster is essential;

8. Traumatic injuries and their consequences are replaced by infectious diseases, cardiovascular diseases and other medical problems within 10–14 days after the earthquake; and
9. Coordinated joint work with the local authority, Disaster Medical Teams from other countries, medical and charitable organizations is essential.

RRL- 0323

Title The Gujarat Earthquake (2001) Experience in a Seismically Unprepared Area: Community Hospital Medical Response

Author(s) Nobhojit Roy, Hemant Shah, Vikas Patel, R. Richard Coughlin

Prehospital and Disaster Medicine, 2002 Vol 17 ISN 4
World Association for Disaster and Emergency Medicine

Key theme(s) Bhuj, Gujarat, India; disaster; earthquake; injury profile; preparedness; response, medical

Abstract

Background: At 08:53 hours on 26 January 2001, an earthquake measuring 6.9 on the Richter scale devastated a large, drought-affected area of northwestern India, the state of Gujarat. The known number killed by the earthquake is 20,005, with 166,000 injured, of whom 20,717 were “seriously” injured. About 370,000 houses were destroyed, and another 922,000 were damaged.

Methods: A community health worker using the local language interviewed all of the patients admitted to the Gandhi-Lincoln hospital with an on-site, oral, real-time, Victim Specific Questionnaire (VSQ).

Results: The census showed a predominance of women, children, and young adults, with the average age being 28 years. The majority of the patients had other family members who were also injured (84%), but most had not experienced deaths among family members (86%). Most of the patients (91%) had traveled more than 200 kilometers using their family cars, pick-ups, trucks, or buses to reach the buffer zone hospitals. The daily hospital admission rate returned to pre-event levels five days after the event, and all of the hospital services were restored by nine days after the quake. Most of the patients (83%) received definitive treatment in the buffer zone hospitals; 7% were referred to tertiary-care centers; and 9% took discharge against medical advice.

The entrapped village folk with their traditional architecture had lesser injuries and a higher rescue rate than did the semi-urban townspeople, who were trapped in collapsed concrete masonry buildings and narrow alleys. However, at the time of crisis, aware townspeople were able to tap the available health resources better than were the poor. There was a low incidence of crush injuries. Volunteer doctors from various backgrounds teamed up to meet

the medical crisis. International relief agencies working through local groups were more effective. Local relief groups needed to coordinate better. Disaster tourism by various well-meaning agencies took a toll on the providers. Many surgeries may have contributed to subsequent morbidity.

Conclusions: The injury profile was similar to that reported for most other daytime earthquakes. Buffer zone treatment outcomes were better than were the field and damaged hospital outcomes.

Research Objective

This study aims to research the community response and the medical response to an earthquake in a seismically unprepared area.

Research Methodology

A community health worker using the local language interviewed all patients while they were being admitted to the Gandhi-Lincoln Hospital (GLH) in the aftermath of the earthquake. The interviewer used an on-site, oral, real-time Victim Specific Questionnaire (VSQ). The responses were recorded along with critical patient information. The data were entered into a database (Microsoft Excel, Microsoft Corporation, Redmond, Washington USA). These data were used for triage, resource allocation, and treatment. The use of the VSQ obtained the following data: (1) *Personal information*: (a) name, (b) age, (c) gender, (d) address, (e) socioeconomic status, and (f) family members injured or dead; (2) *Hospital-related data*: (a) distance from the hospital, (b) mode of transport, (c) date of admission, (d) date of surgical procedures, and (e) date of discharge from the hospital; and (3) *Injury data*: (a) mechanism of injury, (b) type of injury(ies), (c) anatomical site(s), (d) subjective complaints, (e) objective findings (x-rays, etc.), (f) status at discharge, and (g) transfer or death. Victims who arrived dead and those who did not need to be admitted to the hospital were excluded from the study. The questionnaire was updated upon discharge or transfer of the patient.

Finding(s)

As per the disaster nomenclature of PICE scoring,³ this event was a Stage III, Dynamic Paralytic national disaster. At the GLH, there was an abrupt increase in the number of patients who arrived at the hospital on the day of the quake. The age distribution for these patients is in Figure 2. The census showed a predominance of children and young adults, with an average of the ages of 28±years. Of the casualties admitted, 56% were females and 44% were 283 males. The mode of injury was fall of debris in 62% of the cases, falls while escaping in 28% of the cases, and fall from heights in 10% of the cases. A sociological survey of the 181 affected families revealed an average of 5.4 members living in one house (Figure 3). The mortality and morbidity rates within each family unit are illustrated in Figures 4 and 5. Eighty-six percent of the injured had no deaths in the family. Two percent of families had one death in the family, 9% of the injured had two deaths, and 3% had three deaths among family members. Eighty-four percent of the patients had other members of the family injured. Half of the injured had one other member injured, a quarter had two injured family members, and 10% had three. Sixteen percent had no other member of the family among the injured. The economic profiles of the patients admitted to the GLH after the earthquake were markedly different from the

hospital's usual clientele (Figure 6). More than half (52%) of the clientele in normal times hailed from a poor background, of whom one-fifth were below the poverty line. Thirty-four percent were of average income, and only 14% were of a good financial standing. However, after the quake, more than half of the admitted patients were the "well-to-do." Of this group, one-fifth said they had lost all that they had owned. The poor constituted only 37% of patients, and the average-level wage earner occupied 10% of the beds. On the first day, 102 critically injured patients were admitted to the hospital. The first four patients arrived within two hours of the quake. On the second and the third days, 79 and 53 patients were admitted, respectively. The daily admission rate returned to baseline on the sixth day; by then, a total of 283 patients had been admitted (Figure 7). The disruption of the normal hospital services due to increased load of trauma cases lasted for nine days. The majority of the patients (91%) traveled more than 200 kilometers to reach the hospital. This distance would take more than 5 hours under normal circumstances. One third of the remaining traveled more than 300 kilometers and two-thirds more than 100 kilometers. Only one-fifth of the patients were ambulatory; most of the victims were carried in on makeshift stretchers. The services of the GLH were overwhelmed by the fifth day, and the hospital had taken in nearly twice its normal bed-strength. At least 30 patients were discharged daily thereafter, with only the most critical ones being kept indoors. The length of indoor admission by days following admission (length of stay) is shown in Figure 8.

A summary of the anatomical site of the primary injury is in Figure 9. The most common injury was to the lower extremity (56%). The spine and pelvis were injured in 17% of cases, and the upper extremity in 13% of cases. Chest and/or abdominal trauma constituted <4% of cases. Crush syndrome was seen in <2% of cases. Of those patients admitted, half were subjected to open reduction and internal fixation (ORIF) for their complex fractures. Only 14% were conserved in plaster, and 16% were closed reduced; 12% required amputations; and 6% required external fixation. The treatment provided and the outcome of treatment are summarized in Figures 10 and 11. Eighty-three percent of the treated patients received definitive treatment at the GLH. Seven percent of the patients had to be referred to higher-level centers, and 9% took discharge against medical advice. The mortality during the study period was 1%.

RRL- 0324

Title Reducing Disaster Risk: A Challenge for Development
UNDP Bureau for Crisis Prevention and Recovery, 2004
One United Nations Plaza
New York, NY 10017, USA

Key theme Disaster risk reduction

Summary

Some 75 percent of the world's population live in areas affected at least once by earthquake, tropical cyclone, flood or drought between 1980 and 2000. The consequences of such widespread exposure to natural hazard for human development is only now beginning to be identified. *Reducing Disaster Risk: A Challenge for Development* plays a role in this learning process.

Natural disaster risk is intimately connected to processes of human development. Disasters put development at risk. At the same time, the development choices made by individuals, communities and nations can generate new disaster risk. But this need not be the case. Human development can also contribute to a serious reduction in disaster risk.

This Report shows that billions of people in more than 100 countries are periodically exposed to at least one event of earthquake, tropical cyclone, flood or drought. As a result of disasters triggered by these natural hazards, more than 184 deaths per day are recorded in different parts of the world. This Report demonstrates that development processes intervene in the translation of physical exposure into natural disaster events. This is demonstrated by the observation that while only 11 percent of the people exposed to natural hazards live in countries classified as low human development, they account for more than 53 percent of total recorded deaths. The Report argues that disaster risk is not inevitable and offers examples of good practice in disaster risk reduction that can be built into ongoing development planning policy.

Research Methodology

Literature Review

Finding(s)

This Report supports six emerging agendas within disaster risk reduction:

- Appropriate governance is fundamental if risk considerations are to be factored into development planning and if existing risks are to be successfully mitigated.
- Factoring risk into disaster recovery and reconstruction.
- Integrated climate risk management.
- Managing the multifaceted nature of risk.
- Compensatory risk management
- Addressing gaps in knowledge for disaster risk assessment.

RRL- 0325

Title UNISDR Terminology on Disaster Risk Reduction
<http://www.unisdr.org/eng/library/lib-terminology-eng.htm>
last update: 2009
International Strategy for Disaster Reduction (ISDR) Library on disaster risk reduction

Key theme(s) Disaster Risk Reduction

Summary

The UNISDR Terminology aims to promote common understanding and common usage of disaster risk reduction concepts and to assist the disaster risk reduction efforts of authorities, practitioners and the public. The previous version "Terminology: Basic terms of disaster risk reduction" was published in "Living with risk: a global review of disaster risk reduction initiatives" in 2004. The following year, the Hyogo Framework for Action 2005-2015 requested the UNISDR secretariat to "update and widely disseminate international standard terminology related to disaster risk reduction, at least in all official United Nations languages, for use in programme and institutions development, operations, research, training curricula and public information programmes".

RRL- 0326

Title The Threat of Communicable Diseases Following Natural Disasters: A Public Health Response
Author(s) Stephen C. Waring, DVM, PhD, Bruce J. Brown, MPH
Disaster Management & Response, 2005
Elsevier Inc. Elsevier GmbH (Corporate Office), Hackerbrücke 6, Munich
Germany, 80335

Key theme(s) Communicable Diseases, Infectious Diseases, Natural Disasters, Public Health

Abstract / Summary

Natural disasters, such as the recent Indian Ocean tsunami, can have a rapid onset, broad impact, and produce many factors that work synergistically to increase the risk of morbidity and mortality caused by communicable diseases. The primary goal of emergency health interventions is to prevent epidemics and improve deteriorating health conditions among the population affected. Morbidity and mortality due to infectious diseases can be minimized providing these intervention efforts are implemented in a timely and coordinated fashion. This article presents a review of some of the major issues relevant to preparedness and response for natural disasters.

Finding(s)

- 1) In the days and weeks following such a devastating disaster, the threat of infectious disease outbreaks is high.
- 2) Outbreaks are prevented when public health can detect increases in diarrheal, respiratory, and other communicable diseases early and rapidly. The actual implementation of surveillance and rapid needs assessments under field conditions is not without substantial challenges. The goal is timely and accurate delivery of information on the health status of an affected population, which needs to be adequately understood and communicated to ensure the effort will meet expectations.
- 3) Diarrheal diseases may be a major contributor to overall morbidity and mortality rates following a disaster. Cholera and dysentery warrant particular concern because of their ease of transmission, rapid spread in crowded conditions, and immediate lifethreatening conditions. Other foodborne and waterborne diseases such as typhoid fever, hepatitis, and leptospirosis also are capable of producing severe illness and high case fatalities.
- 4) The likelihood of tetanus also should be a consideration in any disaster situations. It is essential that injured people receive prompt surgical and medical care of contaminated open wounds as well as appropriate tetanus
- 5) Malaria is becoming more difficult to control. Similar to malaria, conditions following a disaster increase the likelihood of a dengue epidemic, and only through adequate early warning and rapid response can outbreaks be contained. Effective prevention and control for both diseases requires vector control, which may prove challenging during recovery periods depending on availability of adequate resources and appropriate access to breeding habitats.
- 6) Any emergency response designed to mitigate adverse health effects resulting from natural disasters requires a multidisciplinary approach that employs a broad range of expertise to help minimize exposure to known health threats while identifying and attending to those in need of immediate treatment. This multidisciplinary effort also forms the framework for postdisaster recovery, which will require extensive ongoing preparedness planning, education, and training efforts.

RRL- 0327

Title Fact Sheet : Health effects and preventive measures, 2002 Vol 5

WHO European Centre for Environment and Health
Rome Operational Division
Via Francesco Crispi, 10
I-00187 Rome, Italy

Key theme(s) Flooding; health effects; prevention.

Summary

Flooding is the most common natural disaster in Europe, and the most costly in economic terms. Although the possible relationship between floods and climate change has often been mooted, it is unclear to what extent the two can be linked. Besides the “tangible” effects of flooding, such as damage to property and infrastructure, there is a growing awareness of the significance of the “intangible” effects, both physical and psychological, that have traditionally been underestimated in assessing the consequences of flooding. This paper aims at describing the effect of flooding on health and possible preventive measures at the national and international level.

Research Question(s)

- a. What are the health effects of flooding?
- b. What are possible preventive measures?

Finding(s)

Direct health effects :
Mortality from drowning, heart attacks and injuries
Injuries

Indirect health effects
Infectious diseases
Poisoning
Post-traumatic stress disorder

Public health preventive measures
Early warning
Planning, including initiatives to ensure water quality, food safety, sanitation and hygiene; precautions during clean-up activities; immunization when appropriate; protective measures against potential vectorborne diseases and chemical hazards; and measures to ensure mental health and wellbeing.

