The observable properties/traits of an organism (e.g. eye colour, blood type) is:

A. Genotype

B. Phenotype

C. Epigenetic code

D. Biomarkers

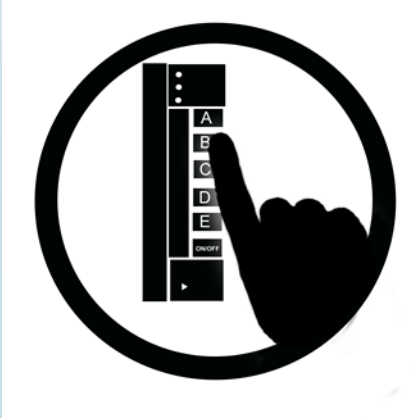
Study design used to compare epigenetic markers in those with disease and those without disease:

A. Prevalence Study

B. Randomized Controlled Trials

C. Cohort Studies

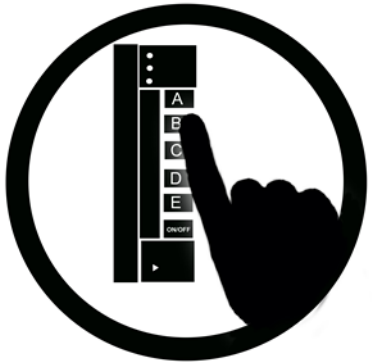
D. Case Control Studies



The “thrifty gene” hypothesis explains why aboriginal populations have higher levels of diabetes.

A.TRUE

B.FALSE



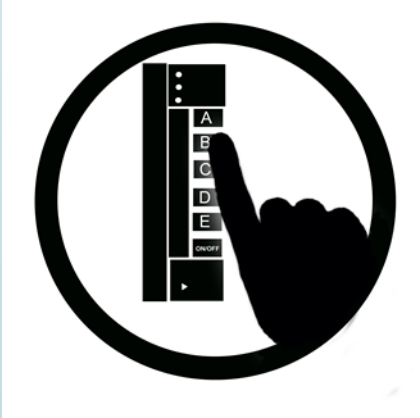
An example of a fomite:

A.Tick

B.Water

C.Food

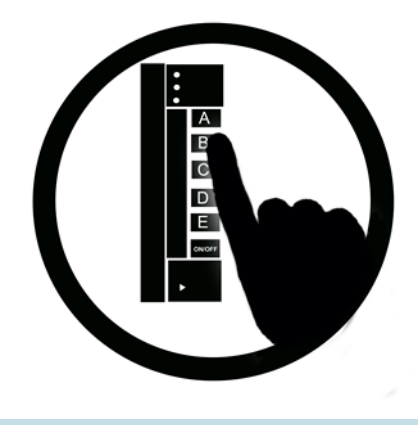
D.iPhone



Active and Passive immunity can be both naturally and artificially acquired by the host:

A.TRUE

B.FALSE



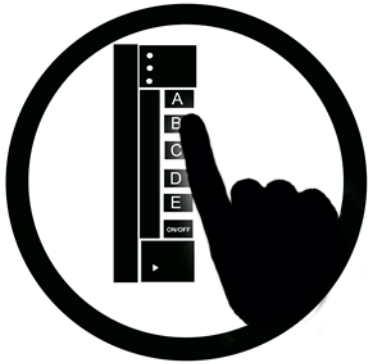
Confounding may be difficult to determine in the case of environmental toxins because:

A. Epigenetics may play a role in gene expression

B. It is difficult to determine if it is on the causal pathway

C. Environmental cues may alter gene expression

D. All of the above



ENVIRONMENTAL EPIDEMIOLOGY

and the USE OF GIS

HLSC 2003

ALI WALKER

SRPING 2016

Class Objectives

- Define Environmental Epidemiology
- Recognize how various epidemiologic study designs are used in the field of environmental epidemiology
- Use the epidemiologic triangle to understand the relationship between environmental agents, the environment, and host outcomes
- Identify associations between environmental hazards and health outcomes
- Become familiar with the definition of GIS and its potential use in the field of epidemiology

Define Epidemiology:

KEY WORDS:

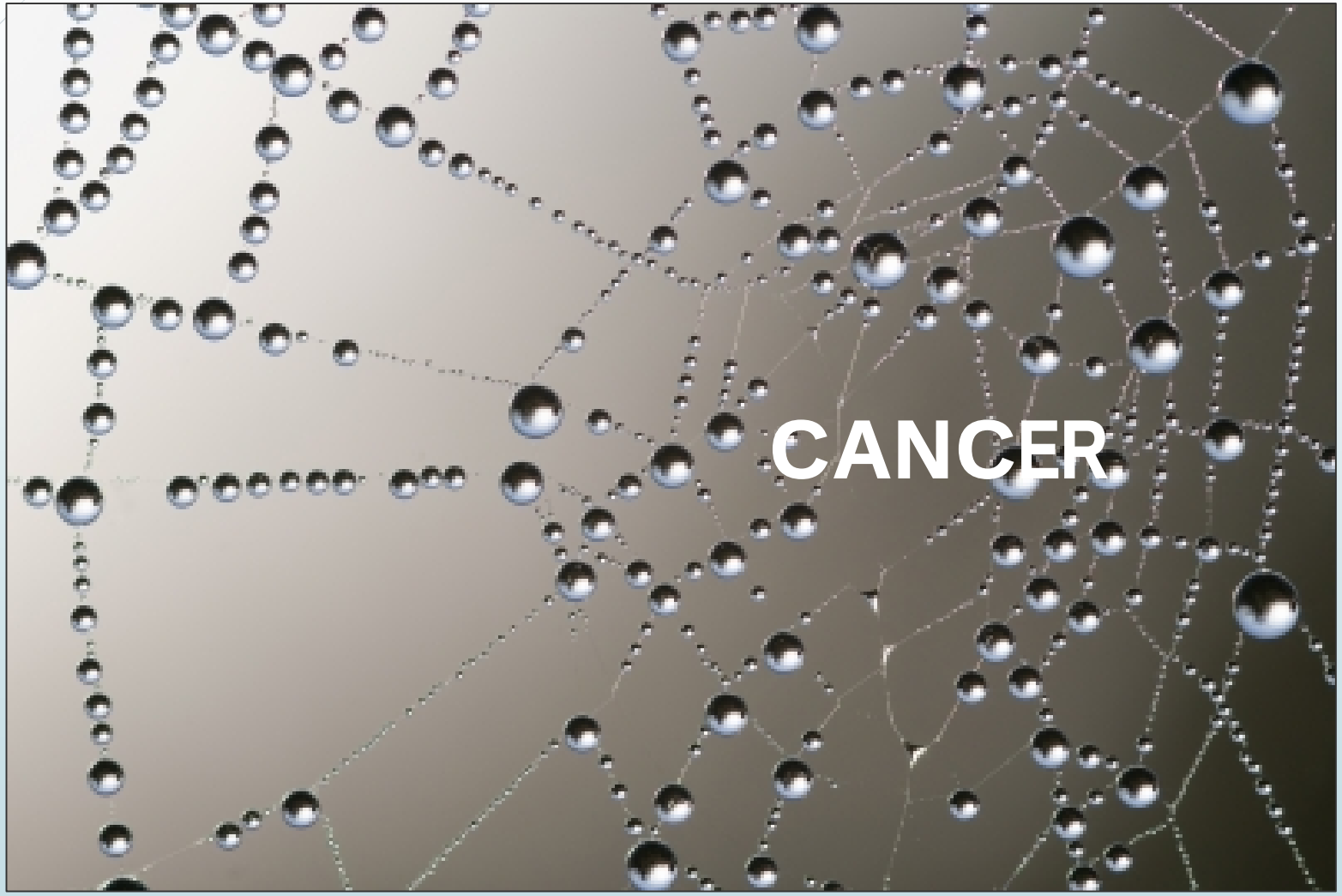
- Distribution
- Determinants
- Health related states or events
- Human populations
- Application of study to control/intervene to control health problems

ENIVONRMENTAL EPIDEMIOLOGY THEN…

Study of health related states or events (occurring within **populations**) that are linked to environmental factors, and which are **outside of an individual's control** (involuntary exposure).

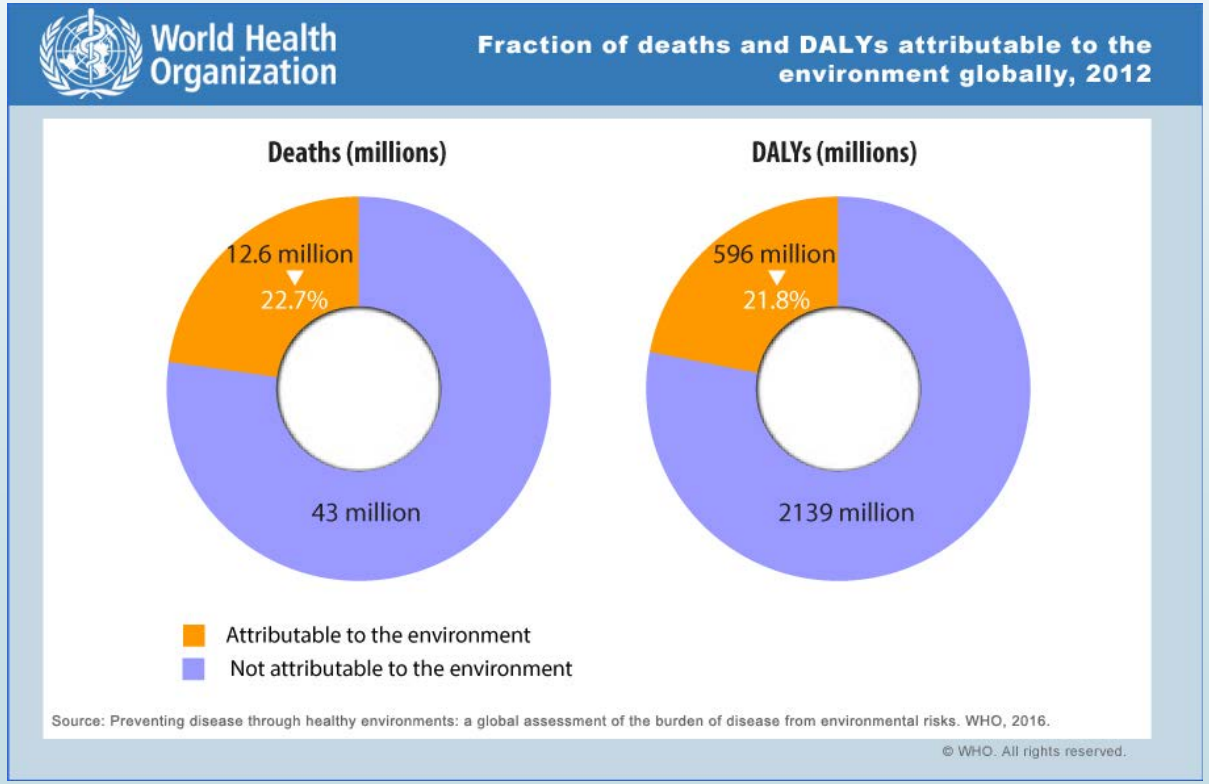
Value of this field of Epidemiologic Study?

