Chapter 2:  Prevention Ideas

        A major objective of disaster management is the prevention of damage and disease associated with the natural or manmade disasters.  This analysis considers ideas presenting prevention as the primary term and a related term, thus completing the definition of an idea. The ideas are presented in two ways.  The first is the declaration of facts detailing what has been studied.  The second considers possible research designs by arranging the ideas in ways not previously considered.  The reader is challenged to interpret the results in terms of effective or less than effective management.  In addition, the reader is challenged to estimate the additional knowledge acquired as a consequence of the research.

This analysis involved 49 documents linking prevention with disaster and 164 ideas. They were entered in PubMed during 2016. Table 1 shows the vocabulary linked with the primary term – prevention.

Table 1. Frequency of Ideas involving – Prevention – as the Primary Term.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Prevention | Freq |  | Prevention | Freq |
| Total | 164 |  | Total | 164 |
| disaster | 20 |  | analysis | 3 |
| health | 14 |  | federal | 3 |
| response | 13 |  | protection | 3 |
| infection | 11 |  | accident | 2 |
| emergency | 8 |  | community | 2 |
| intervention | 7 |  | detection | 2 |
| planning | 7 |  | global | 2 |
| damage | 5 |  | humanitarian | 2 |
| infectious | 5 |  | property | 2 |
| mitigation | 5 |  | research | 2 |
| children | 4 |  | security | 2 |
| environment | 4 |  | social | 2 |
| hazard | 4 |  | surveillance | 2 |
| management | 4 |  | survey | 2 |

The ideas are relatively low frequency and reflect their newness into the literature.

The following exhibits offer examples of relationships involving the primary term. Exhibit 1 involved the use of MR scanners to determine reduction of damages associated with an earthquake of considerable effect. The difference in languages is evident. The authors described “disaster-prevention machines”, meaning the use of these scanners in diagnosis of disease. They implied that the scanners were a form of intervention in dealing with the earthquake. Actually, the article describes the effect of the earthquake on the scanners rather than the effect of the scanners on the quake.

Exhibit 1. Use of MR Scanners in Modifying Damage of an Earthquake

[Yamaguchi-Sekino S](https://www.ncbi.nlm.nih.gov/pubmed/?term=Yamaguchi-Sekino%20S%5BAuthor%5D&cauthor=true&cauthor_uid=26597429)1, [Machida Y](https://www.ncbi.nlm.nih.gov/pubmed/?term=Machida%20Y%5BAuthor%5D&cauthor=true&cauthor_uid=26597429), [Tsuchihashi T](https://www.ncbi.nlm.nih.gov/pubmed/?term=Tsuchihashi%20T%5BAuthor%5D&cauthor=true&cauthor_uid=26597429), [Isoda H](https://www.ncbi.nlm.nih.gov/pubmed/?term=Isoda%20H%5BAuthor%5D&cauthor=true&cauthor_uid=26597429), [Noguchi T](https://www.ncbi.nlm.nih.gov/pubmed/?term=Noguchi%20T%5BAuthor%5D&cauthor=true&cauthor_uid=26597429), [Nakai T](https://www.ncbi.nlm.nih.gov/pubmed/?term=Nakai%20T%5BAuthor%5D&cauthor=true&cauthor_uid=26597429). Effectiveness of Disaster-prevention Technologies against Quake-induced Damage of MR Scanners during the Great East Japan Earthquake. [Magn Reson Med Sci.](https://www.ncbi.nlm.nih.gov/pubmed/26597429) 2016;15(2):246-7. doi: 10.2463/mrms.bc.2015-0025. Epub 2015 Nov 20. PMID: 26597429

In the present study, we have performed a statistical analysis to investigate damages to magnetic resonance (MR) scanners caused by the Great East Japan Earthquake (GEJE, magnitude 9.0) and evaluated whether these disaster-prevention technologies contributed to the reduction of damages in the GEJE or not. It was confirmed that the extent of damage was significantly different between seismic scale (SS) 5 and SS over 6. Our survey study demonstrated that anchoring of MR facilities reduced damages due to quakes and demonstrated that anchoring is an efficient method for quake-induced damage prevention. The odds ratio revealed that base isolation was very useful to prevent damages to MR scanners.

Exhibit 2 is a different statement. The combined strength, resources, and knowledge of federal agencies and the pediatric health community have recognized the need for preparation of materials to protect the health of children in the event of a disaster. The term – prevention – is used as part of the label for the CDC and not as a description of intervention. The protective devices developed over the past years are not identified. This type of statement is the concern of the book (Hatfil et al, 2016) dealing with a pandemic of influenza. Those authors suggested that preparation of these protective devices was promised but not available or in short supply for all but a privileged segment of the population. ( Hatfil, S, Coullahan,R, WalshJ., Three Minutes to Midnight. In Publication.)