International sustainable flood prevention
1992 UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes and its Protocol on Water and Health
UNECE/ISDR/WHO/WMO guidelines on sustainable flood prevention; focus on

recommendations for water retention areas, land use, zoning and risk assessment, structural measures and their impact, early warning and forecast systems.

RRL- 0328

Title Flooding and Communicable Diseases Fact Sheet. Risk Assessment and Preventive Measures, 2010
WHO Avenue Appia 20
1211 Geneva 27
Switzerland

Key theme(s) Flooding; communicable diseases; risk; prevention.

Summary

Floods can potentially increase the transmission of the following communicable diseases:

- Water-borne diseases, such as typhoid fever, cholera, leptospirosis and hepatitis A
- Vector-borne diseases, such as malaria, dengue and dengue haemorrhagic fever, yellow fever, and West Nile Fever.

Specific short and long term measures can be taken to avoid such risks and are described in this fact sheet.

Research Question(s)

- Which communicable diseases can be increasingly transmitted during flooding?
- Which measures can be taken to avoid such transmission?

Finding(s)

Risk assessment

Water-borne diseases

Flooding is associated with an increased risk of infection, however this risk is low unless there is significant population displacement and/or water sources are compromised.

Vector-borne diseases

Floods may indirectly lead to an increase in vector-borne diseases through the expansion in the number and range of vector habitats.

Standing water caused by heavy rainfall or overflow of rivers can act as breeding sites for mosquitoes, and therefore enhance the potential for exposure of the disaster-affected population and emergency workers to infections such as dengue, malaria and West Nile fever. Flooding may initially flush out mosquito breeding, but it comes back when the waters recede. The lag time is usually around 6-8 weeks before the onset of a malaria epidemic.

Risk posed by corpses

Contrary to common belief, there is no evidence that corpses pose a risk of disease "epidemics" after natural disasters. Most agents do not survive long in the human body after death (with the exception of HIV -which can be up to 6 days) and the source of acute infections is more likely to be the survivors. Human remains only pose health risks in a few special cases requiring specific precautions, such as deaths from cholera or haemorrhagic fevers.

Preventive measures

Short-term measures

Chlorination of water

Vaccination against hepatitis A

Malaria prevention

Health education

Handling corpses

Long term measures

Legislative/administrative issues

Create Disaster-Preparedness Programmes and Early Warning Systems.

Improve surveillance on a local, national, international and global level.

Promote tap-water quality regulation and monitoring.

Enforce high standards of hygiene.

Technical issues

Improve water treatment and sanitation.

Keep infectious disease control programmes active and efficient.

RRL- 0329

Title WHO Paper: Health Evidence Network (HEN) : What are the human health consequences of flooding and the strategies to reduce them?, 2010
WHO European Centre for Environment and Health
Rome Operational Division
Via Francesco Crispi, 10
I-00187 Rome, Italy

Key theme(s) Flooding; human health effects; reduction of health consequences.

Summary

Floods are the most common natural disaster causing loss of life and economic damage in Europe, which experiences three types of floods: flash, riverine, and storm surges. Flash and riverine floods result from two main groups of meteorological events. In large- and medium-sized river basins in north and central Europe, flooding usually results either from wide-ranging and continuous precipitation or from snowmelt in connection with high antecedent soil saturation. The frequency of great floods increased during the twentieth century, underscoring the need for measures to prevent their negative health impacts.

The adverse human health consequences of flooding are complex, far-reaching and difficult to attribute to the flood event itself. This paper discusses the human health consequences of flooding and the strategies to reduce them.

Research Question

What are the human health consequences of flooding and the strategies to reduce them?

Research Methodology

Based on the paper by Hajat S, et al. The human health consequences of flooding in Europe and the implications for public health: a review of the evidence. *Applied Environmental Science and Public Health*, 2003, 1(1):13-21.

Finding(s)

Human health consequences

There is very limited quantitative evidence of the health impacts of floods. The main health impacts are deaths, injuries and mental health illnesses during the flood event itself, during the restoration process, or from knock-on effects brought about by damage to major infrastructure including displacement of populations. On average, the higher the water depth and the greater the flow velocity of a flood, the greater the damage to property. Most flood-related deaths can be attributed to rapid rise floods. Floods with fewer deaths and severe injuries were attributed to mild temperatures, government rescue plans, civilian rescue operations and disaster occurrence at times when most people were at home. Other health problems and injuries were reduced by measures taken by trained military personnel and by distribution of boots and gloves to other responders. Driving into flood waters is dangerous, as cars can become buoyant

and swept away. The fatal effects of slow-rise river floods proved to be lower if people were aware of the risk of flooding and better prepared for a potential disaster. Sprains, strains, lacerations, abrasions and contusions are the most commonly reported injuries following floods. The risk of communicable disease outbreaks following flooding is small in industrialized countries (excluding tropical regions of industrialized countries like Australia) due to effective water treatment and sewage pumping, safe drinking-water, and public health infrastructure. However, national ministries and governments might need to take additional action on case-by-case bases. Providing accurate information on safe management of flood water during evacuation and clean-up and on the actual situation is essential. Chronic health effects followed by flooding were explained by exposure to human and animal viruses during evacuation, or substantial psychological or physical stress at the time of flooding. Furthermore, flooding is associated with increased rates of anxiety and depression stemming from the experience itself, troubles brought about by geographic displacement, damage to the home or loss of familiar possessions and stress in dealing with builders and other repair people in the aftermath. The persistence of flood-related health effects is directly related to flood intensity. A comprehensive surveillance of morbidity from floods is limited, however. Hospitals, ambulances, retirement homes, schools and kindergarten in flood-prone are at risk, and evacuation of patients and vulnerable groups might represent a further risk.

Policy considerations

There is a need to shift emphasis from disaster response to risk management; to improve flood forecasting; to establish early warning systems, and to include health actors in the communication flow. Risk management in this area must cover a broad field, including health impact assessment of flood structural measures, regulations concerning building in flood prone areas, insurance policies, etc. The harmful effects of flooding can be reduced by building codes, legislation to relocate structures away from flood-prone areas, planning appropriate land use and migration measures. The evidence, however, is inadequate concerning the effectiveness of comprehensive, risk-based emergency management programmes for reducing the adverse health effects of floods. The elderly, disabled, children, women, ethnic minorities and those on low incomes have been shown to be more vulnerable than others to the effects of flooding and may need special consideration during the response and recovery periods. However, more good-quality epidemiological data on these issues is still needed.

Health Systems

RRL- 0330

Title Creating Order from Chaos: Part II: Tactical Planning for Mass Casualty and Disaster Response at Definitive Care Facilities

Author Michael S. Baker
Military Medicine, 2007 Vol 172 ISN 3
AMSUS - Association of Military Surgeons of the U.S.

Key theme(s) Emergency preparedness; disasters; response plan

Summary

Current events highlight the need for disaster preparedness. We have seen tsunamis, hurricanes, terrorism, and combat in the news every night. There are many variables in a disaster, such as damage to facilities, loss of critical staff members, and overwhelming numbers of casualties. Each medical treatment facility should have a plan for everything from caring for staff members to getting the laundry done and providing enhanced security or mortuary services. Communication and agreements with local, regional, and federal agencies are vital. Then we must train and drill to shape the tools to impose order on chaos and to provide the most care to the greatest number.

Research Question

How to prepare disaster response?

Research Methodology

Literature Review

Finding(s)

The purpose of disaster planning is to bring order out of chaos. This requires that the magnitude of the disaster be recognized, resources mobilized, and the scene dealt with in systematic fashion. Each casualty must be quickly assessed, triaged to a priority for treatment, and moved from the scene to definitive care.

Each casualty must undergo triage on arrival at definitive care and then flow through the areas as smoothly as can be directed by the triage officer. Triage is not democratic, and very tough decisions must be made. Casualty triage should be run by a senior staff member with experience in evaluating wounds, assessing physiological impact, determining the requirement for resources and the availability of operating rooms and teams, and predicting the likelihood of patient survival.

Triage of large numbers of patients resulting from disease epidemics or hazardous contamination would require many of these same skills. The key decisions in certain

overwhelming disasters may be more along the lines of food, water, shelter, isolation, and decontamination; medical treatment might be low on the list of priorities. Experience, wisdom, and strong leadership are needed to make and to enforce tough decisions in these settings. Definitive care facilities must have plans outlined for multiple and varied, catastrophic events. Checklists and training for everything from staff notification to supply cache locations should be readily created and drilled. Information should be Internet based, with a hard copy for backup in case of an information technology failure. Solutions should be arranged for alternate sources of supplies, heightened security, expanded mortuary capability, and hotel services for staff members. Planning should also include forging relationships with every possible source of assistance or support. Communication should be established and exercised between facilities and their local, regional, and federal agencies. There are numerous resources in our communities. The challenge is to forecast the need, to establish communication, to develop relationships, and to forge agreements in advance of a crisis.

RRL- 0331

Title Challenge of Hospital Emergency Preparedness: Analysis and Recommendations

Author(s) Joseph A. Barbera, Dale J. Yeatts, Anthony G. Macintyre

Disaster Medicine and Public Health Preparedness, 2009 Vol 3 ISN 1

Key theme(s) Emergencies and disasters; organization; medical response; hospital preparedness

Summary

In the United States, recent large-scale emergencies and disasters display some element of organized medical emergency response, and hospitals have played prominent roles in many of these incidents. These and other well-publicized incidents have captured the attention of government authorities, regulators, and the public. Health care has assumed a more prominent role as an integral component of any community emergency response. This has resulted in increased funding for hospital preparedness, along with a plethora of new preparedness guidance.

Methods to objectively measure the results of these initiatives are only now being developed. It is clear that hospital readiness remains uneven across the United States. Without significant disaster experience, many hospitals remain unprepared for natural disasters. They may be even less ready to accept and care for patient surge from chemical or biological attacks, conventional or nuclear explosive detonations, unusual natural disasters, or novel infectious disease outbreaks.

This article explores potential reasons for inconsistent emergency preparedness across the hospital industry. It identifies and discusses potential motivational factors that encourage

effective emergency management and the obstacles that may impede it. Strategies are proposed to promote consistent, reproducible, and objectively measured preparedness across the US health care industry. The article also identifies issues requiring research.

Research Objective

To examine potential reasons for inconsistent emergency preparedness across the hospital industry in the USA.

Research Methodology

Literature Review

Finding(s)

OBSTACLES TO ADEQUATE PREPAREDNESS.

Medical Economics

Risk perception

Planning assumptions

Cost vs Benefits

Business and legal risks

FACTORS PROMOTING HOSPITAL PREPAREDNESS

Funding

Federal Government Focus and Guidance

Standards and Regulations

Experience and examples

Community Standards for Involving and Supporting Local Hospitals

ANALYSIS AND RECOMMENDATIONS

Increase Research

More Appropriately Focused Motivational Efforts

Reward Effective Preparedness Actions

More Appropriately Focused Preparedness Guidance

Revision of Federal Funding Programs

RRL- 0332

Title Disaster Preparedness: Is Your Unit Ready?

Author(s) C.S. Counts

Nephrology Nursing Journal, 2001 Vol 28 ISN 5
American Nephrology Nurses Association

Key theme(s) Nephrology, disaster plan, hospitals

Summary

This article aimed at reviewing various issues that may arise with disasters and promoting predisaster planning for dialysis units. It raises a number of issues related to disaster planning and assisting facilities in developing or improving disaster plans designed to meet the unique needs of the facility and patient.

Research Objective

To review various issues that may arise with disasters and to promote predisaster planning for dialysis units.

Finding(s)

It is important that the staff of a dialysis facility knows the community's disaster plan or plans and knows what other dialysis facilities may be able to provide for their patients.

All hospitals and health care facilities should have a disaster plan. The first phase of the plan (Taggart, 1985) is the predisaster preparation phase, where disaster potentials are assessed and the plan developed, education, training and drills take place. The next is the warning phase, the period of time from the first danger signal to the moment of impact. The disaster plan is activated and communicated to all involved parties. During the impact phase, the disaster actually strikes and little can be done. The emergency phase begins at the end of the impact and can be divided into three parts: isolation, rescue and remedy. Finally, the recovery phase begins with the resumption of normal order and functions.

The principles and objectives of a disaster plan are:

- a) to prepare the staff, the facility resources, and chronic patients for optimal performances in an emergency situation
- b) to reduce the facility's vulnerability to a disaster and perhaps even prevent it
- c) to make the community aware of the needs of the facility and patient population
- d) to establish a security system to be implemented if needed.

A meaningful disaster plan must include following basic services: water, waste disposal, electricity, communications, supplies, transportation and personnel.

RRL- 0333

Title The Importance of Disaster Planning
Author C.S. Counts
Nephrology Nursing Journal, 2001 Vol 28 ISN 5
American Nephrology Nurses Association

Key theme(s) Natural disasters; emergency planning

Summary

The need for disaster preparedness appears to be greater today than at any previous time in history. This would reduce the cost of natural disasters, help keeping alive people who depend on modern technology and adjust to the special needs of an older population.

RRL- 0334

Title Surveillance of infectious diseases: Principles and organization in France in 2005
Author(s) J.-C. Desenclos, 2005 Vol 35
Médecine et maladies infectieuses

Key theme(s) Infectious diseases; Surveillance; Epidemiology

Summary

Surveillance is a continuous and systematic process of collection, analysis, and diffusion of health data to all those who contributed to the collection and all those who need this data in order to take action. Surveillance activities first target health problems for which effective prevention or control measures are available. Surveillance objectives include the following-up of trends and changes in disease characteristics, evaluation of public health actions, and early detection of infectious diseases threats and epidemic and their investigation. The data produced by surveillance systems allow prioritizing public health actions and defining the objectives of infectious diseases control or prevention. The surveillance of infectious diseases relies on a large number of partners grouped in a public health network in which clinicians and microbiologists have a prominent role.