Web of Causation



Linking Health and the Environment

- Global burden of disease attributable to the environment is approximately 25% (death and disability).
- 19% of Cancers globally are likely due to environmental exposures.



What is meant by “environmental factors”

- Physical, chemical, biologic, social, political, cultural, and built environments.

***EXAMPLES** of how these factors could impact health?*

In Pott's own words,

> [E]very body . . . is acquainted with the disorders to which painters, plummers, glaziers, and the workers in white lead are liable; but there is a disease as peculiar to a certain set of people which has not, at least to my knowledge, been publickly noteced; I mean the chimney-sweepers' cancer. . . . The fate of these people seems singularly hard; in their early infancy, they are most frequently treated with great brutality, and almost starved with cold and hunger; they are thrust up narrow, and sometimes hot chimnies, where they are bruised, burned, and almost suffocated; and when they get to puberty, become peculiary [*sic*] liable to a noisome, painful and fatal disease. Of this last circumstance there is not the least doubt though perhaps it may not have been sufficiently attended to, to make it generally known. Other people have cancers of the same part; and so have others besides lead-workers, the Poictou colic, and the consequent paralysis; but it is nevertheless a disease to which they are particularly liable; and so are chimney-sweepers to the cancer of the scrotum and testicles. The disease, in these people . . . seems to derive its origin from a lodgment of soot in the rugae of the scrotum.[15(pp521–522)]

As cited by Friis (2007) in Essentials of Environmental Health p. 32

EARLY ENVIORNMENTAL EPIDEMIOLOGY – recognizing exposure and outcome effects

- **Hippocrates** – linked water and air quality with disease (Book - On Airs, Waters, and Places)
- **Baker** – cider laced with lead – and Colic
- **Sir Percival Pott** – Chimney sweeps and scrotal/testicular cancer
- **John Snow** – Broad street pump and Cholera

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Association of Particulate Air Pollution With Daily Mortality

The China Air Pollution and Health Effects Study

Renjie Chen, Haidong Kan*, Bingheng Chen, Wei Huang, Zhipeng Bai, Guixiang Song and Guowei Pan , on Behalf of the CAPES Collaborative Group

*Correspondence to Dr. Haidong Kan, School of Public Health, Fudan University, P.O. Box 249, 130 Dong-An Road, Shanghai 200032, China (e-mail: haidongkan@gmail.com).

Received August 6, 2011.
Accepted October 27, 2011.

Abstract

LINK

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Cadmium Exposure and Neurodevelopmental Outcomes in U.S. Children
Ciesielski, Timothy;Weuve, Jennifer;Bellinger, David C;Schwartz, Joel;Lanphear, Bruce;Wright, Rob...
Environmental Health Perspectives; May 2012; 120, 5; ProQuest
pg. 758

Research | Children's Health

Cadmium Exposure and Neurodevelopmental Outcomes in U.S. Children

Timothy Ciesielski,[1] Jennifer Weuve,[1,2] David C. Bellinger,[1,3,4] Joel Schwartz,[1] Bruce Lanphear,[5,6] and Robert O. Wright[1,4,7]

[1]Department of Environmental Health, Harvard School of Public Health, Boston, Massachusetts, USA; [2]Rush Institute fo Rush University Medical Center, Chicago, Illinois, USA; [3]Department of Neurology, Children's Hospital Boston, Boston, USA; [4]Harvard Medical School, Boston, Massachusetts, USA; [5]Cincinnati Children's Environmental Health Center, Cinci Hospital Medical Center, Cincinnati, Ohio, USA; [6]Child and Family Research Institute, BC Children's Hospital and Facult Sciences, Simon Fraser University, Vancouver, British Columbia, Canada; [7]Department of Pediatrics, Children's Hospita Massachusetts, USA

Background: Low-level environmental cadmium exposure in children may be associated with adverse neurodevelopmental outcomes.

Objective: Our aim was to evaluate associations between urinary cadmium concentration and reported learning disability (LD), special education utilization, and attention deficit hyperactivity disorder (ADHD) in U.S. children using National Health and Nutrition Examination Survey (NHANES) data.

Methods: We analyzed data from a subset of participants in NHANES (1999–2004) who were 6–15 years of age and had spot urine samples analyzed for cadmium. Outcomes were assessed by parent or proxy-respondent report. We fit multivariable-adjusted logistic regression models to estimate associations between urinary cadmium and the outcomes.

Results: When we compared children in the highest quartile of urinary cadmium with those in the lowest quartile, odds ratios adjusted for several potential confounders were 3.21 [95% confidence interval (CI): 1.43, 7.17] for LD, 3.00 (95% CI: 1.12, 8.01) for special education, and 0.67 (95% CI: 0.28, 1.61) for ADHD. There were no significant interactions with sex, but associations with LD and special education were somewhat stronger in males, and the trend in the ADHD analysis was only evident among those with blood lead levels above the median.

Conclusions: These findings suggest that children who have higher urinary cadmium concentrations may have increased risk of both LD and special education. Importantly, we observed these associations at exposure levels that were previously considered to be without adverse effects, and these levels are common among U.S. children.

Key words: attention deficit hyperactivity disorder, cadmium, learning disability, neurodevelopment, neuropsychological development, NHANES, risk assessment, special education. *Environ Health Perspect* 120:758–763 (2012). http://dx.doi.org/10.1289/ehp.1104152 [Online 27 January 2012]

cadmium were associate
deficit hyperactivity disord
or placement in special e
knowledge, this is the larg
ate associations between
and neurodevelopmental c
first to do so in a nationa
sample of U.S. children.

Methods

Data source and study popu
is an ongoing series of cross-
naires, examinations, and l
that evaluate nutritional a
exposures as well as various
in the U.S. population [C
Control and Prevention N
Health Statistics (CDC-
Detailed documentation
available online (CDC-N
this study we used NHAN
1999–2004. We restricte
children 6–15 years of ag
cadmium was evaluated i

LINK

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Health | Rate My Hospital

Toxic jewelry: Cadmium found in Ardene, Aldo products

Jewelry bought from popular fashion chains contains toxic cadmium

By Sarah Bridge / Marketplace, CBC News Posted: Jan 15, 2016 5:00 AM ET | Last Updated: Jan 15, 2016 10:52 AM ET

Cadmium found in Ardene and Aldo jewellry 2:11

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Canadians who buy low-cost jewelry from popular fashion chains may be wearing products made with cadmium, a heavy metal that can be particularly toxic for kids.

A CBC *Marketplace* investigation reveals some Ardene and Aldo Accessories jewelry manufactured in China contains thousands of times more cadmium than Health Canada says is safe for children.

Health Canada considers cadmium to pose a threat similar to lead if ingested.

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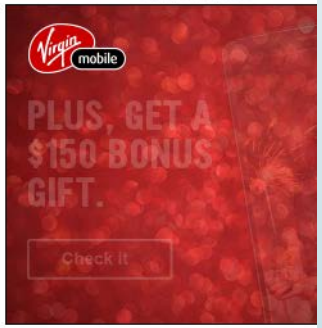

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Chapter
Sunlight, Vitamin D and Skin Cancer
pp 120-140

Epidemiology of Skin Cancer

Ulrike Leiter, Thomas Eigentler, Claus Garbe

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Abstract

Melanoma and nonmelanoma skin cancer (NMSC) are now the most comr
white populations. Both tumor entities show an increasing incidence rate v
decreasing mortality rate.

NMSC is the most common cancer in white-skinned individuals with a wor
incidence. NMSC is an increasing problem for health care services worldw
significant morbidity. The rising incidence rates of NMSC are probably cau
increased exposure to ultraviolet (UV) or sun light, increased outdoor activ
style, increased longevity, ozone depletion, genetics and in some cases, i
intensive UV exposure in childhood and adolescence was causative for th
cell carcinoma (BCC) whereas for the etiology of SCC a chronic UV expos
was accused.

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More sun-safe outdoor spaces vital, says cancer society

UV radiation 'nothing you want to fool around with'

CBC News Posted: Jul 16, 2015 11:20 AM AT | Last Updated: Jul 16, 2015 11:30 AM AT

Tea Hill Park opted to keep up a tent that was put up for Canada Day celebrations to provide shade for patrons through the summer. (CBC)

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Municipalities and employers need to create more sun-safe outdoor spaces, says the P.E.I. division of the Canadian Cancer Society.

While the group says people seem to be more aware about the dangers of the sun, the province's skin cancer rates are still **higher than the national average**.