Exhibit 2. Prevention in Protection of Children Exposed to Disasters.

[Krug SE](https://www.ncbi.nlm.nih.gov/pubmed/?term=Krug%20SE), [Chung S](https://www.ncbi.nlm.nih.gov/pubmed/?term=Chung%20S), [Fagbuyi DB](https://www.ncbi.nlm.nih.gov/pubmed/?term=Fagbuyi%20DB), [Fisher MC](https://www.ncbi.nlm.nih.gov/pubmed/?term=Fisher%20MC), [Needle SM](https://www.ncbi.nlm.nih.gov/pubmed/?term=Needle%20SM), [Schonfeld DJ](https://www.ncbi.nlm.nih.gov/pubmed/?term=Schonfeld%20DJ). Medical Countermeasures for Children in Public Health Emergencies, Disasters, or Terrorism. [Pediatrics.](https://www.ncbi.nlm.nih.gov/pubmed/?term=26729737) 2016 Feb;137(2):e20154273. doi: 10.1542/peds.2015-4273. Epub 2016 Jan 4. PMID: 26729737

Significant strides have been made over the past 10 to 15 years to develop medical countermeasures (MCMs) to address potential disaster hazards, including chemical, biological, radiologic, and nuclear threats. Significant and effective collaboration between the pediatric health community, including the American Academy of Pediatrics, and federal partners, such as the Office of the Assistant Secretary for Preparedness and Response, Centers for Disease Control and Prevention, Federal Emergency Management Agency, National Institutes of Health, Food and Drug Administration, and other federal agencies, over the past 5 years has resulted in substantial gains in addressing the needs of children related to disaster preparedness in general and MCMs in particular. Yet, major gaps still remain related to MCMs for children, a population highly vulnerable to the effects of exposure to such threats, because many vaccines and pharmaceuticals approved for use by adults as MCMs do not yet have pediatric formulations, dosing information, or safety information. As a result, the nation's stockpiles and other caches (designated supply of MCMs) where pharmacotherapeutic and other MCMs are stored are less prepared to address the needs of children compared with those of adults in the event of a disaster. This policy statement provides recommendations to close the remaining gaps for the development and use of MCMs in children during public health emergencies or disasters. The progress made by federal agencies to date to address the needs of children and the shared commitment of collaboration that characterizes the current relationship between the pediatric health community and the federal agencies responsible for MCMs should encourage all child advocates to invest the necessary energy and resources now to complete the process of remedying the remaining significant gaps in preparedness.

Exhibit 3. Future Needs for Disaster Management in China.

[Hou SK](https://www.ncbi.nlm.nih.gov/pubmed/?term=Hou%20SK%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1, [Lv Q](https://www.ncbi.nlm.nih.gov/pubmed/?term=Lv%20Q%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1, [Ding H](https://www.ncbi.nlm.nih.gov/pubmed/?term=Ding%20H%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1, [Zhang YZ](https://www.ncbi.nlm.nih.gov/pubmed/?term=Zhang%20YZ%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1, [Yu BG](https://www.ncbi.nlm.nih.gov/pubmed/?term=Yu%20BG%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1, [Liu ZQ](https://www.ncbi.nlm.nih.gov/pubmed/?term=Liu%20ZQ%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1, [Su B](https://www.ncbi.nlm.nih.gov/pubmed/?term=Su%20B%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1, [Liu JY](https://www.ncbi.nlm.nih.gov/pubmed/?term=Liu%20JY%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1, [Yu MY](https://www.ncbi.nlm.nih.gov/pubmed/?term=Yu%20MY%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1, [Sun ZG](https://www.ncbi.nlm.nih.gov/pubmed/?term=Sun%20ZG%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1, [Fan HJ](https://www.ncbi.nlm.nih.gov/pubmed/?term=Fan%20HJ%5BAuthor%5D&cauthor=true&cauthor_uid=27349809)1.Disaster Medicine in China: Present and Future.

[Disaster Med Public Health Prep.](https://www.ncbi.nlm.nih.gov/pubmed/?term=27349809) 2016 Jun 28:1-9. [Epub ahead of print] PMID: 27349809 Institute of Disaster Medicine and Public Health,Affiliated Hospital of Logistic University of Chinese People's Armed Police Force (PAP).