Research Methodology

Literature research

Finding(s)

In France, the surveillance of infectious diseases is based on mandatory notification of some

diseases, national reference centers, networks of voluntary health professionals or services, and repeated surveys. The national surveillance is coordinated by a public health institute, "l'Institut de Veille Sanitaire", the missions of which are public health surveillance of the population, alerting health authorities in case of health threats, and identifying the determinants of changes in the population's health status.

RRL- 0335

Title A Stitch in Time: Improving Public Health Early Warning Systems for Extreme Weather Events

Author(s) K. L. Ebi, J. K. Schmier
Epidemiologic Reviews, 2005 Vol 27

Key theme(s) Early warning systems; extreme weather events

Summary

The skill with which weather and climatic events can be forecast has increased significantly over the past 30 years as more has been learned about the climate system. Public health professionals have the opportunity to integrate weather- and climate-related information into local and regional risk management plans to reduce the detrimental health effects of hazards as diverse as tropical cyclones, floods, heat waves, wildfires, and droughts. This article aims at reviewing evolutions and suggest improvements in early warning systems.

Research Question(s)

How to improve public health early warning systems for extreme weather events ?

Research Methodology

Literature review

Finding(s)

Evidence demonstrates that early warning systems can reduce the morbidity and mortality associated with extreme weather events. To be effective, public health must move from a focus on surveillance and response to a greater emphasis on prediction and prevention. It is essential for public health to collaborate and coordinate with meteorologists in the development of early warning systems. Linking the increasing skill of meteorologists in forecasting extreme events with effective public health interventions can improve disaster management.

Projections of more frequent and more intense extreme events in a changing climate increase the importance of designing and implementing early warning systems that take into consideration the possibility of extremes outside the historic range. The precise structure of an

early warning system will depend on its purpose (i.e., whether it is designed for a heat wave or a riverine flood), on stakeholder needs, and on institutional structures. In general, such a system will include meteorologic forecasts, predictions of health outcomes, a written response plan (including thresholds for action), and evaluation criteria.

Basic research is needed to support the development of early warning systems, particularly the systematic collection of epidemiologic data on the full range of health risks associated with extreme events and better understanding of the effectiveness of particular interventions. Although extreme weather events are well known to be hazardous, the morbidity associated with these events is surprisingly poorly characterized. In addition, data are generally collected only for large events, so the burden of smaller events is uncertain. Functional early warning systems initiate a range of interventions in response to a warning, but few specific interventions have been evaluated for their effectiveness. Such evaluations are needed to ensure effective and efficient use of resources.

Development of early warning systems in anticipation of increased climate variability can be viewed as an application of the precautionary principle. The precautionary principle is an approach to public policy action that can be used in situations of potentially serious or irreversible threats to health or the environment, where there is a need to act to reduce potential hazards before there is strong proof of harm. One element of a precautionary approach is undertaking action before full proof of harm is available, if impacts could be serious or irreversible. This certainly is the situation with projections of a future possibly characterized by increases in the frequency and severity of extreme weather events. The scientific awareness that not only is climate change occurring now, but its effects are also being felt now, must be translated into political awareness before extreme weather events cost more lives.

RRL- 0336

Title Surge Capacity for Health Care Systems: Early Detection, Methodologies, and Process

Author P. L. Estacio
Academic Emergency Medicine, 2006 Vol 13 ISN 11

Key theme(s) Healthcare Systems and Disaster, BioWatch, BioSense, National Biosurveillance Integration System (NBIS), BioShield, pandemic influenza preparedness, point-of-care medical diagnostics

Summary

Excessive demand on hospital services from large-scale emergencies is something that every emergency department health care provider and hospital administrator knows could happen at any time. Nowhere in this country have we recently faced a disaster of the magnitude of

concern we now face involving agents of mass destruction or social disruption, especially those in the area of infectious diseases and radiological materials. The war on terrorism is not a conventional war, and terrorists may use any means of convenience to carry out their objectives in an unpredictable time line. Have we adequately prepared for the potentially excessive surge in demand for medical services that a large-scale event could bring to our medical care system? Are our emergency departments ready for such events? Surveillance systems, such as BioWatch, BioSense, the National Biosurveillance Integration System, and the countermeasure program BioShield, offer hope that we will be able to meet these new challenges. These surveillance systems start at the local health care provider, and connect to city, county, state, federal, and international health care response systems.

Research Question(s)

- a. How do the various methods and processes of this system-of-systems work together to accomplish these tasks?
- b. How do we get the “initial heads up” that our patient is the first of many to follow?

Research Methodology

Literature Review

Finding(s)

Working together, these early-warning detection systems can provide the situational awareness needed to afford the time to invoke appropriate emergency response countermeasures provided by local, county, state, and federal preparedness efforts, such as those found in the BioShield Act of 2004. At the local point-of-care level, the use of accurate and rapid diagnostic tests on a routine basis can lead to improved quality of care for the individual and lower-cost medical care for medical care providers, while allowing early warning of the emergence of an agent that affects the health of individuals and requires special attention. Being warned early of an approaching surge for medical care demand allows the medical care community to execute their cooperative agreements and better meet the challenges presented by these large-scale medical emergencies.

Title Floods, Health and Climate Change: a Strategic Review

Author(s) R. Few, M. Ahern, F. Matthies, S. Kovats
 Working Paper 64, 2004
 Tyndall Centre for Climate Change Research
 Zuckerman Institute for Connective Environmental Research, School of
 Environmental Sciences, University of East Anglia

Key theme(s) Flooding; health impacts; natural hazards.

Summary

Flooding is one of the most widespread of climatic hazards and poses multiple risks to human health, yet there has been little systematic research work on health outcomes and the means by which vulnerable populations and health systems respond to those risks. Given the prospect that flood hazards may increase as a result of climate change, it is timely now to make a strategic assessment of the existing knowledge base on health and flood risk. Following preliminary discussion of global flood risk issues (chapter 2), the main sections of the report comprise an epidemiological review of the evidence base for health outcomes of flooding (chapter 3) and a review of literature analysing mechanisms of response to health risks from floods (chapter 4). Though the scope of the report is global, the material discussed in these sections is fairly narrow in thematic focus: the intention has been to maximise the added value of the work by concentrating as closely as possible on issues connected with health and flooding. The final section (chapter 5) then discusses the key findings in the wider contexts of social differentiation, development, hazard management, climate change and adaptation.

Research Objectives

- a. To present findings from a wide-ranging review of global literature on health impacts, adaptation processes and policies relating to flood risk.
- b. To make a critical assessment of the existing knowledge base and identify key opportunities and challenges for intervention and research.
- c. To assess the implications of climate change and future flood risk for health impacts, adaptation processes and policies.

Research Methodology

Literature Review

Finding(s)

Infectious disease is a major flood-related health concern in the South, especially in settings where infectious disease transmission is an endemic public health problem. Infectious disease outbreaks have been reported following major flood events in developing countries, and these outbreaks vary in magnitude and rates of mortality. There is some evidence from India and Bangladesh that diarrhoeal disease increases after flooding. There is also good evidence of outbreaks of leptospirosis, but relatively weak evidence that flooding leads to outbreaks of other infectious diseases (e.g. cholera, hepatitis, vector-borne disease). From the studies reviewed it is clear that there is no strong evidence of outbreaks of infectious disease in

countries of the North.

Overall, the epidemiological review suggests that there is presently a weak evidence-base to assess the health impacts of flooding. Relatively few rigorous epidemiological studies have been undertaken, and it is extremely difficult to assess the duration of symptoms and disease, and the attribution of cause without longitudinal data.

The knowledge gap on health outcomes relates in part to a need to improve monitoring and surveillance. This includes strengthening general surveillance systems for infectious diseases, and developing and enhancing specific surveillance following flood events. Many studies in the review also suffered from methodological shortcomings. We therefore make the following recommendations for the design of epidemiological studies that investigate the health impacts of floods: control groups for comparison with non-flooded populations; use of longitudinal data, or routine data in order to gain information on pre-flood levels of disease; use of objective measures of disease outcome; and improved use of routine surveillance information.

Advance planning is key for successful health education, warning and evacuation, emergency health care provision, infrastructure protection and other aspects of health-related response to floods. At the same time, a planned approach to health-related response needs a degree of flexibility, to ensure that actions are tailored to local circumstances and needs, and to promote institutional learning from positive experiences and external examples of good practice. Efficient response to health risks from flooding also rests on effective coordination between sectors and agencies, and on effective linkage between scales of responsibility, including the relations of trust and accountability between local public agencies and communities subject to flooding.

RRL- 0338

Title Pediatric Disaster Preparedness: Are We Really Prepared?

Author(s) M. Gausche-Hill

The Journal of Trauma, Injury, Infection, and Critical Care, 2009 Vol 67 ISN 2

Key theme(s) Children, Preparedness, Disaster, Multicasualty incidents, Schools, DMAT, Institute of Medicine

Summary

Pediatric disaster preparedness implies that systems are in place to ensure the rapid triage and emergency management of children as patients in a natural, manmade, or terrorist-initiated disaster. Children are a vulnerable population for a number of reasons that include anatomic, physiologic, immunologic, developmental and psychologic issues that are important for planning for the care of children in disasters or multicasualty incidents. Data suggest that more than one third of victims of disasters or multicasualty incidents are children, yet system planning has not included pediatric issues. Although there are challenges, lessons learned can be applied to current system planning that provides an opportunity within emergency and trauma care systems to plan more effectively, and then evaluate our strategies, policies, and procedures in simulated or real disaster scenarios.

Research Question

What is the state of pediatric disaster preparedness in the USA?

Finding(s)

Middleton and Burt demonstrated in a stratified sample of emergency departments that only 6% of emergency departments have all the important equipment for the care of children. Gausche-Hill et al. found similar deficiencies in equipment and supplies for children in emergency departments but also notes that approximately 90% of emergency departments stocked at least 80% of the recommended equipment. Items most likely to be missing included smaller sized items appropriate for the care of small infants and children, such as oral and nasal airways, vascular access catheters, and pediatric Magill forceps for removal of aspirated foreign bodies. Furthermore, only half of the emergency departments had a quality improvement or performance improvement plan for the care of children or were even aware that national guidelines for preparedness of emergency departments exist. The pediatric coordinator for emergency care may have a significant impact in improvement in these areas. Pediatric preparedness of emergency care and trauma systems to date is poor. Efforts are being made at local, state, county, and federal levels to create resources to assist communities in getting prepared. The challenge for the future is to bring resources to address the issues, such as pediatric expertise to system planning, pediatric appropriate equipment, supplies, medications and technologies, and strategies to improve rapid triage and field management for children in disasters. Hospitals and EMS systems must have disaster plans that address the unique aspects of caring for children in disasters, and DMAT teams must have pediatric expertise. Finally, strategies developed must include methods of identifying children, tracking them through the triage and evaluation process, reunifying children with their parents, and mitigating the emotional impact to children and their families.

RRL- 0339

Title Proper Planning and Networking are Key in Preparing for disasters

Author M.A. Gould
Nephrology Nursing Journal, 2001 Vol 28 ISN 5
American Nephrology Nurses Association

Key theme(s) Planning process, natural disasters.

Summary

This article is the President's message in the special issue on natural catastrophes. It emphasizes on the need for advocacy, the importance of the formation of strategic alliances and the strengthening of scholarships and leadership.

RRL- 0340

Title The Human Health Consequences of Flooding in Europe: a Review

Author(s) S. Hajat, K. L. Ebi, R. S. Kovats, B. Menne
Review based on a paper originally published in "Applied Environmental Science and Public Health", 2003 Vol 1

Key theme(s) Floods, mental health, climate change, Europe

Summary

Floods are the most common natural disaster in Europe. The adverse human health consequences of flooding are complex and far-reaching: these include drowning, injuries, and an increased incidence of common mental disorders. Anxiety and depression may last for months and possibly even years after the flood event and so the true health burden is rarely appreciated. Effects of floods on communicable diseases appear relatively infrequent in Europe. The vulnerability of a person or group is defined in terms of their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard. Determining vulnerability is a major challenge. Vulnerable groups within communities to the health impacts of flooding are the elderly, disabled, children, women, ethnic minorities, and those on low incomes. There is a need for more good-quality epidemiological data before vulnerability indices can be developed. With better information, the emphasis in disaster management could shift from post-disaster improvisation to pre-disaster planning. A comprehensive, risk-based emergency management program of preparedness, response, and recovery has the potential to reduce the adverse health effects of floods, but there is currently inadequate evidence of the effectiveness of public health interventions.

Research Objective

To review the epidemiological literature to assess the human health consequences of flooding in Europe and other industrialised countries and investigate the current adaptation strategies available to the health-sector to minimise effects.

Research Methodology

The search for literature on the health effects of floods was restricted to events in the following regions: the whole of Europe, North America and Australasia. Although the focus of this work is to document the effects of flood events from Europe, examples from other industrialised countries are also used to illustrate the potential range of health impacts from floods. Events from low-income countries are excluded as the effects can be very different to those experienced in the majority of Europe. Literature was obtained by consulting experts in the field and by searching the databases using the following search strategy:

- Objectives: To search for literature relating to the human health impacts of flooding
- Database list: BIDS, Embase, PsycLit, Pubmed, Sigle
- Terms searched for: Flood, floods, flooding, disasters, extreme events, health
- Inclusion criteria: all available years
- Exclusion criteria: events not occurring in Europe, North America or Australasia.