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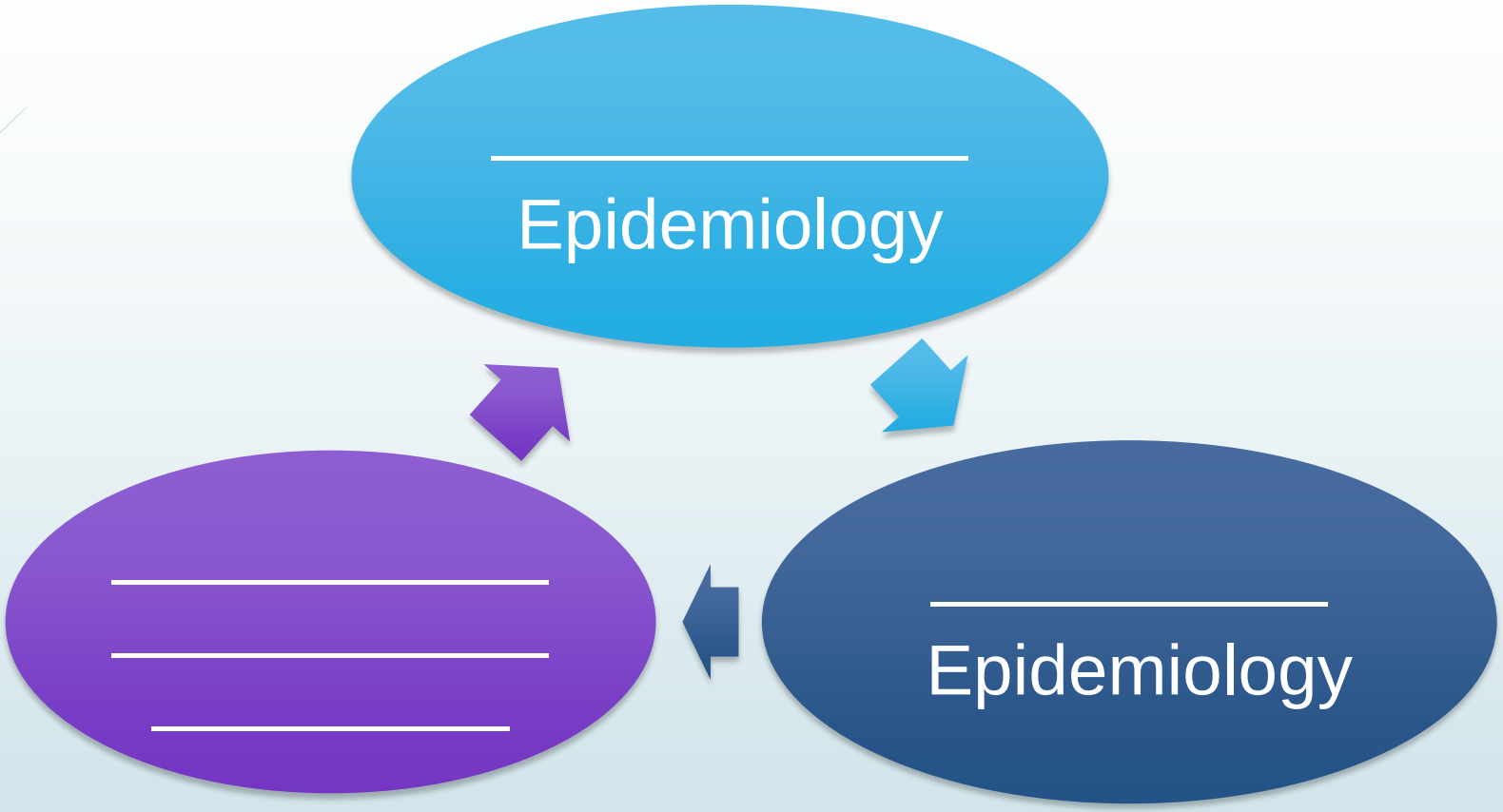
EPI Concept Review

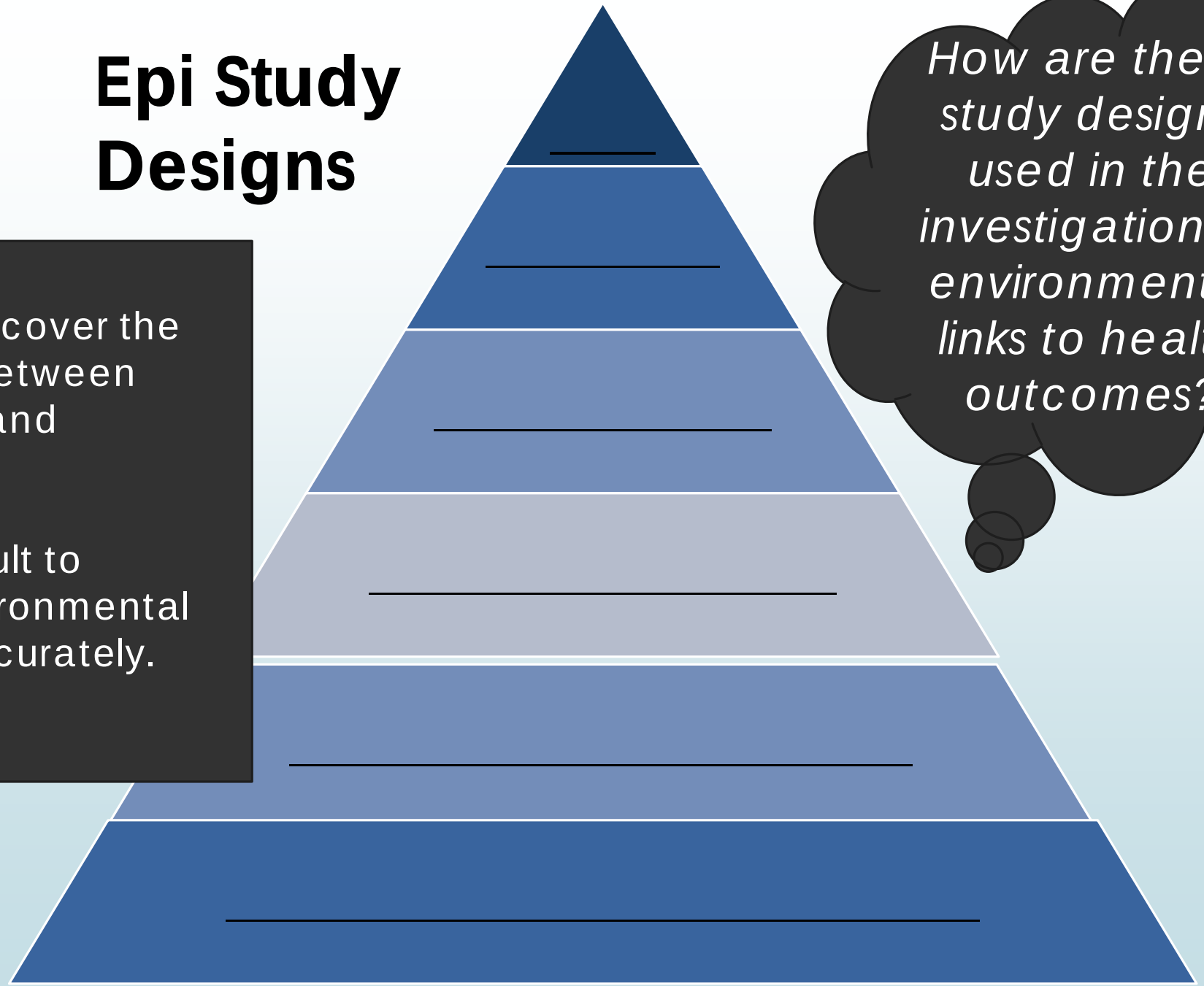
In groups or Individually


Epidemiology
Epidemiology

Epi Study Designs

Seeking to discover the association between Exposure (X) and Outcome (Y).