Disaster can strike people in any community at any time anywhere in the world. Disasters occur with high frequency, take on multiple forms, and exert wide influence, typically causing property damage, injuries, and death. As the world's largest developing country, China incurs great costs when a disaster hits. After the Wenchuan earthquake in 2008, the Chinese government focused its attention on the construction of an emergency response system, the creation of disaster prevention and mitigation systems, and the development of a disaster medicine program. Here, we describe the current status of disaster medicine in China, focusing on the following four aspects: the Emergency Management System, Education & Training, Rescue Practices, and Research. We also discuss the future of disaster medicine in China. (Disaster Med Public Health Preparedness. 2016;page 1 of 9).

Exhibit 3 provides an example of how governments mimic one another in developing agencies or units to deal with a recognized problem. The details essential to moving forward with materials and training are not delineated. This suggests that they may be less prepared in providing actual preventive techniques.

The prevailing perception associated with disasters is that such events are inevitable. Protection against these is difficult if not impossible. The language used is much alike (Exhibit 2 vs. 3) and may be the strongest indicator of disastrous management.

Research Designs Possible?

The ideas involving – prevention – as the primary term, may be used as independent building blocks. This fact raises the possibility that new research designs might be identified. Table 3 lists the terms linked with Prevention, classified into dimensions. The dimensions (Chapter 1) are organized from Personal 🡪 Methods.

# Table 3A. Possible Research Designs using Prevention Ideas as

Building Blocks – Personal, Environmental, Subject Dimensions.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Personal* | *Freq* | Environment | Freq | Subject | Freq |
| *children* | *4* | community | 2 | disaster | 20 |
| *vulnerability* | *1* | global | 2 | infection | 11 |
|  |  | humanitarian | 2 | emergency | 8 |
|  |  | property | 2 | damage | 5 |
|  |  | social | 2 | infectious | 5 |
|  |  | worldwide | 2 | hazard | 4 |
|  |  | climate | 1 | accident | 2 |
|  |  | political | 1 | disabilities | 1 |
|  |  | wenchuan | 1 | injuries | 1 |
|  |  |  |  | tornado | 1 |

Table 3B. Possible Research Designs using Prevention Ideas as Building Blocks – Interventional, Outcome, and Methods Dimensions.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| intervention | Freq |  | Outcome | Freq |  | Methods | Freq |
| intervention | 7 |  | health | 14 |  | planning | 7 |
| mitigation | 5 |  | response | 13 |  | analysis | 3 |
| management | 4 |  | protection | 3 |  | detection | 2 |
| federal | 3 |  | catastrophic | 1 |  | research | 2 |
| security | 2 |  | exposure | 1 |  | surveillance | 2 |
| government | 1 |  | recovery | 1 |  | survey | 2 |
| hospital | 1 |  | survivor | 1 |  | communication | 1 |
| policy | 1 |  |  |  |  | model | 1 |
| psychological | 1 |  |  |  |  | simulation | 1 |
| rehabilitation | 1 |  |  |  |  | training | 1 |

Table 4 shows some of the research designs. Each design shows one term from each of the dimensions. The selection is based on the most frequently cited, then the next most frequently, etc. The ideas can be combined because of their independence. The challenge is to determine the potential benefit in terms of increased knowledge. To do that, one approach would be based on the hypothesis or problem statement addressed. To construct those descriptive statements, the dimensions are considered from right to left, beginning with the outcome dimension. Some of these are shown in Exhibit 4. The Appendix displays the terms linked with – Prevention – classified into dimensions.

Table 4. Possible Research Designs based on Frequency of Citation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Personal** | **Environmental** | **Subject** | **Interventional** | **Outcome** | **Method** |
| **children** | **community** | **Disaster** | **intervention** | **health** | **planning** |
| **children** | **global** | **Infection** | **mitigation** | **response** | **Analysis** |
| **children** | **humanitarian** | **emergency** | **management** | **protection** | **detection** |
| **children** | **property** | **Damage** | **federal** | **catastrophic** | **research** |

**Etc. Etc**.

Exhibit 4. Hypotheses or Problem Statements Associated with the Different Research Designs in Table 4.

First Design: children 🡪 community 🡪 disaster 🡪 intervention 🡪 health 🡪 planning

First Hypothesis: health 🡪 intervention 🡪 disaster 🡪 community 🡪 children.

Statement: Prevention involves protecting the health of children using appropriate interventions to minimize or prevent disasters in the community. The relevant method involved is the planning of procedures to be used.