Finding(s)

In general, the reviewed reports suggest two main messages arising when considering the health impacts of floods in industrialised countries:

1. The biggest impacts occur as a result of the psychological distress experienced during flooding and in its aftermath
2. In direct contrast to low-income countries, the likelihood of infectious disease outbreaks following flooding in temperate industrialised countries is low. Maintenance of existing public health responses to flooding in these countries is important to sustain the low risk.

A better understanding is needed of vulnerability risk factors. There are suggestions that some people may be more susceptible to the effects of floods than others, but the available evidence is insufficient to allow vulnerability indices to be devised and used operationally. Again the need is for more and better quality epidemiological data, including

- Centralized and systematic national reporting for deaths and injuries from floods using standardized methodology
- Development of instruments to assess health risks
- Identification of data needed to prepare for and evaluate the impacts of such strategies on future events.

RRL- 0341

Title Equipment, Supplies, and Pharmaceuticals: How Much Might It Cost to Achieve Basic Surge Capacity?

Author D. Hanfling
Academic Emergency Medicine, 2006 Vol 13 ISN 11

Key theme(s) surge capacity, disaster medicine, pandemic influenza, critical care

Summary

The ability to deliver optimal medical care in the setting of a disaster event, regardless of its cause, will in large part be contingent on an immediately available supply of key medical equipment, supplies, and pharmaceuticals. Although the Department of Health and Human Services Strategic National Stockpile program makes these available through its 12-hour “push packs” and vendor-managed inventory, every local community should be funded to create a local cache for these items. This report explores the funding requirements for this suggested approach. Furthermore, the response to a surge in demand for care will be contingent on keeping available staff close to the hospitals for a sustained period. A proposal for accomplishing this, with associated costs, is discussed as well.

Research Question

What is the cost of basic surge capacity?

Research Methodology

Literature review.

Finding(s)

Based on estimates, and assuming that these equipment, supplies, and pharmaceuticals are intended to manage 100 patients, 50 of whom require intensive, high-acuity level care and 50 of whom require less intensive but still considerable moderate level of care, for three days only, a very conservative estimate of funding requirements for basic items would be approximately \$1.1 million per 100 patients.

RRL- 0342

Title Emergency and Disaster Preparing: Patient Education and Preparation

Author(s) E. Howard, K. Wiseman

Nephrology Nursing Journal, 2001 Vol 28 ISN 5
American Nephrology Nurses Association

Key theme(s) Disaster planning; patients involvement

Summary

While disasters and emergencies cannot always be predicted, they can often be anticipated. Careful thorough and thoughtful planning can help to minimize the confusion and disruption that such events cause. Involvement of patients is especially for dialysis units of special importance for the design of a disaster plan.

Research Methodology

Literature review

Finding(s)

A successful plan will involve patients, their families and other necessary personnel agencies before disaster strikes and guide them through the emergency and recovery period.

There are a number of resources available to a facility developing a disaster plan. Many communities have local emergency programs. Several ESRD Networks have developed handbooks that include emergency supply lists and meal plans.

RRL- 0343

Title Healthcare worker competencies for disaster training

Author(s) Edbert B Hsu, Tamara L Thomas, Eric B Bass, Dianne Whyne
BMC Medical Education, 2006 Vol 6 ISN 19

Key theme(s) Disaster preparedness training; healthcare workers. disaster response

Summary

Although training and education have long been accepted as integral to disaster preparedness, many currently taught practices are neither evidence-based nor standardized. The need for effective evidence-based disaster training of healthcare staff at all levels, including the development of standards and guidelines for training in the multi-disciplinary health response to major events, has been designated by the disaster response community as a high priority. The authors describe the application of systematic evidence-based consensus building methods to derive educational competencies and objectives in criteria-based preparedness and response relevant to all hospital healthcare workers.

In total, cross-cutting competencies and objectives developed through a systematic evidence-based consensus building approach may serve as a foundation for future hospital healthcare worker training and education in disaster preparedness and response.

Research Objective

To propose a competency-based approach with specific measurable objectives derived by a national expert panel as a paradigm for healthcare worker disaster preparedness and response training.

Finding(s)

Seven cross-cutting competencies were developed: (1) Recognize a potential critical event and implement initial actions; (2) Apply the principles of critical event management; (3) Demonstrate critical event safety principles; (4) Understand the institutional emergency operations plan; (5) Demonstrate effective critical event communications; (6) Understand the incident command system and your role in it; (7) Demonstrate the knowledge and skills needed to fulfil our role during a critical event. For each of the cross-cutting competencies, comprehensive terminal objectives are described.

RRL- 0344

Title Hospital Disaster Preparedness in Los Angeles County

Author(s) Amy H. Kaji, Roger J. Lewis
Academic Emergency Medicine, 2006 Vol 13

Key theme(s) Hospital disaster preparedness, surge capacity

Summary

There are no standardized measures of hospital disaster preparedness or hospital “surge capacity.” The objective of this study was therefore to characterize disaster preparedness among a cohort of hospitals in Los Angeles County, focusing on practice variation, plan characteristics, and surge capacity. The authors found out that among hospitals in Los Angeles County, disaster preparedness and surge capacity appear to be limited by a failure to fully integrate interagency training and planning and a severely limited surge capacity, although there is a generally high level of availability of equipment and supplies.

Research Question(s)

To characterize disaster preparedness among a cohort of hospitals in Los Angeles County, CA, focusing on practice variation, plan characteristics, and surge capacity, using a telephone-based survey tool and an on-site survey to verify and clarify initial responses.

Research Methodology

This was a descriptive, cross-sectional survey study, followed by on-site verification. Forty-five 9-1-1 receiving hospitals in Los Angeles County, CA, participated. Evaluations of hospital disaster plan structure, vendor agreements, modes of communication, medical and surgical supplies, involvement of law enforcement, mutual aid agreements with other facilities, drills and training, surge capacity (assessed by monthly emergency department diversion status, available beds, ventilators, and isolation rooms), decontamination capability, and pharmaceutical stockpiles were assessed by survey.

Finding(s)

Forty-three of 45 hospital plans (96%) were based on the Hospital Emergency Incident Command System, and the majority had protocols for hospital lockdown (100%), canceling elective surgeries (93%), early discharge (98%), day care for children of staff (88%), designating victim overflow areas (96%), and predisaster “preferred” vendor agreements (96%). All had emergency medical services-compatible radios and more than three days’ worth of supplies. Fewer hospitals involved law enforcement (56%) or had mutual aid agreements with other hospitals (20%) or long-term care facilities (7%). Although the vast majority (96%) conducted multiagency drills, only 16% actually involved other agencies in their disaster training. Only 13 of 45 hospitals (29%) had a surge capacity of greater than 20 beds. Less than half (42%) had ten or more isolation rooms, and 27 hospitals (60%) were on diversion greater than 20% of the

time. Thirteen hospitals (29%) had immediate access to six or more ventilators. Less than half had warm-water decontamination (42%), while approximately one half (51%) had a chemical antidote stockpile and 42% had an antibiotic stockpile.

RRL- 0345

Title Assessing Hospital Disaster Preparedness: A Comparison of an On-Site Survey, Directly Observed Drill Performance, and Video Analysis of Teamwork

Author(s) Amy H. Kaji, Vinette Langford, Roger J. Lewis

Annals of Emergency Medicine, 2008 Vol 52 ISN 3

Key theme(s) Hospital disaster preparedness; method; evaluation.

Summary

There is currently no validated method for assessing hospital disaster preparedness. This study aimed at determining the degree of correlation between the results of 3 methods for assessing hospital disaster preparedness: administration of an on-site survey, drill observation using a structured evaluation tool, and video analysis of team performance in the hospital incident command center.

As a conclusion, the disparate results obtained from the 3 methods suggest that each measures distinct aspects of disaster preparedness, and perhaps no single method adequately characterizes overall hospital preparedness.

Research Objective

To determine the degree of correlation between the results of 3 methods for assessing hospital disaster preparedness: administration of an on-site survey, drill observation using a structured evaluation tool, and video analysis of team performance in the hospital incident command center.

Research Methodology

This was a prospective, observational study conducted during a regional disaster drill, comparing the results from an on-site survey, a structured disaster drill evaluation tool, and a video analysis of teamwork, performed at 6 911-receiving hospitals in Los Angeles County, CA. The on-site survey was conducted separately from the drill and assessed hospital disaster plan structure, vendor agreements, modes of communication, medical and surgical supplies, involvement of law enforcement, mutual aid agreements with other facilities, drills and

training, surge capacity, decontamination capability, and pharmaceutical stockpiles. The drill evaluation tool, developed by Johns Hopkins University under contract from the Agency for Healthcare Research and Quality, was used to assess various aspects of drill performance, such as the availability of the hospital disaster plan, the geographic configuration of the incident command center, whether drill participants were identifiable, whether the noise level interfered with effective communication, and how often key information (eg, number of available staffed floor, intensive care, and isolation beds; number of arriving victims; expected triage level of victims; number of potential discharges) was received by the incident command center. Teamwork behaviors in the incident command center were quantitatively assessed, using the MedTeams analysis of the video recordings obtained during the disaster drill. Spearman rank correlations of the results between pair-wise groupings of the 3 assessment methods were calculated.

Finding(s)

The 3 evaluation methods demonstrated qualitatively different results with respect to each hospital's level of disaster preparedness. The Spearman rank correlation coefficient between the results of the on-site survey and the video analysis of teamwork was -0.34 ; between the results of the on-site survey and the structured drill evaluation tool, 0.15 ; and between the results of the video analysis and the drill evaluation tool, 0.82 .

RRL- 0346

Title Surge Capacity for Healthcare Systems: A Conceptual Framework

Author(s) Amy H. Kaji, Kristi L. Koenig, Tareg Bey
Academic Emergency Medicine, 2006 Vol 13

Key theme(s) disaster medicine, surge capacity, ED crowding

Summary

This report reflects the proceedings of a breakout session, "Surge Capacity: Defining Concepts," at the 2006 Academic Emergency Medicine Consensus Conference, "Science of Surge Capacity." Although there are several general descriptions of surge capacity in the literature, there is no universally accepted standard definition specifying the various components. Thus, the objectives of this breakout session were to better delineate the components of surge capacity and to outline the key considerations when planning for surge capacity. Participants were from diverse backgrounds and included academic and community emergency physicians, economists, hospital administrators, and experts in mathematical modeling. Three essential components of surge capacity were identified: staff, stuff, and structure. The focus on enhancing surge capacity during a catastrophic event will be to

increase patient-care capacity, rather than on increasing things, such as beds and medical supplies. Although there are similarities between daily surge and disaster surge, during a disaster, the goal shifts from the day-to-day operational focus on optimizing outcomes for the individual patient to optimizing those for a population. Other key considerations in defining surge capacity include psychosocial behavioral issues, convergent volunteerism, the need for special expertise and supplies, development of a standard of care appropriate for a specific situation, and standardization of a universal metric for surge capacity.

RRL- 0347

Title Disaster Preparedness: What Do We Do Now?

Author(s) Gwen B. Keeney

Journal of Midwifery & Women's Health, 2004 Vol 49 ISN 1

Key theme(s) disasters, international health problems, health systems, public health, public policy

Summary

Disasters are events that exceed the capacity of the people affected to recover from the adverse affects. Understanding types of disasters and components of disaster responses provides a basis for developing disaster preparedness plans. Disaster preparedness is a process for assessing risks and capacities for responding when disasters occur. Planning can mitigate damages and facilitate rapid and effective disaster response services. Health care workers, including midwives and women's health care providers, can access resources to be prepared as competent responders in disaster contexts to meet the needs of women and their communities.

RRL- 0348

Title Investigating public health emergency response information system initiatives in China

Author(s) Huigang Liang, Yajiong Xue

International Journal of Medical Informatics, 2004 Vol 73

Key theme(s) Public health; Emergency response; Information systems

Summary

Infectious diseases pose a great danger to public health internationally. The outbreak of SARS has exposed China's fragile public health system and its limited ability to detect and respond to emergencies in a timely and effective manner. In order to strengthen its capability of responding to future public health emergencies, China is developing a public health emergency response information system (PHERIS) to facilitate disease surveillance, detection, reporting, and response. The purpose of this study is to investigate the ongoing development of China's PHERIS. This paper analyzes the problems of China's existing public health system and describes the design and functionalities of PHERIS from both technical and managerial aspects.

Research Objective

To review the literature regarding emergency response information systems, analyze the weakness of China's old public health system, and describe the design and functionalities of PHERIS from both technical and managerial aspects.

Research Methodology

Literature review: In order to identify the relevant literature, the authors searched research databases including PubMed, IEEE Explore, and ACM Digital Library. The search was performed, using different combination of keywords, such as "public health", "emergency system", "emergency response", "emergency response systems", "surveillance", and "bioterrorism". They also collected information from the official websites of organizations, including the Centers of Disease Control and Prevention (CDC), the Agency for Healthcare Research and Quality (AHRQ), and the Health and Human Services (HHS), which have been sponsoring emergency response information systems initiatives.

Case Study: Given the complexity of China's PHERIS and the lack of previous research on this topic, a case research method was employed by this study. Interviews with two professors at Health Science Center of Beijing University, three healthcare informatics experts, and six healthcare IT practitioners were conducted to collect data of the development of China's PHERIS. Additional documents were reviewed to retrieve pertinent information. These documents include government IT policies and regulations, meeting minutes, reports, development plans, media reports, and news.