Can be difficult to measure environmental exposures accurately. *WHY?*

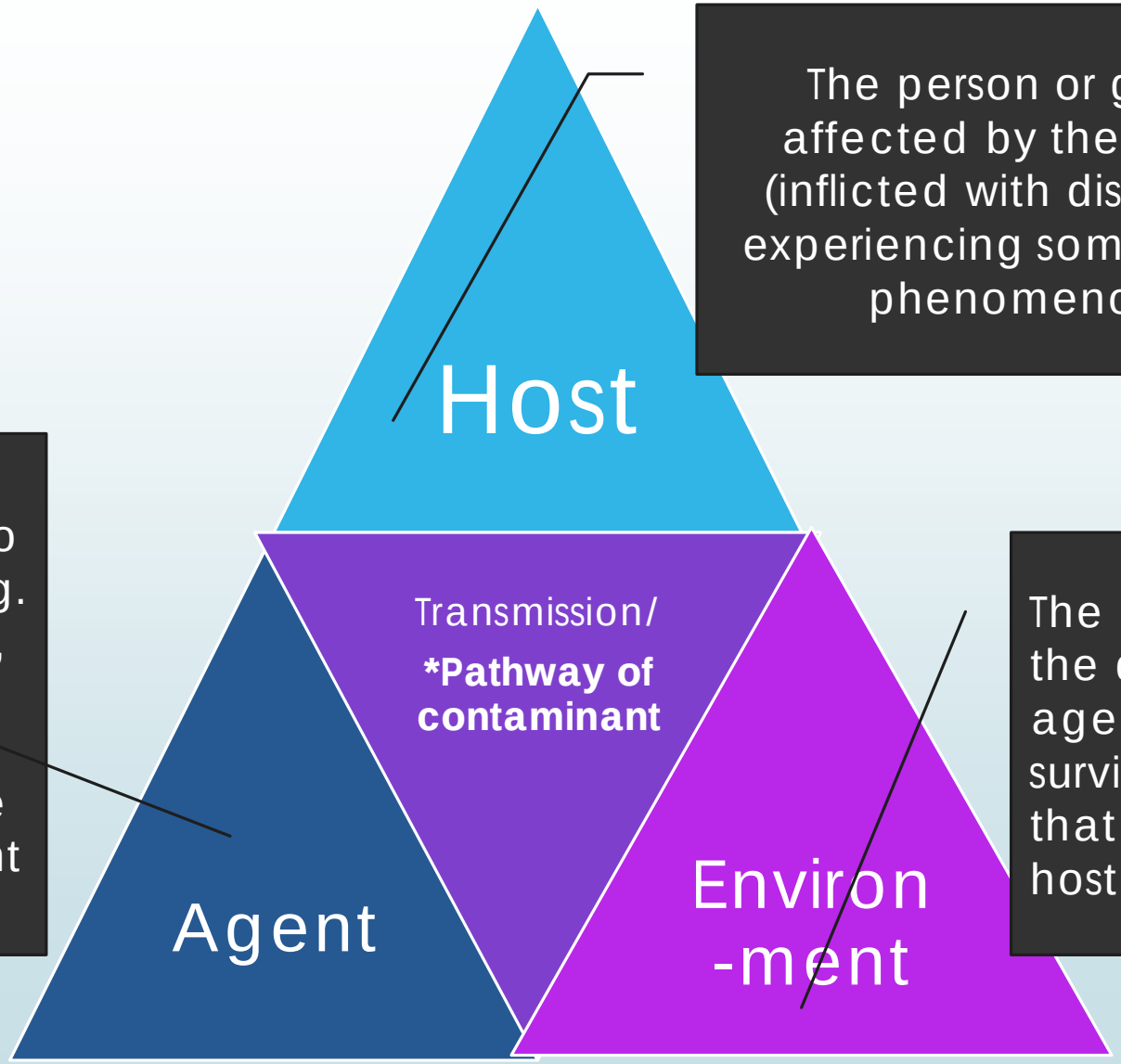


How are these study designs used in the investigation of environmental links to health outcomes?

Common sources of **Confounding** and **Bias** in environmental epidemiology

- **Socioeconomic Status** – Low SES associated with hazardous environmental exposures (environmental factors are a confounder to the relationship between SES and health outcomes) ***HOW CAN YOU EXPLAIN this using the three criteria for confounding…***
- **Healthy Worker Effect** – employed populations tend to have lower mortality and morbidity than the general population. WHY?
  - *General population includes both employed and unemployed populations and therefore may seem to have elevated mortality rates (also may not be able to detect mortality from occupational exposures as readily)*
  - *Stronger for non-malignant (without long latency periods) causes of mortality as they produce worker attrition during early career phases*
  - *Healthier workers may have more total exposure to occupational hazards than those who leave the workforce early due to illness*

The person or group affected by the agent (inflicted with disease or experiencing some health phenomenon)



The environmental factor contributing to health outcomes (e.g. chemical, radiation, particulate matter, social condition, toxins, etc.); may be more than one agent contributing

The domain in which the disease-causing agent(s) may exist, survive, or originate; all that is external to the host

ENVIRONMENTS COMMONLY LINKED TO AGENT EXPOSURES:

- Hazardous Waste Sites
- Air (pollution)
- Water (quality)
- Nuclear Facilities

Susceptible **HOST** - Characteristics

- **Children** – unable to process and remove chemicals, proportionate size relative to dosage, developmental periods with critical long-term outcomes, behavioural differences (unique pathways), less control over their environment, rising chronic disease in children
- **Seniors** – "body burden" (lifetime's worth of contaminants), increased sensitivity, may have less control over their environment, weakened defense mechanisms (e.g. decreased respiratory, renal functions), co-morbidities
- **Individual defense mechanisms** – immunocompromised, diseased states, cognitive/physical alterations,
- **Exposure status** (e.g. hot-spot communities, work exposure, vulnerable populations)
- **Pregnant women** – chemicals crossing placenta during critical/sensitive periods of fetal development, women may also be at greater risk due to physiologic changes (i.e. decreased gastrointestinal mobility, increased fluid volume)

ENVIRONMENTAL **AGENTS** LINKED TO DISEASE

- **Chemicals**
  - Pesticides
  - BPA
  - Paints
  - Household cleaners
- **Asbestos**
- **Metallic Compounds**
  - Mercury
  - Lead
  - Cadmium
  - Arsenic
- **Electric and Magnetic Fields**
- **Ionizing Radiation**
  - X-rays
  - UV
- **Allergens and Molds**
- **Physical and Mechanical Energy**

Chemical Agents

- Pesticides, asbestos, household cleaners, paints, automotive chemicals

- Potential effects on human health through acute toxicity, direct skin irritation, contact dermatitis, or long-term effects such as cancer.

Occupational Medicine 2009;59:180–184
Published online 6 March 2009 doi:10.1093/occmed/kqp017

Work as a hairdresser and cosmetologist and adverse pregnancy outcomes

Jacqueline A. Halliday-Bell[1], Mika Gissler[2,3] and Jouni J. K. Jaakkola[1,4]

Background Hairdressers and cosmetologists are commonly exposed to chemicals, poor posture and psychological stress that may increase the risk of adverse pregnancy outcomes.

Aims To assess whether work as a hairdresser and cosmetologist during pregnancy increases the risk of low birth weight, preterm delivery, small for gestational age (SGA) and perinatal death.

Methods The 1990–2004 Finnish Medical Birth Registry was used to identify all singletons of hairdressers (n = 10 622) and cosmetologists (n = 2490) and those of teachers (n = 18 594) as the reference group. The main outcomes were sexual differentiation measured as the probability of female gender, low birth weight, preterm delivery, SGA and perinatal death. Logistic regression analysis was used to estimate odds ratios (ORs) adjusted for maternal age, parity, marital status and maternal smoking during pregnancy.

Results In logistic regression, the risk of low birth weight (adjusted OR 1.44, 95% CI 1.23–1.69), preterm delivery (adjusted OR 1.21, 95% CI 1.07–1.38), SGA (adjusted OR 1.65, 95% CI 1.38–2.07) and perinatal death (adjusted OR 1.62, 95% CI 1.01–1.60) was higher in hairdressers than in teachers. In cosmetologists, the risk of SGA (adjusted OR 1.53, 95% CI 1.10–2.12) and perinatal death (adjusted OR 1.36, 95% CI 0.62–2.98) was elevated. There were no substantial differences in the sex distribution.

Conclusions This study provides evidence that work as a hairdresser or cosmetologist may reduce foetal growth. Work as a hairdresser may also increase the risk of preterm delivery and perinatal death.

Study finds flame-retardant chemicals in breast milk

BY MARIANNE WHITE, POSTMEDIA NEWS MARCH 8, 2012

Flame-retardants found in many household products, electronics and cars make their way into breast milk, according to a new Canadian study.

Photograph by: File photo , AFP

QUEBEC — Flame-retardants found in many household products, electronics and cars make their way into breast milk, according to a new Canadian study.

A team of researchers led by Larissa Takser from the University of Sherbrooke studied 87 samples of human milk collected in two Canadian cities of similar sizes: Kingston, Ont., and Sherbrooke, Que.

They found traces of two flame-retardants — dechlorane plus (DP) and polybrominated diphenylether (PBDE) — in all samples, according to their findings published in the latest edition of the Environment International.

Example

Concentrations of the **flame-retardant chemicals** are **5-10x higher** in Canada than in Europe.

These chemicals can damage memory, learning, and hearing, behavioural changes, and reproductive function (in animal lab studies)

These fire-retardant chemicals are also present in **household dust**.

These chemicals have been banned for their toxicity in Europe.

LINK

Human Reproduction

Future fertility for the male child and adolescent with cancer: best practice, research breakthroughs and current dilemmas

Münster – Germany, 13-14 May 2016 | www.eshre.eu/munster

Contribution of environmental factors to the risk of male infertility

Alejandro Oliva[1], Alfred Spira[2] and Luc Multigner[2,3]

+ Author Affiliations

Received December 1, 2000.
Accepted March 14, 2001.

Hum. Reprod. (2001) 16 (8): 1768-1776.
doi: 10.1093/humrep/16.8.1768

Abstract

BACKGROUND: An increasing number of reports suggest that chemical and physical agents in the environment, introduced and spread by human activity, may affect male fertility in humans. We investigated the relationships between exposure to environmental agents and seminal characteristics, and the concentrations of reproductive hormones in the serum of men seeking infertility treatment. METHODS: We studied 225 male partners from consecutively recruited couples, who had their first

METALLIC COMPOUNDS: Arsenic

- Found naturally in Environment and as a by product of metal refinement
- Poisonous in high doses, carcinogenic when ingested or inhaled (skin, lung, liver, bladder and kidney cancers)
- Many studies are ecological and further research is needed

LINK

Concerned, but should they be?

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Arsenic in lake sediment has Ndilo residents concerned about swimming safety

'Unless somebody was actually eating the mud...there is no public health concern' says N.W.T.'s top doctor

By Curtis Mandeville, CBC News Posted: Mar 30, 2016 6:25 AM CT | Last Updated: Mar 30, 2016 11:14 AM CT

William Lines, community liaison and technical advisor with the Yellowknives Dene First Nation, is concerned the territorial government isn't taking the issue of arsenic contamination in lake sediments near Ndilo seriously enough. (CBC)

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For decades, residents living in Ndilo, N.W.T., have had concerns about possible arsenic contamination in and around their community from nearby Giant Mine.