Second Design: children 🡪 global 🡪 infection 🡪 mitigation 🡪 response 🡪analysis

Second Hypothesis: response 🡪 mitigation 🡪 infection 🡪 global – children

Statement: Prevention includes a positive response to the procedures used in mitigation by reducing infection in the global community of children. The relevant method involved is the analysis of the relationships between response and mitigation.

Third Design: children 🡪 humanitarian 🡪 emergency 🡪 management 🡪 protection 🡪 detection

Third Hypothesis: protection 🡪 management 🡪 emergency 🡪 humanitarian 🡪 children

Statement: Prevention involves protection of children using effective disaster management with the aid of humanitarian agencies. The relevant method is detection of impending disasters.

Exhibit 4 shows three of the research designs and their associated statements. Each of the terms in the vocabulary can be selected for inclusion in a design. Not all combinations will be considered informative in terms of new knowledge. Many will. The interesting feature of this construction process is that both qualitative and quantitative designs may be formulated. Accordingly, the design process is simplified by using this algorithm. The creative path leading to the hypothesis/problem statement is clear. The particular arrangement of ideas used in the design may be based on frequency of citation (see Table 4) or on the human analyst’s preferences (see Appendix). In either case, the selection can be made transparent and human creativity/intelligence are maintained in a world where artificial intelligence is intriguing. The assistance in developing effective research designs is clear.

Table 5 illustrates that process by selecting the least frequently cited ideas from the dimensions.

Table 5. Formulation of the Hypothesis for a Research Design involving the lowest frequency ideas.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Design:** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Personal** | **Environment** | **Subject** | **Intervention** | **Outcome** | **Method** |  |  |  |  |  |  |  |  |  |
| **vulnerability** | **wenchuan** | **tornado** | **rehabilitation** | **survivor** | **training** |  |  |  |  |  |  |  |  |  |
| **Hypothesis:** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Outcome** | **Intervention** | **subject** | **environment** | **personal** |  |  |  |  |  |  |  |  |  |  |
| **Survivor** | **rehabilitation** | **tornado** | **wenchuan** | **vulnerability** | |  |  |  |  |  |  |  |  |  |
| **Statement:** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Prevention involves protection of survivors by effective rehabilitation following a tornado**  **in earthquake stricken provinces such as Wenchuan and their population of vulnerable children.** | | | | | | | | | | | | | | |

Subject specialists will have to decide the merits of each design. Even the lowest frequency organization of ideas may have merit since the earthquake in Wenchuan left a large number of stressed children.

A wind event, such as a tornado, could cause significantly further damage unless preventive procedures are put into place.

The Appendix shows the vocabulary of terms linked with the primary – prevention. The terms (ideas) are organized by dimensions (see Chapter 1).

Appendix – Terms Linked with Prevention Organized by Dimensions.

|  |  |  |
| --- | --- | --- |
| Prevention | Freq | Dimension |
| environment | 4 | environment |
| community | 2 | environment |
| global | 2 | environment |
| humanitarian | 2 | environment |
| property | 2 | environment |
| social | 2 | environment |
| worldwide | 2 | environment |
| climate | 1 | environment |
| political | 1 | environment |
| wenchuan | 1 | environment |
| intervention | 7 | intervention |
| mitigation | 5 | intervention |
| management | 4 | intervention |
| federal | 3 | intervention |
| security | 2 | intervention |
| government | 1 | intervention |
| hospital | 1 | intervention |
| policy | 1 | intervention |
| psychological | 1 | intervention |
| rehabilitation | 1 | intervention |
| planning | 7 | method |
| analysis | 3 | method |
| detection | 2 | method |
| research | 2 | method |
| surveillance | 2 | method |
| survey | 2 | method |
| communication | 1 | method |
| model | 1 | method |
| simulation | 1 | method |
| training | 1 | method |
| health | 14 | outcome |
| response | 13 | outcome |
| protection | 3 | outcome |
| catastrophic | 1 | outcome |
| exposure | 1 | outcome |
| recovery | 1 | outcome |
| survivor | 1 | outcome |
| children | 4 | personal |
| vulnerability | 1 | personal |
| disaster | 20 | subject |
| infection | 11 | subject |
| emergency | 8 | subject |
| damage | 5 | subject |
| infectious | 5 | subject |
| hazard | 4 | subject |
| accident | 2 | subject |
| disabilities | 1 | subject |
| injuries | 1 | subject |
| tornado | 1 | subject |
| Total | 164 |  |

This vocabulary of terms is relevant in Prevention research. Each term was linked with – Prevention – and the frequency of citation by author-specialists is shown. Classification into dimensions is based on the meaning of the related term.