Finding(s)

China recognizes that surveillance and detection of disease outbreaks is a critical part of the

solution and a dynamic system incorporating command, action, and supporting components is also needed to manage emergencies. The ongoing development of PHERIS will provide a complete package for China to rapidly detect emergencies, effectively share critical information among key stakeholders, and competently manage emergencies. Comparing PHERIS with the five criteria recommended by Turoff et al., the authors find that the concepts of roles and notifications have been partly built into the system, while metaphors, context visibility, and hypertext are hardly realized in the system. This is not surprising, since China just started developing PHERIS and the system is still relatively rudimentary. At this stage, China's effort in developing PHERIS can be considered to be successful because of the radical emergency response process change resulted from PHERIS and its associated performance improvement in public health surveillance and group co-ordination. China expects PHERIS to be an adaptable system which is able to adjust to the changing environment. Thus, PHERIS will play a significant role in protecting China's public health for years to come.

RRL- 0349

Title Catastrophic Disasters and the Design of Disaster Medical Care Systems

Author(s) Louis Emmet Mahoney, Thomas P Reutershan
Annals of Emergency Medicine, 1987 Vol 16 ISN 9

Key theme(s) disasters, medical care; National Disaster Medical System, USA

Summary

The National Disaster Medical System (NDMS) is aimed at medical care needs resulting from catastrophic earthquakes, which may cause thousands of deaths and injuries. Other geophysical events may cause great mortality, but leave few injured survivors. Weather incidents, technological disasters, and common mass casualty incidents cause much less mortality and morbidity. Catastrophic disasters overwhelm the local medical care system. Supplemental care is provided by disaster relief forces; this care should be adapted to prevalent types of injuries. Most care should be provided at the disaster scene through supplemental medical facilities, while some can be provided by evacuating patients to distant hospitals. Medical response teams capable of stabilizing, sorting, and holding victims should staff supplemental medical facilities. The NDMS program includes hospital facilities, evacuation assets, and medical response teams. The structure and capabilities of these elements are determined by the medical care needs of the catastrophic disaster situation.

Research Question(s)

To demonstrate that certain types of disasters, notably earthquakes, may cause catastrophic numbers of casualties and substantial medical care needs.

Research Methodology

Literature review

Finding(s)

In order to meet the medical care needs of a catastrophic disaster, a disaster medical system must provide for supplemental field medical care, internal evacuation of patients, and adequate definitive care. These needs are best met by a three-part strategy. First, field medical care resources locally available to triage and stabilize victims should be augmented by outside medical teams. Second, patients who need inpatient care and cannot be accommodated in local or regional facilities should be evacuated. Third, adequate hospital facilities should be made available at destinations for definitive treatment of evacuated patients. The disaster medical system should respond immediately on need, as medical care must be delivered quickly if it is to be useful. The system and all its necessary components should therefore be in place before a disaster occurs. However, disasters are uncommon events, so a response system cannot maintain special assets dedicated solely to disaster medical care. A mutual aid system in which unaffected areas lend existing assets to an affected area is the only model that is economically feasible. The NDMS has been designed as an interstate medical mutual aid system to address the medical care needs of catastrophic disasters. It contains a medical response element to bring organized aid to the affected area, an evacuation system, and a network of precommitted hospital beds throughout the United States. Its medical response element is to contain disaster medical teams specifically designed to provide the quantity and kind of medical care needed by disaster victims.

RRL- 0350

Title The Measurement of Daily Surge and Its Relevance to Disaster Preparedness

Author(s) Melissa L. McCarthy, Dominik Aronsky, Gabor D. Kelen

Academic Emergency Medicine , 2006 Vol 13

Key theme(s) emergency department, ED overcrowding, catastrophic surge, surge capacity, disaster preparedness

Summary

This article reviews what is known about daily emergency department (ED) surge and ED surge capacity and illustrates its potential relevance during a catastrophic event. Daily ED surge is a sudden increase in the demand for ED services. There is no well-accepted, objective measure of daily ED surge. The authors propose that daily and catastrophic ED surge can be measured by the magnitude of the surge, as well as by the nature and severity of the illnesses and injuries that patients present with during the surge. The magnitude of an ED surge can be measured by the patient arrival rate per hour. The nature and severity of the surge can be measured by the type (e.g., trauma vs. infection vs. biohazard) and acuity (e.g., triage level) of the surge. Surge

capacity is defined as the extent to which a system can respond to a rapid and sizeable increase in the demand for resources. ED surge capacity includes multiple dimensions, such as systems, space, staffing, and supplies. A multidimensional measure is needed that reflects both the core components and their relative contribution to ED surge capacity. Although many types of factors may influence ED surge capacity, relatively little formal research has been conducted in this area. A better understanding of daily ED surge capacity and influencing factors will improve our ability to simulate the potential impact that different types of catastrophic events may have on the surge capacity of hospital EDs nationwide.

Research Objective

To review what is known about daily ED surge and to illustrate the importance of gaining a better understanding of the daily phenomenon, so that it can be used as a foundation to more accurately predict how well hospital EDs will respond to a catastrophic surge in the demand for their services.

Research Methodology

Literature Review

Finding(s)

Clinical information systems are essential to understanding patient flow and to improving operational efficiency. To accurately measure daily ED surge and to identify potential bottlenecks before they cause significant delays in patient flow, hospital EDs require real-time, simultaneous measurement of many factors that can predict daily ED surge and surge capacity requirements. Very few institutions, if any today, have the information technology infrastructure to accomplish this task. With the appropriate data, time-series modeling techniques can be used to examine the influence of different factors on ED surge capacity on a minute by minute basis. An individual hospital's response to daily ED surge can be modeled, as well as multiple hospitals' response, by aggregating data across hospitals. Data from multiple sites will strengthen our estimates and allow us to identify site-specific variations that influence ED surge capacity.

With a better understanding of daily ED surge capacity and the factors that influence it, the knowledge of catastrophic events and how to manage them can be combined with advanced simulation techniques to predict the potential impact that different types of catastrophic events would have on the surge capacity of hospital EDs. To do this, however, the following are needed: 1) a common metric for measuring daily ED surge, 2) a conceptual model of ED surge capacity, and 3) better clinical information systems with realtime data on all important aspects of ED operations and clinical care. The best way to prepare for a largescale disaster is to be better informed and prepared for the mini-disasters that many of us experience daily in the ED.

RRL- 0351

Title Surviving a 500-Year Flood

Author(s) H. Fadness McFarland

Nephrology Nursing Journal, 2001 Vol 28 ISN 5
American Nephrology Nurses Association

Key theme(s) Floods, health care, North Carolina

Summary

Experience of the 1999 flooding in Greenwhich, North Carolina, from the point of view of a nephrology nurse. Thorough preparation is essential for getting through disasters, especially when facing one of this magnitude. One lesson taken from Hurricane Floyd and the ensuing flood is the need to expect and be ready for the very worst possible scenario. Teamwork, creative thinking, and the generosity of strangers also enabled the people of eastern North Carolina to survive this unanticipated occurrence. The importance of making plans and identifying the people who will be responsible for carrying them out cannot be over emphasized. In this way, all facilities can be prepared as much as possible to deal with the catastrophe and to prevent harm to patient and staff.

RRL- 0352

Title Combined external and internal hospital disaster: Impact and response in a Houston trauma center intensive care unit

Author(s) Joseph L. Nates

Critical Care Medicine, 2004 Vol 32 ISN 3

Key themes disaster; flood; intensive care; power failure; communications; patient safety; mass casualty

Summary

In June 2001, tropical storm Allison caused >3 feet of rainfall and catastrophic flooding in Houston, TX. Memorial Hermann Hospital, one of only two level I trauma centers in the community, lost electrical power, communications systems, running water, and internal transportation. All essential hospital services were rendered nonfunctional. Life-saving equipment such as ventilators, infusion pumps, and monitors became useless. Patients were triaged to other medical facilities based on acuity using ground and air ambulances. No patients died as result of the internal disaster.

Adequate training, teamwork, communication, coordination with other healthcare professionals, and strong leadership are essential during a crisis. Electricity is vital when

delivering care in today's healthcare system, which depends on advanced technology. It is imperative that hospitals take the necessary measures to preserve electrical power at all times. Hospitals should have battery-operated internal and external communication systems readily available in the event of a widespread disaster and communication outage. Critical services such as pharmacy, laboratories, blood bank, and central supply rooms should be located at sites more secure than the ground floors, and these services should be prepared for more extensive performances. Contingency plans to maintain protected water supplies and available emergency kits with batteries, flashlights, two-way radios, and a nonelectronic emergency system for patient identification are also very important. Rapid adaptation to unexpected adverse conditions is critical to the successful implementation of any disaster plan.

RRL- 0353

Title A Call for Help. Collaboration with Community Officials is Key

Author(s) R. Neil
Materials Management in Health Care, 2003
Association for Healthcare Resource & Materials Management

Key theme(s) Hospital infections, planning, disaster preparedness.

Summary

This article based on interviews and literature research aims to look at how hospitals' infection control departments are working to meet the challenge of dealing with a potential attack on the general population. The author comes to the conclusion that specific answers to developing comprehensive plans will vary by region, but the main tool is for hospitals to unite with other facilities and local agencies and insist that city and county governments take a leadership role in disaster preparedness.

Research Objective

To look at how hospitals' infection control departments are working to meet the challenge of dealing with a potential attack on the general population.

Research Methodology

Interviews and literature research

Finding(s)

Dealing with the threat of a mass biological or chemical attack is a relatively new concept for hospitals, and although training has been slow to develop, there are signs efforts are moving forward.

In addition to the comprehensive planning in San Diego, other regimes, including Los Angeles and New York City, have announced significant progress in disaster preparedness. Recently, Memorial Health University Medical Center, Savannah, Ga., completed a response plan to an attack by weapons of mass destruction, and officials said they did it by using state and local resources.

Specific answers to developing comprehensive plans will vary by region, but the main tool is for hospitals to unite with other facilities and local agencies and insist that city and county governments take a leadership role in disaster preparedness.

RRL- 0354

Title Survey of Bam Earthquake Survivors' Opinions on Medical and Health Systems Services

Author(s) Masoud Saghafi Nia, Nahid Nafissi, Yashar Moharamzad

Prehospital and Disaster Medicine, 2008 Vol 23 ISN 3
World Association for Disaster and Emergency Medicine

Key theme(s) Air evacuation; Bam earthquake; international response; medical disaster response; primary health facility

Summary

On 26 December 2003, a catastrophic earthquake measuring 6.6 on the Richter scale devastated large areas of the city of Bam in southeastern Iran. More than 40,000 people died, tens of thousands were injured, and almost 20,000 homes were destroyed. Many national and international search-and-rescue teams were dispatched to the area to provide medical and health services and assist in the evacuation of survivors to undamaged areas. The purpose of the study was to evaluate the opinions of survivors about medical responses provided, and the process of reconstruction of health infrastructures.

The authors found out that in addition to reinforcing the medical and health infrastructures of a society in accordance with geographical and architectural characteristics, effective air evacuation and relief missions carried out by experienced international relief teams can play an important role in the appropriate management of approximately 30,000 casualties after a catastrophic event, such as experienced with the Bam Earthquake.

Research Objective

To evaluate the opinions of survivors about medical responses provided, and the process of reconstruction of health infrastructures.

Research Methodology

This was a descriptive study performed two years after the earthquake. Stratified, two-stage area sampling was used to enroll 211 survivors into the survey. A designed questionnaire was applied to evaluate the respondents' opinions about medical and health responses. The respondents were asked to score their satisfaction on a variety of services on a five-point scale, with 1 being "very poor" and 5 being "very good".

Finding(s)

Family members and relatives comprised the majority of first responders for those injured or trapped (127, 60.2%). Field hospitals deployed by the Red Crescent, international relief teams, and military forces were the first medical facilities for 98 (46.4%) of the casualties. As denoted by the mean values for the satisfaction scores, transportation by aircraft to the backup hospitals received the highest score (4.2), followed by international assistance (4.1), first medical care (3.5), search and rescue (3.3), primary transportation (3.1), and reconstruction and the quality of access to the infrastructures of the city (2.6). Two years after the earthquake, 151 (71.5%) respondents still were living in connexes (temporary accommodations or shelters for victims to live in; resemble a small hotel), only 33 (15.6%) had access to safe drinking water, and 44 (20.9%) did not have sufficient supplies of sanitary food.

RRL- 0355

Title Germany counts cost of flood damage to health-care services

Author(s) Claudia Orellana
The Lancet, 2002 Vol 360

Key theme(s) Elbe floods, Germany, costs

Summary

This article assesses the costs and consequences of the 2002 Elbe floods in Germany.

Research Question

What were the costs of the 2002 Elbe flood in Germany?

Finding(s)

The receding waters of the river Elbe are revealing the effects of the worst floods to strike Germany in the past 100 years. The bill for repairing the flood damage is estimated to be €15 billion.

Germany's national healthcare service has started to assess the impact of the floods. In Saxony,

in eastern Germany, 31 doctor's surgeries were destroyed and 22 were severely damaged, leaving a €50 million repair bill.

The damage to local healthcare services has compromised the ability of doctors to deal with the increased risk of flood-related disease. So far the levels of infectious disease are below the seasonal average. Nearly all water-treatment plants are working again and there is little or no risk of faecal matter contaminating drinking water supplies. However, there are some serious outstanding issues. Flooded factories and chemical plants in eastern Germany and the Czech Republic spilt toxic chemicals into the flood waters. Mercury concentrations in the Elbe have doubled but remain below the WHO limit. The long-term effects of this pollution remain to be seen.