- Giant Mine's tailings pond dust blows toward Yellowknife again

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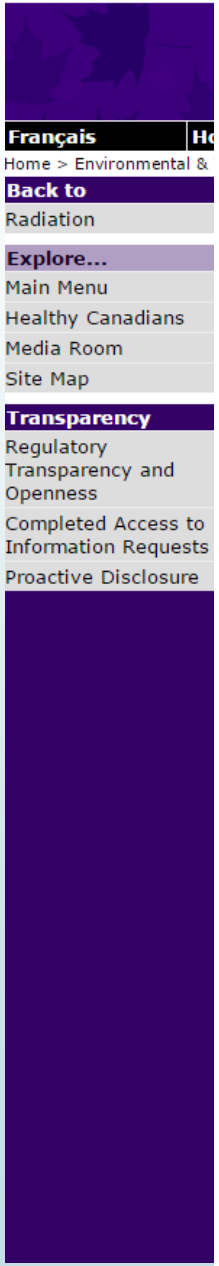
Lethbridge, AB

Today	Sat	Sun
Mainly sunny	Sunny	Cloudy with sunny breaks

IONIZING RADIATION

- Natural and Synthetic sources
- Epidemiologic research is interested in health effects of nuclear exposure, medical exposures, occupational exposure, and exposure to naturally occurring (e.g. radon)

LINK



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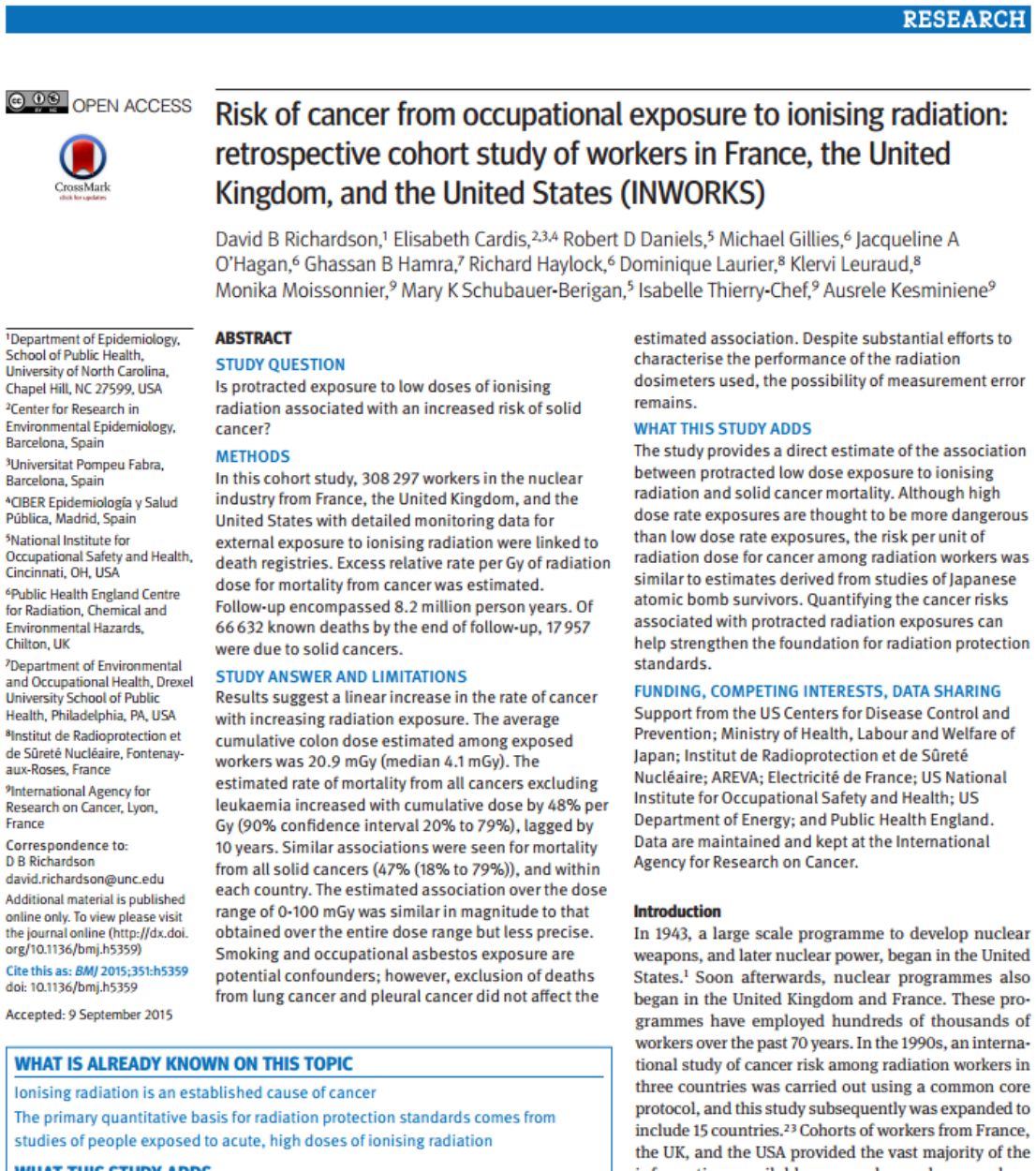

RESEARCH

OPEN ACCESS

Risk of cancer from occupational exposure to ionising radiation: retrospective cohort study of workers in France, the United Kingdom, and the United States (INWORKS)

David B Richardson,[1] Elisabeth Cardis,[2,3,4] Robert D Daniels,[5] Michael Gillies,[6] Jacqueline A O'Hagan,[6] Ghassan B Hamra,[7] Richard Haylock,[6] Dominique Laurier,[8] Klervi Leuraud,[8] Monika Moissonnier,[9] Mary K Schubauer-Berigan,[5] Isabelle Thierry-Chef,[9] Ausrele Kesminiene[9]

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[2]Center for Research in Environmental Epidemiology, Barcelona, Spain
[3]Universitat Pompeu Fabra, Barcelona, Spain
[4]CIBER Epidemiología y Salud Pública, Madrid, Spain
[5]National Institute for Occupational Safety and Health, Cincinnati, OH, USA
[6]Public Health England Centre for Radiation, Chemical and Environmental Hazards, Chilton, UK
[7]Department of Environmental and Occupational Health, Drexel University School of Public Health, Philadelphia, PA, USA
[8]Institut de Radioprotection et de Sûreté Nucléaire, Fontenay-aux-Roses, France
[9]International Agency for Research on Cancer, Lyon, France

Correspondence to: D B Richardson david.richardson@unc.edu

Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/bmj.h5359)

Cite this as: *BMJ* 2015;351:h5359 doi: 10.1136/bmj.h5359

Accepted: 9 September 2015

ABSTRACT

STUDY QUESTION
Is protracted exposure to low doses of ionising radiation associated with an increased risk of solid cancer?

METHODS
In this cohort study, 308 297 workers in the nuclear industry from France, the United Kingdom, and the United States with detailed monitoring data for external exposure to ionising radiation were linked to death registries. Excess relative rate per Gy of radiation dose for mortality from cancer was estimated. Follow-up encompassed 8.2 million person years. Of 66 632 known deaths by the end of follow-up, 17 957 were due to solid cancers.

STUDY ANSWER AND LIMITATIONS
Results suggest a linear increase in the rate of cancer with increasing radiation exposure. The average cumulative colon dose estimated among exposed workers was 20.9 mGy (median 4.1 mGy). The estimated rate of mortality from all cancers excluding leukaemia increased with cumulative dose by 48% per Gy (90% confidence interval 20% to 79%), lagged by 10 years. Similar associations were seen for mortality from all solid cancers (47% (18% to 79%)), and within each country. The estimated association over the dose range of 0-100 mGy was similar in magnitude to that obtained over the entire dose range but less precise. Smoking and occupational asbestos exposure are potential confounders; however, exclusion of deaths from lung cancer and pleural cancer did not affect the estimated association. Despite substantial efforts to characterise the performance of the radiation dosimeters used, the possibility of measurement error remains.

WHAT THIS STUDY ADDS
The study provides a direct estimate of the association between protracted low dose exposure to ionising radiation and solid cancer mortality. Although high dose rate exposures are thought to be more dangerous than low dose rate exposures, the risk per unit of radiation dose for cancer among radiation workers was similar to estimates derived from studies of Japanese atomic bomb survivors. Quantifying the cancer risks associated with protracted radiation exposures can help strengthen the foundation for radiation protection standards.

FUNDING, COMPETING INTERESTS, DATA SHARING
Support from the US Centers for Disease Control and Prevention; Ministry of Health, Labour and Welfare of Japan; Institut de Radioprotection et de Sûreté Nucléaire; AREVA; Electricité de France; US National Institute for Occupational Safety and Health; US Department of Energy; and Public Health England. Data are maintained and kept at the International Agency for Research on Cancer.

WHAT IS ALREADY KNOWN ON THIS TOPIC
Ionising radiation is an established cause of cancer
The primary quantitative basis for radiation protection standards comes from studies of people exposed to acute, high doses of ionising radiation

Introduction
In 1943, a large scale programme to develop nuclear weapons, and later nuclear power, began in the United States.[1] Soon afterwards, nuclear programmes also began in the United Kingdom and France. These programmes have employed hundreds of thousands of workers over the past 70 years. In the 1990s, an international study of cancer risk among radiation workers in three countries was carried out using a common core protocol, and this study subsequently was expanded to include 15 countries.[2 3] Cohorts of workers from France, the UK, and the USA provided the vast majority of the

Electric & Magnetic Fields (non-ionizing radiation)

- Sources include power lines, microwave ovens, stoves, clocks, cell phones.
- Some epi studies have found an association between residential proximity to power lines and childhood cancer risk.
- Epi studies have also found an increased risk for male breast cancer among male electrical workers.

Allergens & Molds

- Allergens – found in air and elsewhere in the environment are substances that provoke an allergic reaction in susceptible individuals.
- Allergic reactions range from dermatitis, asthma, and itchy eyes to anaphylactic shock.
- Molds most prominent in moist environments
- Molds can cause irritation or respiratory system, lung infections, memory loss (?)