RRL- 0356

Title Current Status of Surge Research

Author(s) Sally Phillips
Academic Emergency Medicine, 2006 Vol 13

Key theme(s) Surge research, emergency department

Summary

The dramatic escalation of bioterrorism and public health emergencies in the United States in recent years unfortunately has coincided with an equally dramatic decline in the institutions and services we rely on for emergency preparedness. Hospitals in nearly every metropolitan area in the country have closed; those that remain open have reduced the number of available beds. "Just in time" supplies and health professional shortages have further compromised the nation's overall surge capacity. Emergency departments routinely operate at capacity. These circumstances make evidence-based research on emergency preparedness and surge capacity both more urgently needed and more complex. The Agency for Healthcare Research and Quality and other government and private agencies have been rapidly widening the field of knowledge in this area in recent months and years. This report focuses primarily on the work of the Agency for Healthcare Research and Quality.

Research Question(s)

What is the work of the AHRQ regarding surge research?

Research Methodology

Literature review

Finding(s)

The Agency for Healthcare Research and Quality has supported a large portfolio of research addressing medical surge capacity. The models and tools have been developed from a diverse

repository of data across all public and private sectors. A robust set of data is available in the CBRNE area, but health care clinical research data analyzing clinical outcomes, developing algorithms for medical care decisions, and delivery of care in alternative settings for the short-term or long-term need to be studied, tested, and applied. More robust models need to be developed that allow for operations and implementation planning scenarios so that decisions on policies and cost-benefits can be made as we move forward. Progress to date is impressive. Now, decisions can be made with data that were not accessible to clinicians and planners previously. The challenge is to place the planning tools in the hands of the appropriate decision makers and community planners so they can use the research, test it in the field, and provide input in the development of the science for the best care possible during public health emergencies.

RRL- 0357

Title Health Sector Implications of the 1988 Earthquake in Yunnan Province, China

Author(s) DG Sapir, VC.Panaccione
Disasters, 1992 Vol 16 ISN 2

Key theme(s) Health sector, earthquake, China, Yunnan

Summary

This article reviews the implications of the 1988 earthquake for the health sector in Yunnan, China. Most of the serious injuries were secondary results of the earthquake itself. They were caused by exposed construction debris, traffic accidents at the site of the disaster and by obstetric complications following births precipitated by the event. Many of these injuries could have been avoided by proper preparation and by anticipation of the potential effects of an earthquake. The authors found out that accurate records should be made in advance and that radio communication is a critical aspect of a disaster preparedness programme. They further concluded that proper preparedness can substantially reduce the mortality and morbidity which are indirect consequences of earthquakes and that adequate monitoring and knowledge of survival and injury patterns are essential for effective planning and training of health personnel.

Research Question

What are the lessons learned from the 1988 earthquake regarding the health sector?

Research Methodology

Literature Review.

Finding(s)

There are four main lessons to be learned from the Yunnan earthquake. Firstly, accurate

records should be made in advance. Secondly, radio communication, especially in mountainous provinces with weak road networks, is a critical aspect of a disaster preparedness programme. Thirdly, proper preparedness can substantially reduce the mortality and morbidity which are indirect consequences of earthquakes. Fourthly, adequate monitoring and knowledge of survival and injury patterns are essential for effective planning and training of health personnel.

Finally, while it is unrealistic to expect that no mortality will result from earthquakes, there are many actions which could be undertaken to reduce their impact. The external and delayed relief which characterizes health response to disasters today will always be marginally effective and costly. The main approach to disaster management and preparedness should become local community preparedness. By using the same methods that are applied to other health issues, local community education and preparation for disasters should become an integral yet distinct part of routine programmes.

RRL- 0358

Title Public Health Systems Research in Emergency Preparedness A Review of the Literature

Author(s) Elena Savoia, Sarah B. Massin-Short, Angie Mae Rodday, Lisa A. Aaron
American Journal of *Preventive Medicine*, 2009 Vol 37 ISN 2

Key theme(s) Emergency preparedness; health systems

Abstract / Summary

Despite the acknowledged promise of developing a public health systems research (PHSR) agenda for emergency preparedness, there has been no systematic review of the literature in this area. The purpose of this study was to conduct a systematic literature review in order to identify and characterize the PHSR literature produced in the U.S. in the past 11 years in the field of public health emergency preparedness.

The authors found out that since 2001, the PHSR literature on PHEP issues has grown at about 33% per year. However, most studies lack a rigorous design, raising questions about the validity of the results.

Research Objective

To identify and characterize the PHSR literature produced in the U.S. in the past 11 years

Research Methodology

Literature review. Articles were searched in MEDLINE and EMBASE, as well as in the gray literature. Two independent reviewers classified the articles according to study design and IOM public health emergency preparedness (PHEP) research goal areas.

Finding(s)

From January 1, 1997, through December 31, 2008, there were 547 articles that met the inclusion criteria that were published. It was possible to classify 314 (57%) articles into at least one of the four IOM PHEP research goal areas. Of these, 61 (11%) addressed Research Area 1 (usefulness of training); 39 (7%) addressed Research Area 2 (communications in preparedness and response); 193 (35%) addressed Research Area 3 (sustainable preparedness and response systems); and 39 (7%) addressed Research Area 4 (criteria and metrics to measure effectiveness and efficiency). Twenty-one studies (4%) could be classified into more than one category. The majority of the articles (81%), including commentaries/reviews and case studies, were based on qualitative analysis. Commentaries/ review articles were the most common study types (62%).

RRL- 0359

Title Characteristics of Medical Surge Capacity Demand for Sudden-impact Disasters

Author(s) S.J. Stratton, R.D. Tyler

Academic Emergency Medicine , 2006 Vol 13

Key theme(s) disaster, emergency medicine, emergency medical services, health care capacity, health services, health care, public health services, surge capacity

Summary

To develop tactics for coping with the medical surge capacity required during a sudden-impact disaster, it is useful to explore the characteristics of the initial demands for medical care that have occurred during these types of events. To explore these characteristics, this study examined statistics that described the baseline capacity of the U.S. health care system. For sudden-impact disasters, data for the following characteristics were evaluated:

- 1) the length of time a community must sustain itself before outside relief can be expected,
- 2) the time from disaster impact to peak in health care demand,
- 3) the types of injuries and illnesses that can be expected, and
- 4) the access points for health care delivery immediately after impact.

The authors found out that as part of planning for sudden-impact disasters, communities

should be expected to sustain medical services for 24 hours, and up to 96, before arrival of external resources. For effective medical surge-capacity response during sudden-impact disasters, there should be a priority for emergency medical care with a focus on ambulatory injuries and illnesses.

Research Objective

To describe the characteristics of the demand for medical care during sudden-impact disasters, focusing on local U.S. communities and the initial phases of sudden-impact disasters.

Research Methodology

This was a literature search study. Established databases and published reports were used as data sources. Data were obtained to describe the baseline capacity of the U.S. medical system. Information for the initial phases of a sudden impact disaster was sought to allow for characterization of the length of time before a U.S. community can expect arrival of outside assistance, the expected types of medical surge demands, the expected time for the peak in medical-care demand, and the expected health system access points.

Finding(s)

The earliest that outside assistance arrived for a community subject to a sudden-impact disaster was 24 hours, with a range from 24 to 96 hours. After sudden-impact disasters, 84% to 90% of health care demand was for conditions that were managed on an ambulatory basis. Emergency departments (EDs) were the access point for care, with peak demand time occurring within 24 hours. The U.S. emergency care system was functioning at relatively full capacity on the basis of data collected for the study that showed that annually, 90% of EDs were boarding admitted inpatients, and 75% were diverting ambulances.

RRL- 0360

Title The role of public health officers in preparedness planning and management of health crises

Authors R Strauss, R Muchl, M Kunze, H Hrabcik

Eurosurveillance, 2008 Vol 13 ISN 1 - 3

Key theme(s) Public health officers; crisis plans; simulation exercises

Summary

The contribution of public health officers is of crucial importance in both the preparedness planning process and the response to health threats since the implementation of public health measures lies within the competence of the public health system. Thus, public health officers on regional and district level have to be involved in every stage of the planning process for crisis management. Federal structures of health systems as equivalent to the political structure of a country pose specific challenges for both the planning process and the response itself. The most important instrument for the evaluation of crisis plans, including the assessment of the public health officers' preparedness, is the performance of exercises. The success of a simulation exercise depends mainly on careful planning process, clear evaluation criteria and a work plan, that allows for necessary improvements of crisis plans of all involved organisations. Simulation exercises are an integrated element of preparedness activities on all administrative levels of the public health system. Depending on the nature of the exercise public health officers on regional and district level are involved as planners or as players.

Research Objective

To give an overview of simulation exercises of public health crises in Austria.

Research Methodology

Review of simulation exercises by an official of the Ministry of Health, Family and Youth.

Finding(s)

Public health officers play a crucial role in crisis planning and management of crisis situations, thus must be involved in every crisis management planning process to implement all operative issues from the start. The roles and competencies of the different administrative levels need to be clearly defined and the functionality of the standardised operational procedures tested repeatedly in exercises. Public health officers have different roles in preparedness planning and crisis management depending on the administrative level they are working at thus their involvement has to be implemented accordingly. Exercises are the most important tool to evaluate crisis plans and thus the level of preparedness among public health officers. In order to design scenarios that are as realistic as possible, public health officers on all administrative levels have to be involved already in the exercise preparation. By this it is guaranteed that all relevant issues are included in order to improve the performance in case of a real crisis.

Macroeconomic Impacts of Disasters

RRL - 0361

Title *Assessing the Macroeconomic Impacts of Natural Disasters Are there Any?*

Authors *Stefan Hochrainer*

The World Bank Policy Research Working Paper 4968, June 2009

Key theme(s) Macroeconomic impacts of disaster,

Abstract

There is an ongoing debate on whether disasters cause significant macroeconomic impacts and are truly a potential impediment to economic development. This paper aims to assess whether and by what mechanisms disasters have the potential to cause significant GDP impacts. The analysis first studies the counterfactual versus the observed gross domestic product. Second, the analysis assesses disaster impacts as a function of hazard, exposure of assets, and, importantly, vulnerability. In a medium-term analysis (up to 5 years after the disaster event), comparing counterfactual with observed gross domestic product, the authors find that natural disasters on average can lead to negative consequences. Although the negative effects may be small, they can become more pronounced depending mainly on the size of the shock. Furthermore, the authors test a large number of vulnerability predictors and find that greater aid and inflows of remittances reduce adverse macroeconomic consequences, and that direct losses appear most critical.

RRL - 0362

Title Macroeconomic Implications of Natural Disasters in the Caribbean

Authors Rasmussen, Tobias N.

IMF Working Series

<http://www.imf.org/external/pubs/ft/wp/2004/wp04224.pdf>

Key theme(s) Macro economic impacts of disaster

Abstract

Each year natural disasters affect about 200 million people and cause about \$50 billion in damage. This paper compares the incidence of natural disasters across countries along several dimensions and finds that the relative costs tend to be far higher in developing countries than in advanced economies. The analysis shows that small island states are especially vulnerable, with the countries of the Eastern Caribbean standing out as among the most disaster-prone in the world. Natural disasters are found to have had a discernible macroeconomic impact, including large effects on fiscal and external balances, pointing to an important role for precautionary measures.

RRL - 0363

Title Shaken, not stirred: the impact of disasters on international trade

Authors Martin Gassebner, Alexander Keck, Robert Teh

KOF Working Paper Series

KOF Swiss Economic Institute

Article can be downloaded from

http://www.kof.ethz.ch/publications/science/pdf/wp_139.pdf

Key theme(s) Macro economic impacts of disaster, international trade

Abstract

This paper examines the impact of major disasters on trade flows using a gravity model (170 countries, 1962-2004). As a conservative estimate, an additional disaster reduces imports on average by 0.2% and exports by 0.1%. Despite the apparent persistence of bilateral trade volumes, the impact of catastrophes depends on the democracy level and size of the affected country. In autocracies, exports and imports are significantly reduced: had Togo been struck by a major disaster in 2000, it would have lost 6.8% of its imports and 8.2% of its exports. Democratic countries' exports suffer modest decreases, while imports are hardly affected.

RRL - 0364

Title *The macro-economic impact of disasters*

Authors Mark Pelling, Alpaslan Özerdem and Sultan Barakat
Progress in Development Studies 2,4 (2002) pp. 283–305

Key theme(s) Macro economic impacts of disaster, disaster losses, economic loss, economic shock, vulnerability

Abstract

Despite 30 years of study, international development policy appears to be little closer to generating protection to vulnerable people from the preventable losses of disaster. Part of the reason for a lack of progress has been the sidelining of disaster in development studies. Disaster events have been seen as exceptional and allowed to fall outside the mainstream of development theory. In this paper we set out and use a framework that allows a more holistic accounting for the macro-economic impacts of disaster, and is a step towards a deeper integration of disasters and development.

RRL - 0365

Title *The Macroeconomic Consequences of Disasters*

Authors Ilan Noy
Working Paper No. 07-7, University of Hawaii at Manoa
http://www.economics.hawaii.edu/research/workingpapers/WP_07-7.pdf

Key theme(s) Macroeconomic impacts of disaster

Abstract

The aim of this study is to describe the macroeconomic dynamics of natural disasters and their determinants in a large sample of disaster events. The study shows that natural disasters have a statistically observable adverse impact on the macroeconomy in the short-run. Not surprisingly, costlier events cause more pronounced slowdowns in production. Yet, interestingly, developing countries, and smaller economies, face much larger output declines following a disaster of similar relative magnitude than do developed countries or bigger economies. A close study of the determinants of these adverse macroeconomic output costs reveals several interesting patterns. Countries with a higher literacy rate, better institutions, higher per capita income, higher degree of openness to trade, and higher levels of government spending are better able to withstand the initial disaster shock and prevent further spillovers into the macroeconomy. These all suggest an increased ability to mobilize resources for reconstruction. Financial conditions also seem to be of importance; countries with more

foreign exchange reserves, and higher levels of domestic credit, but with less-open capital accounts appear more robust and better able to endure natural disasters, with less adverse spillover into domestic production.

Research Methodology

The authors utilized three reported measures of the magnitude of the disaster available obtained from the EM-DAT database maintained by Centre for Research on the Epidemiology of Disasters (CRED): (1) The number of people killed (DKIL); (2) the number of people affected (DAFF); and (3) the amount of direct damage (DDAM). The measures of disasters were standardized by:

- a. Dividing the number of people killed or affected by the population size in the year prior to the disaster year;
- b. Dividing the direct cost measure of the disaster by the last year's GDP (since the current year's population and GDP have been affected by the disaster itself).
- c. Weighing the measures based on the month in which the disaster occurred (or began).

RRL - 0366

Title Assessing the Future Economic Impact of Extreme Climate Events in Europe

Author(s) Anita Wreford, Neil Adger, Mike Hulme

Paper presented at The Ninth Biennial Conference of The International Society for Ecological Economics .Ecological Sustainability and Human Well-being., December 16-18,2006, New Delhi, India

Key theme(s) Macroeconomic Impacts of disaster; Heatwaves; Ricardian Approach; Impacts on agriculture and human health; Welfare effects; Future impact

Summary

Events such as heat waves, floods and storms can have severe economic impacts and their occurrence is predicted to increase as a result of climate change. However, the magnitude of these events is likely to decline as these events occur more frequently, because society may be better prepared as a result of learning from previous events. This paper tries to develop a method for valuing the future impacts of extreme events associated with climate change, incorporating a function, which represents learning from previous events. Some events have cumulative impacts therefore adaptation is constrained by greater frequency. Yet other events as they become the norm are adapted to and have a reduced impact over time. The approach differs from production function approaches and uses a more Ricardian based approach to forecast future impacts using observed social costs of present day events. The heat waves of 1995 and 2003 in Europe are discussed, focusing on their impact on agriculture and human health. The documented social cost of these events is used as a base from which they forecast the impact of similar events more frequently in the future.

Research Methodology

The general framework for this research is as follows.

If sectors such as agriculture, government and individuals do not learn and adapt to extreme events, the costs will follow the horizontal line (Figure 1), remaining at the initial high level of damage, unchanging over time. If however, as is proposed in this research and demonstrated in some areas and studies, autonomous and planned adaptations occur, the costs in the future may follow the exponentially declining curve. Realistically it is unlikely that it will ever be possible to have costless extreme events, thus there remains “frictional costs” that society will have to bear. The level of these frictional costs is also a topic for discussion. How much damage is society prepared to accept?

One model for estimating the costs has been developed in the study. These estimations are carried out under several assumptions. Firstly it is assumed there will be no significant demographic change in the future, that is, the proportion of elderly people for example, will not change significantly, an assumption, which may prove unrealistic. It also assumes a single extreme impact, such as a heat wave, will occur in isolation from other potential extremes. A further assumption is that future economic assumptions will remain constant, such as changes in trade policy or regimes, which could also alter the economic impact in the future.

Finding(s)

Financial estimates of impacts of extreme events typically do not reflect the total cost of the impact. In the agricultural sector, the impact of an extreme event is based on the financial loss resulting from that event. However in the EU, producer returns are heavily dependent on the support policies of the Common Agricultural Policy (CAP) and therefore the financial impacts are not necessarily a true reflection of the welfare effect. In agriculture the social and financial costs of extreme events differ because of market imperfections, such as trade barriers including tariffs, export subsidies, import quotas and direct payments. In the heat wave of 2003 in Europe there were estimated to be 26 000 premature deaths. The economic cost estimated by Munich Re was \$13.5 billion, approximately €12 billion at the 2003 exchange rate. However, if one uses the value of statistical life estimate from Alberini et al. (2006) of €0.9 million, and multiply this by the numbers of premature deaths (26 000), the value of €23.4 billion is reached, while if the higher value in that study of €3.7 is used, the value reaches €96.2 billion. Clearly there is a considerable difference between the purely financial cost and the social cost in the health sector as well, which must be considered and clarified when conducting any type of impact assessment.

RRL - 0367

Title of article Estimating The Direct Economic Damages Of The Earthquake In Haiti

Author(s) Eduardo Cavallo, Andrew Powell, Oscar Becerra

The Economic Journal, 2010 Vol 120

Key theme(s) Macroeconomic impact of disaster; Haiti, Earthquake

Summary

This article makes an initial assessment of the monetary damages caused by the 2010 earthquake in Haiti. Damages are estimated for a disaster with both 200,000 and 250,000 total dead and missing, using Haiti's economic and demographic data. The base estimate is US\$8.1bn, but for several reasons this may be a lower-bound estimate. While the results are subject to many caveats, including possibly high forecast error, the implications of such an estimate are significant. Raising such a figure will require many donors. Hence excellent coordination of funding and execution will be key to ensuring the efficient use of funds.

Research Methodology

Simple regression techniques were used to assess the estimated direct cost of the catastrophic earthquake that struck Haiti on January 12, 2010. The earthquake, which hit about 15km (10 miles) southwest of the capital city Port-au-Prince, was followed by several strong aftershocks and has caused significant loss of human life, the displacement of hundreds of thousands and severe damage to the country's economic infrastructure.

In order to estimate the monetary damages caused by this event, worldwide data from about 2,000 natural catastrophic events between 1970 and 2008 were combined. The dollar amount of damage of each event has been modelled as a function of the number of dead or missing, the level of economic development (real GDP per capita), country size (alternatively measured as population size, real GDP or land area), regional dummies and a linear trend. Using these regression results out-of-sample predictions regarding the estimated dollar amount of damages are made that can be expected for a country with Haiti's economic and demographic characteristics in the aftermath of the catastrophic earthquake of January 12.

The unit of observation is an event as recorded in the Emergency Events Database (EM-DAT) maintained by the Centre for Research on the Epidemiology of Disasters (CRED) at the Catholic University of Louvain, Belgium (<http://www.emdat.be/>). The database is compiled from various sources, including various UN agencies, nongovernmental organisations, insurance companies, research institutions and press agencies. Disasters can be hydro-meteorological, including floods, wave surges, storms, droughts, landslides and avalanches; geophysical, including earthquakes, tsunamis and volcanic eruptions; and biological, including epidemics and insect infestations (these are much more infrequent in this database). There are approximately 2,000 such events recorded in the dataset in the 1970–2008 period, for which we also have all the necessary information to conduct the empirical analysis. The direct damage reported in EM-DAT is damage to fixed assets and capital (including inventories), damages to raw materials and extractable natural resources, and mortality and morbidity that

are a direct consequence of the natural phenomenon recorded.

The process of analysis uses historical data on catastrophic events and econometric techniques to answer the following question: what are the expected costs of rebuilding Haiti's infrastructure? Damages are estimated for a disaster with both 200,000 and 250,000 total dead and missing (i.e., the range of mortality that is estimated to have caused the earthquake) and using Haiti's economic and demographic data. The bottom line is that for a disaster with 200,000 total dead and missing, in a country with Haiti's observable characteristics, damages are expected to be about US\$7.2bn (2009 dollars). For a death toll of 250,000 the estimate would be US\$8.1bn. Intermediate numbers give intermediate results. Unfortunately, recent estimates place the actual death toll at the top of this range. Nonetheless, the errors attached to these estimates (obtained via bootstrapping) remain quite large, in part because there are relatively few disasters of this size: while the base estimate may be as high as US\$8.1bn for 250,000 deaths, an estimate of US\$13.9bn is within statistical error.

Model Specification and Methodology:

A model of the following form has been estimated:

$$DIS_{it} = \alpha + \beta X_{it} + \varepsilon_{it}$$

where DIS_{it} is a measure of dollar amount of direct damages caused by the immediate impact of a disaster in country i at time t . The economic impact of a disaster usually consists of direct consequences on the local economy (e.g., damage to infrastructure, crops, housing) and indirect consequences (e.g. loss of revenues, unemployment, market destabilisation) when the information is available. In EM-DAT database, the registered figure corresponds to the value of the immediate damage at the time of the event and usually only to the direct damage, expressed in US dollars (current value).

For comparability purposes, all data are converted into 2009 US dollars using the United States' Consumer Price Index (CPI). X_{it} is a vector of control variables of interest that capture the 'vulnerability' of the country to disasters (i.e., the conditions which increase the susceptibility of a country to the impact of natural hazards) and Countries' demographic characteristics. ε_{it} is an independent and identically distributed error term.

Finding(s)

This study attempted to give a preliminary estimate of the potential damages resulting from the tragedy of the January 12 Haiti earthquake. The estimate derives from simple regression techniques employing data on past natural disasters and their damages estimates. The base estimate is US\$8.1bn for a 250,000 death toll. It has been suspected for several reasons that this is a lower-bound estimate and an estimate of US\$13.9bn for the same death toll is within statistical error.

The implications of such an estimate are significant. Raising such a figure will require many donors, bilateral, multilateral and private. Hence excellent coordination of funding and of execution will be the key to ensuring the efficient use of funds. This is likely to imply that individual donors will have to relinquish control of their donations in terms of which projects

they fund and the precise execution conditions, which in turn implies that appropriate mechanisms of transparency and accountability will be very important. Unfortunately, past experience suggests that, despite higher aid inflows after disasters, the growth impact of major disasters remains highly persistent. Apart from potential inefficiencies of the management of aid flows, microeconomic bottlenecks and a macroeconomic Dutch Disease-type phenomenon may hurt private activity not directly related to reconstruction. While Haiti's export sector is very small, it does have significant growth potential. The international community will need to consider how best to support private activities to ensure the negative growth impact is minimised and to ensure sustainable growth once reconstruction activities start to diminish.

Willingness To Pay, Insurance, and Disasters

RRL - 0368

Title Dying in an Avalanche: Current Risks and Valuation

Author(s) Andrea M. Leiter Gerald J. Pruckner
Paper presented in the "Third World Congress of Environment and resource economists" held at Kyoto 3-7 July 2006

Key theme(s) Willingness to Pay; Contingent Valuation; Double-bounded Dichotomous Choice

Summary

This paper examines the influence of implicit information associated with the occurrence of avalanches on willingness to pay (WTP) values for a risk prevention of dying in an avalanche. The study presents results of a contingent valuation (CV) study carried out in Austria in two different periods (fall 2004 and winter 2005). The comparison of WTP results between the two waves allows the identification whether the immediate occurrence of avalanches and their attendant deathly accidents affect individual risk evaluations. Surprisingly, individuals state a lower WTP in winter although avalanche accidents are predominant at that time. Personal responsibility of risk exposure and its associated voluntariness are main reasons for the decrease in WTP over time. Preferences for alternative protective measures (e.g. against car accidents or food poisoning) also lead to a decrease of WTP while a higher risk perception and personal experience with avalanches show a positive influence. We conclude that the change in WTP across seasons is not arbitrary but can be explained by specific risk characteristics. It follows that WTP is more robust as previously assumed and therefore represents a proper measure for the elicitation of individual risk reduction preferences.

Research Methodology

The survey focuses on WTP for the prevention of an increase in the risk of dying in an avalanche. After the respondents received a detailed description of the good in question they

were asked about their individual valuation. The wording of the CV question was as follows:

Protective measures against avalanches on roads and in residential areas have been implemented in Tyrol. At present, avalanches on average are killing 2.35 people out of 100,000 inhabitants. Assume that all public funds to maintain protective measures will be cut and henceforth servicing costs have to be paid exclusively by private funds. If aggregate private contributions are too small, maintenance remains undone, and the probability of a fatal avalanche doubles. Then on average 4.7 people out of 100,000 inhabitants die in the snow bulk. Would you be willing to pay - given your income constraint - a monthly insurance premium of 2.5/5/10 € to maintain the effect of previous protective measures to save human lives? Depending on the answer to this initial question, the respondent was asked whether she would also pay 5/10/20 Euro to avoid the risk increase if the first bid was accepted or 1.3/2.5/5 Euro if the first bid was rejected. If the interviewee answered “no – no” or “do not know – no” she was asked whether she would be prepared to pay any positive amount. In case of a negative reply interviewees were also asked why they refused a contribution. We classified those answers as protest responses that indicate a general refuse of payments for protection against natural hazards or that it was the government's responsibility to care about the protection of citizens.

The empirical analysis of the study is based on a double-bounded dichotomous choice format (DBDC).

Data

The data were collected in two waves, the first in September/October 2004, and the second in February 2005. Almost 2000 observations (992 in fall and 1,005 in winter) are used to examine the influence of current avalanche occurrence on WTP for protective measures against avalanches. The winter sample is further divided into two groups with the first one evaluating a risk variation of 1/42,500 and the second one of 3/42,500.

Finding(s)

The paper shows the regression results for the Weibull and log-normal WTP distribution. Additionally, a short description of all included variables is provided. The focus of the empirical analyses is on the role of socio-economic characteristics and on the influence of avalanche risk related attributes and their change over time.