Sick Building Syndrome (SBS)

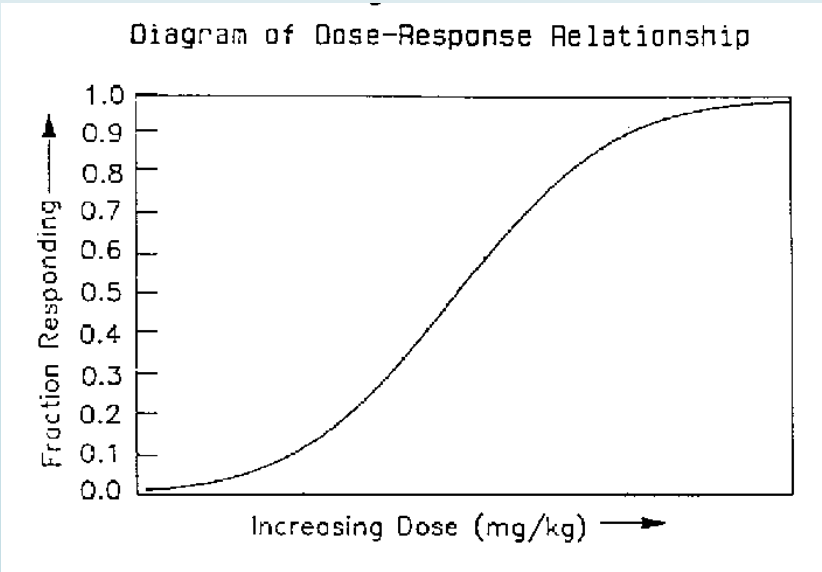
- Term coined in 1983
- Illness of office employees with symptoms of dry skin, mental fatigue, headaches, general pruritus, airway infections, nausea, personality changes….(unclear case definition?)
- Begin when person enters the building and cease when they leave…
- Thought to be caused by poor ventilation, exposure to solvents, low humidity, airborne microbial agents, odors, and poor lighting.
- May also be linked to work environment - monotony, lack of control, stress, physical and mental stress.

TOXICOLOGY CONCEPTS in environmental epidemiology

1. Dose-response Curves
2. Threshold
3. Latency
4. Synergism

DOSE-REPSONSE CURVES:

- Maps the association between amount of exposure entering the host (dose) and health effects (biologic response to exposure)
- Used to assess causality of suspected exposures on health outcomes (but not always necessary)
- Typical dose-response curve:



THRESHOLDS:

- Refers to the lowest dose at which a response may occur
- If subthreshold, no effect (or a protective effect) may be observed
- Question as to whether or not long-term exposure are subthreshold levels may cause health response

LATENCY:

- The time period between initial exposure and a measure of measureable response
- Can range from almost immediate to decades
- Long latency makes detection of hazards more difficult

SYNERGISM

- The combined effect of several exposures is greater than the sum of the individual effects
- Example synergistic relationship between asbestos and smoking in the development of lung cancer.

LINK

RESEARCH ARTICLE

Additive Synergism between Asbestos and Smoking in Lung Cancer Risk: A Systematic Review and Meta-Analysis

Yuwadee Ngamwong[1,2], Wimonchat Tangamornsuksan[1,2], Ornrat Lohitnavy[1,2,3], Nathorn Chaiyakunapruk[1,3,4,5,6,7], C. Norman Scholfield[1,3], Brad Reisfeld[1,8], Manupat Lohitnavy[1,2,3]*

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Citation: Ngamwong Y, Tangamornsuksan W, Lohitnavy O, Chaiyakunapruk N, Scholfield CN, Reisfeld B, et al. (2015) Additive Synergism between Asbestos and Smoking in Lung Cancer Risk: A Systematic Review and Meta-Analysis. PLoS ONE 10(8): e0135798. doi:10.1371/journal.pone.0135798

Editor: Scott M. Langevin, University of Cincinnati College of Medicine, UNITED STATES

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Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

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Competing Interests: The authors have declared that no competing interests exist.

Abstract

Smoking and asbestos exposure are important risks for lung cancer. Several epidemiological studies have linked asbestos exposure and smoking to lung cancer. To reconcile and unify these results, we conducted a systematic review and meta-analysis to provide a quantitative estimate of the increased risk of lung cancer associated with asbestos exposure and cigarette smoking and to classify their interaction. Five electronic databases were searched from inception to May, 2015 for observational studies on lung cancer. All case-control (N = 10) and cohort (N = 7) studies were included in the analysis. We calculated pooled odds ratios (ORs), relative risks (RRs) and 95% confidence intervals (CIs) using a random-effects model for the association of asbestos exposure and smoking with lung cancer. Lung cancer patients who were not exposed to asbestos and non-smoking (A-S-) were compared with; (i) asbestos-exposed and non-smoking (A+S-), (ii) non-exposure to asbestos and smoking (A-S+), and (iii) asbestos-exposed and smoking (A+S+). Our meta-analysis showed a significant difference in risk of developing lung cancer among asbestos exposed and/or smoking workers compared to controls (A-S-), **odds ratios** for the disease (*95% CI*) were (i) **1.70** (A+S-, *1.31–2.21*), (ii) **5.65;** (A-S+, *3.38–9.42*), (iii) **8.70** (A+S+, *5.8–13.10*). The additive interaction index of synergy was 1.44 (95% CI = *1.26–1.77*) and the multiplicative index = 0.91 (95% CI = *0.63–1.30*). Corresponding values for cohort studies were 1.11 (95% CI = *1.00–1.28*) and 0.51 (95% CI = *0.31–0.85*). Our results point to an additive synergism for lung cancer with co-exposure of asbestos and cigarette smoking. Assessments of industrial health risks should take smoking and other airborne health risks when setting occupational asbestos exposure limits.

"**A healthy environment underpins a healthy population**…if countries do not take actions ot make environments where people can live and work healthy, millions will continue to become ill and die too young" – Dr. Chan, WHO

"there is an urgent need for investment in strategies to reduce environmental risks in our cities, homes, and workplaces" – Dr. Neira, WHO

http://www.who.int/mediacentre/news/releases/2016/deaths-attributable-to-unhealthy-environments/en/

How are we doing?

Is Canada a Clean Environment?

Our Strengths

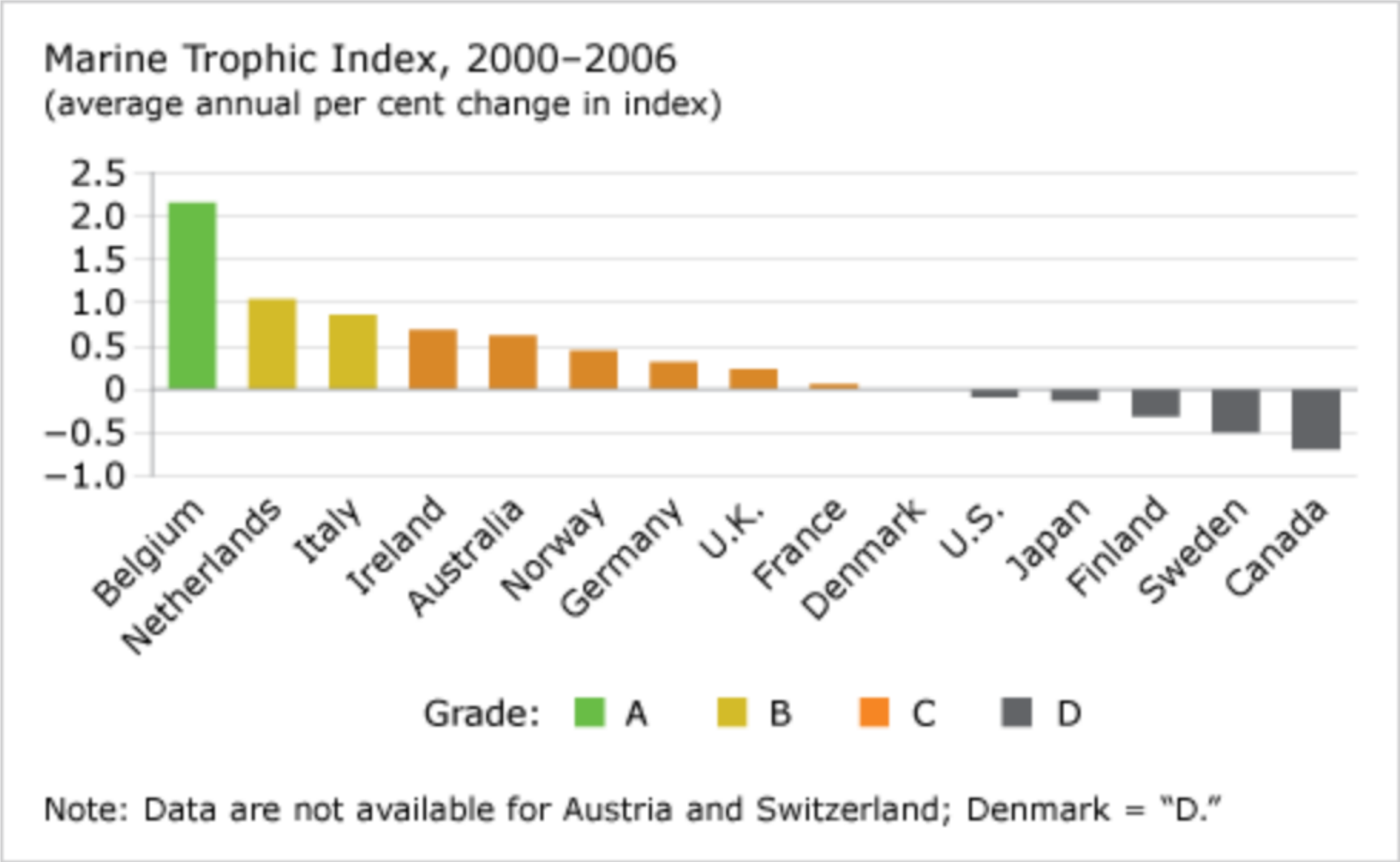
1. Use of forest resources (A)
2. Threatened species (A)
3. Use of low-emitting electrical power (A)
4. Water quality (A)

Is Canada a Clean Environment?

Our Weaknesses

1. Care for marine environments (D)
2. Water consumption (D)
3. Waste generation (D)
4. Green house gases (D)
5. Nitrogen oxide production (D)
6. Volatile Organic Compounds (VOCs) (D)

Marine Biodiversity is Decreasing



Marine Diversity

Question

From the perspective of Geoffery Rose's whole population approach, what is the **value added** by examining these trends across countries, rather than examining the trend in Canada alone?

Any other benefits?