In a CV study conducted in the Austrian federal state of Tyrol individuals were asked in two waves (fall 2004 and winter 2005) their WTP for the prevention of an increase in the risk to die in an avalanche. The question was worded as a double-bounded dichotomous choice format. Using an interval data model and assuming a Weibull and a log-normal distribution, WTP is estimated by a maximum likelihood procedure. Depending on the underlying distribution function of WTP and on the treatment of zero responses mean VSL ranges between AC1.8 and 5.2 million while median VSL goes from AC0 to 1.8 million.

The occurrence of avalanches, their associated deathly accidents, and their media coverage seem to represent important factors in monetary risk valuation. We estimate the impact of

new (implicit) information on WTP for a prevention of deathly avalanches by the comparison of responses in the two periods. Descriptive analysis indicates a higher risk perception among the respondents in the winter sample. Furthermore, differences between the fall and the winter responses are observed with respect to the assessment of subjective avalanche exposure, the perceived causes of deathly avalanches, and the preferences for alternative protective measures. The inclusion of socio-economic and risk-specific characteristics in the regression model allows a deeper insight into the process of individual risk valuation.

Risk perception reveals a significantly positive impact on WTP; i.e. although all respondents are provided with identical information about the baseline risk and the change in risk to be evaluated their subjective assessment of the baseline risk still has an influence on their monetary valuation. However, further risk-specific attributes exist which play a role in the valuation process. Personal experience with avalanches in the past, a lower personally sensed avalanche risk, and the individual classification of avalanches to represent anthropogenic events induce a higher WTP while the characterization of deathly avalanche accidents as natural and existing preferences for other protective measures indicate a negative influence. Women tend to have a higher affirmation to pay, and an increase in income also leads to higher WTP. The respondents' age and higher education reveal a negative impact.

The observation that WTP figures are lower in winter although avalanches accumulate at that time seems surprising. One would have expected that the occurrence of deathly avalanche events and their media coverage in winter increase WTP responses in CV surveys. We control for changes in risk valuation over time by including a time dummy and different interaction terms. The decrease in WTP can then be explained by the interaction of the period dummy with the variables indicating whether avalanches are being characterized as anthropogenic whether the personal avalanche risk is sensed to be below average, and whether a person is skiing. Hence, we infer that the presumed origin of a risk matters, and that WTP tends to be lower when the risk is characterized as voluntary and controllable, i.e. when respondents suppose that people have control over their exposure to risk. The change of the influence of voluntariness and controllability of risk exposure over time are the main reasons for lower WTP in winter. These results show that WTP figures fluctuate between the time periods, however, this variation is not arbitrary. Objections that their sensitivity to external influences, such as salience of an event or period of the survey would invalidate WTP figures from CV studies as proper measures for individual economic preferences are weakened by our findings.

RRL - 0369

Title Economic valuation of flood risk exposure and flood control in a Severely flood prone developing country

Author(s) Roy Brouwer, Sonia Aftab, Luke Brander, Enamul Haque
Paper presented in the "Third World Congress of Environment and resource economists" held at Kyoto 3-7 July 2006

Key theme(s) Dichotomous choice; Contingent Valuation; Willingness to Pay

Summary

This paper examines the results of a dichotomous choice contingent valuation (CV) study of flood control policy in Bangladesh. The CV studies were applied in the domain of flood exposure and flood control, where people are asked to trade-off money income in terms of willingness to pay (WTP), to reduce the risk of flooding and corresponding impacts on their life and livelihood. The use of CV in developing countries like Bangladesh furthermore is constrained by significantly low-level income further limiting the applicability of the method. Average WTP in this study is 0.5 percent of annual household income. As expected, stated WTP varies significantly with different levels of exogenous flood risk exposure measured by the distance people live from the river and the level of inundation during the rainy season. WTP is furthermore significantly constrained by household income and the disutility from flood risks measured through higher or lower flood damage costs and risk aversion measured through people's attitude to flood protection. In the study a number of problems with the CV application in this specific cross-cultural context were detected, which are addressed in more detail in a follow-up survey. A test-retest carried out six months after the original survey shows that the stated WTP values are stable in eighty percent of the cases.

Research Question(s)

- To investigate whether a positive relationship can be found for artificial constructions such as an embankment and to what extent stated WTP varies depending on different flood risk exposure levels, taking into account the challenges identified in the international literature when applying the CV method in the developing world
- Flood risk exposure levels including the distance floodplain residents live from the river
 - Meghna, Bangladesh the level of flooding during the rainy season, and corresponding annual flood damage
 - The temporal stability and reliability of the stated WTP values were tested in a follow-up survey six months after the original valuation study was carried out.

Research Methodology

A large scale survey was carried out in 2005 in the South East of Bangladesh where almost seven hundred floodplain residents currently living without any flood protection along the river Meghna were asked for their preferences for a flood alleviation scheme using the contingent valuation (CV) method, i.e. were asked for their willingness to pay (WTP) to reduce current and future flood risks. CV studies of flood risks and flood control are very rare (Daun et al., 2000).

In terms of WTP for a risk reduction, the relevant measurement of risk is people's subjective assessment of risk, rather than a scientifically observed measure. As Smith (1992) points out,

the use of subjective rather than objective risk assessment is more correct if one assumes that the general model of decision-making under uncertainty is prospective reference theory as an extension of standard expected utility theory (Viscusi, 1989). Hence, theory tells us that WTP_i for a reduction in risk exposure depends on (i) the realised level of risk, R which is itself determined by exogenous risk, X , and self-protection activities, P_i , (ii) income, Y_i and (iii) individual's disutility from risk exposure (risk aversion), S_i such that the following Equation is obtained:

$$WTP_i = f(Y_i, S_i, R(X, P_i))$$

In the case study presented here, exogenous flood risk X , exposure is measured through the distance people live from the river. Different groups, identified by the distance they live from the river, have different exogenous risk exposure levels dependent upon their location. Individuals can self-protect by moving further away from the river and taking measures to anticipate flooding and flood damage such as building houses on tarps (mounds of earth). It is less obvious to see how people can self-insure against the consequences of flood risks once a flood disaster hits them.

Data

The CV study was part of a wider, extensive rural household survey looking generally at flood problems and coping mechanisms, land use and agricultural and fish production systems in flood plains, and general demographic, socio-economic characteristics of floodplain residents in one of the most severely flood prone areas in Bangladesh. A total of 672 people were interviewed face-to-face from the last week of March until and including the second week of May 2005 by local interviewers (male and female) based upon a stratified sampling procedure. Each interview lasted on average 30 minutes. A predetermined representative number of people from six different professional occupational categories were interviewed; mainly head of households (75%), of whom 95 percent are men, in thirty-two different villages. Every fifth house along one side of the main village road was selected. The interviewers were carefully selected and thoroughly trained in view of the low education level of respondents and the high illiteracy rate in the area. The same interviewers were also used for the pre-testing of the questionnaire. Three pre-test rounds were used to finalize the household questionnaire over a period of two and a half months, including one workshop with local experts and stakeholders.

Finding(s)

A number of interesting results are found. First, there exists a small, but significant positive relationship between risk exposure level measured through the distance people live from the river and annual household income ($r=0.11$; $p<0.01$). This means that households with higher income levels live further away from the river. This income differential cannot be attributed to one specific occupational group such as farmers or fishermen. Farmers and fishermen earn significantly different incomes, but there exists no significant relationship between occupation and the distance to the river (one might perhaps expect fishermen to live nearer to the river).

As expected, a negative relationship is found between distance and annual flood damage (the further away, the less damage), but this relationship is not significant at the ten percent level.

Possibly due to the significant relationship between income and distance, we also find that the higher household income, the lower the inundation level during floods ($r = -0.19$; $p < 0.01$). The highest correlation is found between household income and annual flood damage costs ($r = 0.43$; $p < 0.01$), implying that higher income groups suffer more damage. On the other hand, higher household income is negatively correlated with diseases like diarrhea during the rainy season ($r = -0.14$; $p < 0.01$). It implies that higher income groups are better able to cope with the negative health impacts of flooding. Finally, a small, but significant positive relationship exists between the estimated market value of household dwellings and the distance the dwelling is located from the river ($r = 0.17$; $p < 0.01$), implying that flood risk exposure has a negative impact on house prices.

Inundation level is positively related to stated WTP and distance from the river negatively, reflecting significant distance-decay effects. Household income level is only significant in the model where inundation level is used as a proxy for risk exposure level. Respondent attitude towards flood risk reduction as a measure of risk aversion is also a highly significant explanatory variable, but one which interacts with inundation level. Annual flood damage costs are used as a proxy for the disutility of flood risk exposure and have, as expected, a positive impact on stated WTP, i.e. the higher the annual damage costs (or disutility), the higher the probability that someone states a positive WTP.

RRL - 0370

Title Economic valuation of flood risk exposure and reduction in a severely flood prone developing country.

Brouwer, R., S. Akter, L. Bbrandier and E. Haque

Environment and Development Economics, 14 (3); 397-417.

Key theme(s) Economic valuation of flood risk reduction

Summary

This paper presents the results of a dichotomous choice contingent valuation (CV) study of reduced flood risks in Bangladesh. Sensitivity of willingness to pay (WTP) to varying risk exposure levels is tested in a 'natural experiment', targeting floodplain residents facing regular annual flooding and a disaster flood once every five to ten years. Accounting for price, income and education levels, both subjective risk aversion and objective baseline risk exposure affect stated WTP for a common level of flood protection. We find a number of problems with the CV application in this specific developing country context. Half of the respondents are unable to pay in financial terms, but are willing to contribute in kind. The combined use of a monetary and non-monetary measure of WTP would have lowered the number of zero bids considerably. A test-retest carried out six months after the original survey shows that the stated WTP values are reliable.

RRL - 0371

Title Is there a commercially viable market for crop insurance in rural Bangladesh?

Authors Sonia Akter & Roy Brouwer & Saria Choudhury & Salina Aziz
Mitig Adapt Strateg Glob Change (2009) 14:215–229

Key theme(s) Economic valuation of flood risk reduction

Abstract

The study aims to assess the commercial viability of a potential crop insurance market in Bangladesh. In a large scale household survey, agricultural farm households were asked for their preferences for a hypothetical crop insurance scheme using double bounded (DB) contingent valuation (CV) method. Both revenue and production cost based indemnity payment approaches were applied to assess the commercial viability of a crop insurance program assuming a partner-agent (PA) model of insurance supply. Crop insurance is found marginally commercially viable in riverine flood plain areas. The expected indemnity payable consistently exceeds the expected insurance premium receivable by the insurer for the households living in wetland basin and coastal floodplain. We conclude that a uniform structure of crop insurance market does not exist in Bangladesh. The nature of the disaster risks faced by the farm households and the socioeconomic characteristics of the rural farm communities need to be taken into careful consideration while designing such an insurance scheme.

RRL - 0372

Title Willingness of homeowners to mitigate climate risk through insurance

Authors Botzen, W.J.W, Aerts, J.C.J.H. and van den Bergh, J.C.J.M.
Ecological Economics. 68 (2009). Pp. 2265-2277

Key theme(s) Insurance and disasters

Abstract

Climate change is projected to increase flood risks in certain regions due to an increase in both precipitation and sea level rise. In addition, socio-economic scenarios project an increase in urbanization in flood prone areas, which results in a higher damage potential. The combined effect of climate and land use change on flood risks requires innovative adaptation policies to cope with rising risks. Increasingly, attention is paid to the role insurance can play in mitigating damage by providing incentives to policyholders to undertake damage reducing measures. The willingness of homeowners in the Netherlands to undertake measures that mitigate flood damage in exchange for benefits on hypothetical flood insurance policies is examined using surveys. The results indicate that many homeowners are willing to make investments in mitigation. In particular, approximately two-thirds are willing to invest in water barriers in exchange for a premium reduction and about a fifth are willing to replace floor types that are vulnerable to flooding with water resistant floor types. Furthermore, about a quarter are willing to move central heating installations to floors safe against flooding in favor of a reduction in the insurance premium. Estimates of the effectiveness of these mitigation measures to limit potential flood damage in the river delta indicate that prevented damage could be substantial, namely in the order of 1 billion euro or larger. Reductions in (absolute) flood risk due to mitigation are especially large under climate change. A probit model indicates that existing arrangements for compensating flood damage, risk awareness and perceptions, and geographical characteristics are important determinants in the decision to undertake mitigation.

RRL - 0373

Title Insurance Against Climate Change and Flooding in the Netherlands: Present, Future, and Comparison with Other Countries
W. J. W. Botzen¹ and J. C. J. M. van den Bergh
Risk Analysis, Vol. 28, No. 2, 2008

Key theme(s) Insurance, flood risk reduction

Abstract

Climate change is projected to cause severe economic losses, which has the potential to affect the insurance sector and public compensation schemes considerably. This article discusses the role insurance can play in adapting to climate change impacts. The particular focus is on the Dutch insurance sector, in view of the Netherlands being extremely vulnerable to climate

change impacts. The usefulness of private insurance as an adaptation instrument to increased flood risks is examined, which is currently unavailable in the Netherlands. It is questioned whether the currently dominant role of the Dutch government in providing damage relief is justified from an economic efficiency perspective. Characteristics of flood insurance arrangements in the Netherlands, the United Kingdom, Germany, and France are compared in order to identify possible future directions for arrangements in the Netherlands. It is argued that social welfare improves when insurance companies take responsibility for part of the risks associated with climate change.

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