REPORT CARD

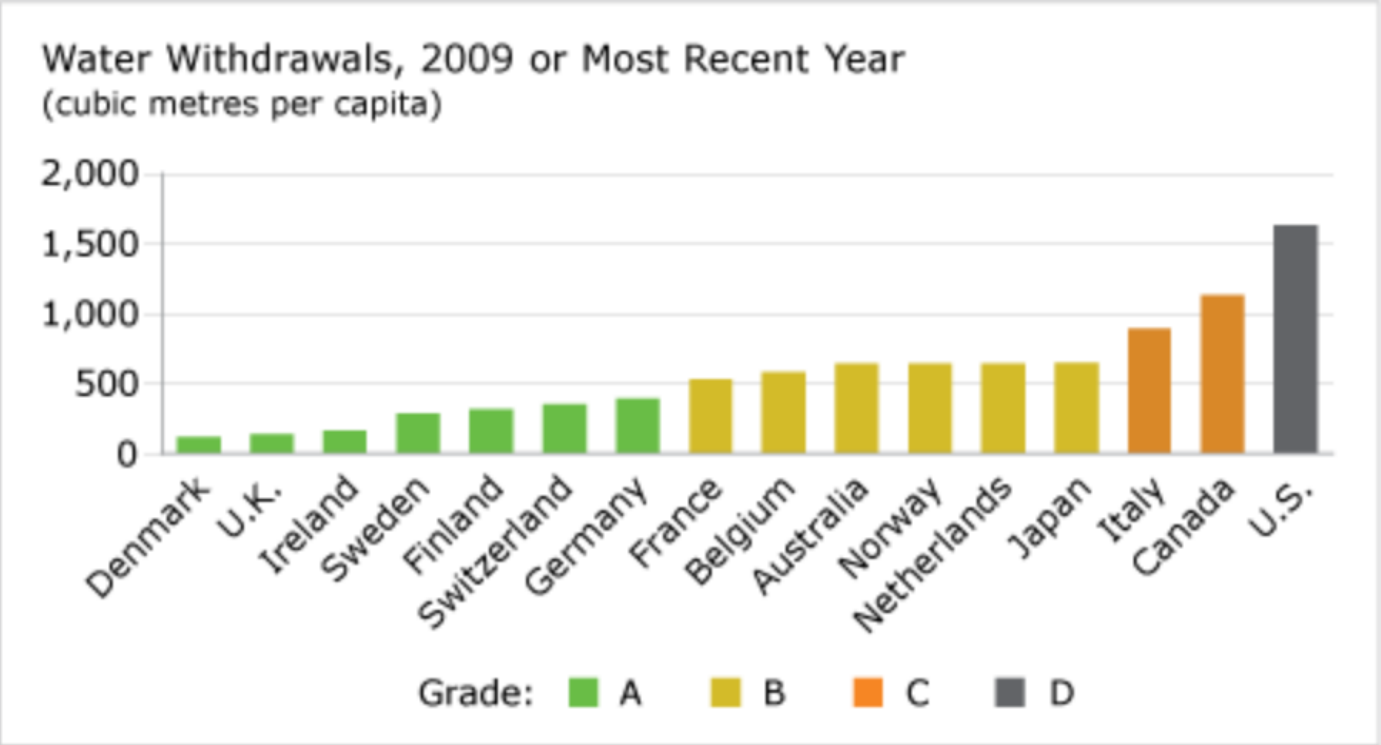
Marine Trophic Index

	1970s	1980s	1990s	2000s
Australia	B	B	D	C
Austria	n.a.	n.a	n.a	n.a
Belgium	A	D	B	A
Canada	C	C	D	D
Denmark	D	C	C	D
Finland	B	D	C	D
France	C	A	B	C
Germany	B	D	B	C
Ireland	B	B	B	C
Italy	B	B	C	B
Japan	D	D	A	D
Netherlands	C	C	B	B
Norway	B	D	C	C
Sweden	B	C	C	D
Switzerland	n.a	n.a	n.a	n.a
U.K.	C	C	B	C
U.S.	D	B	B	D

Source: The Conference Board of Canada.

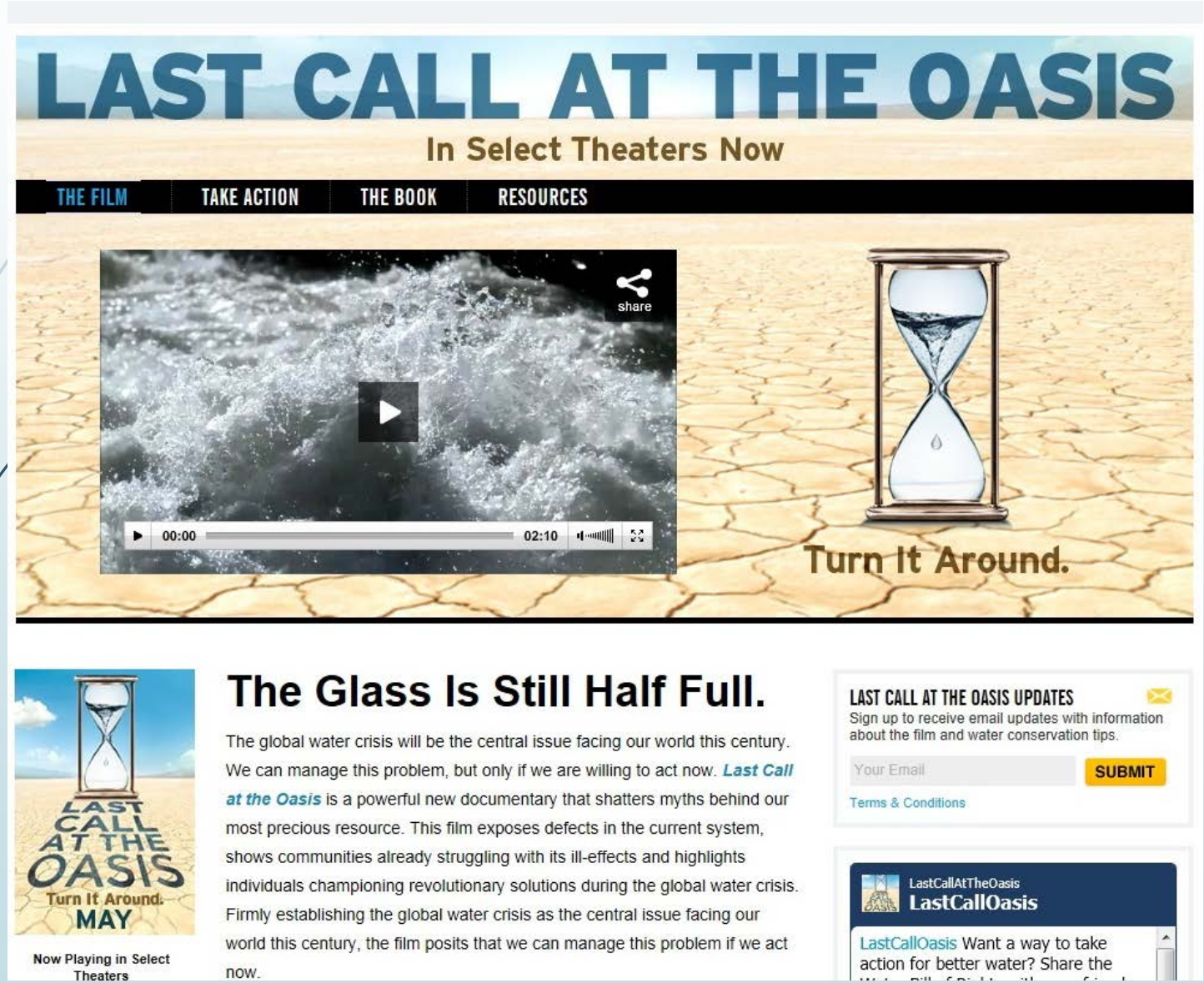
2. Canadians Use Too Much Water!

- Canada ranks 15th out of 16 peer countries and earns a "C" grade.
- Canada's water withdrawals are nearly double that of the 16-country average. Industry is Canada's largest water user.
- Excessive water withdrawals in Canada can be attributed to the lack of widespread water conservation practices and water pricing that does not promote efficiency



Link to report

Water is a Critical Public Health Issue

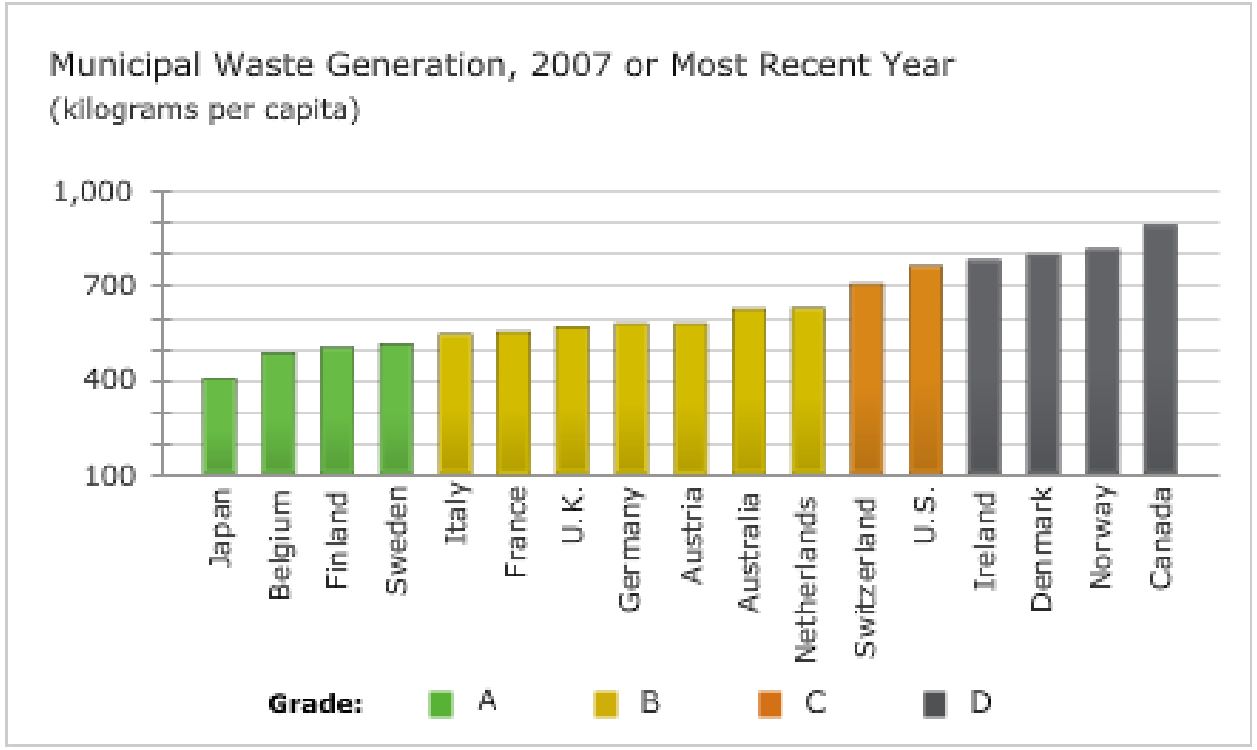


[Movie clip]

[Website]

3. Canadians Produce Too Much Waste!

- Canada produces 894 kg per capita of municipal waste each year, more than twice as much as the best performer, Japan.
- Canada's municipal waste generated per capita has been steadily increasing since 1980.



LinkedIn
Facebook
Digg

Definition

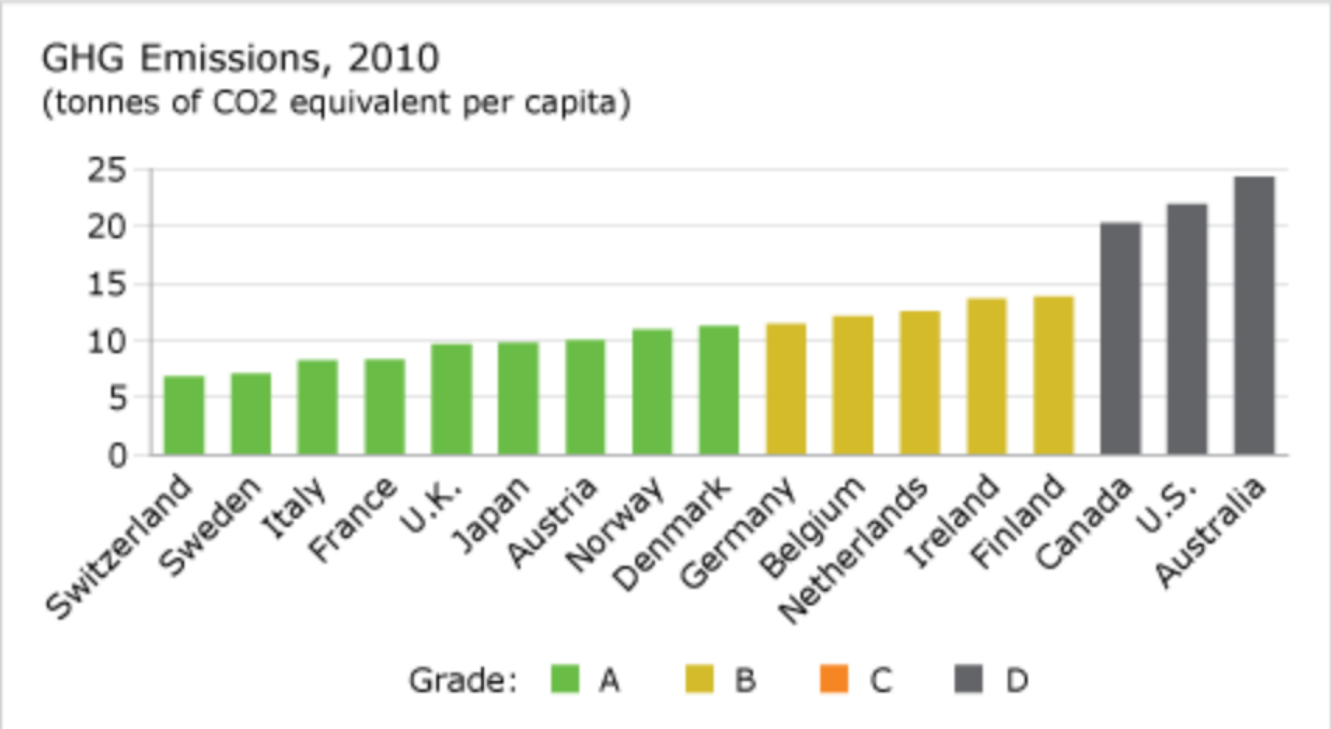
Municipal Waste Generation

Amount of municipal waste generated per capita, measured in kilograms.

Link to full report

4. Canada Produces too Much GHG!

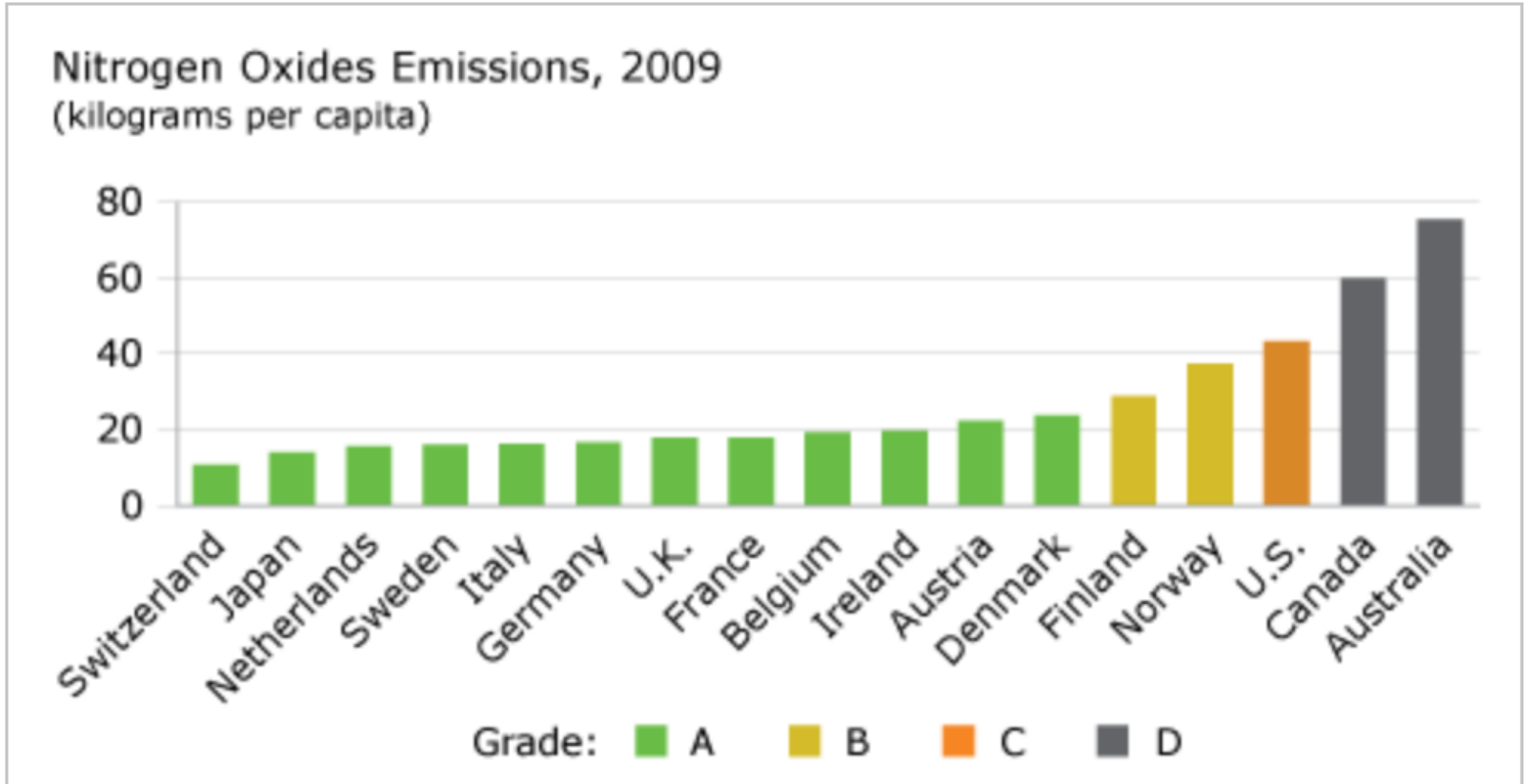
- Canada ranks 15th out of 17 countries for greenhouse gas (GHG) emissions per capita and earns a "D" grade.
- Canada's per capita GHG emissions decreased by nearly 5 per cent between 1990 and 2010, while total GHG emissions in Canada grew 17 per cent.
- The largest contributor to Canada's GHG emissions is the energy sector, which includes power generation (heat and electricity), transportation, and fugitive sources.



Link to Report

5. Canada Produces Too much Nitrogen Oxide!

- Canada gets a "D" and ranks 16th out of 17 peer countries.
- Canada's per capita nitrogen oxides emissions have been decreasing since 1990.
- Canada needs to do more to reduce emissions from the transportation, electricity, and industrial sectors.



Emissions

Nitrogen oxides are a major air pollutant. Nitrogen oxides (NOx) are the sum of nitric oxide (NO) and nitrogen dioxide (NO2). The indicator is measured in kilograms per capita.

Please note:
The data on this page are current as of January 2013.

Consequences when Nitrogen Oxide gets too high

Epi in the News

Newsweek

TECH & SCIENCE

Volkswagen's Emissions Cheating Directly Responsible for 60 Early Deaths in the U.S.

BY ZOË SCHLANGER 10/29/15 AT 12:24 AM

The 482,000 diesel Volkswagen and Audi cars sold in the U.S. with "defeat devices" since 2008 will have emitted enough excess pollution to kill 60 people across the country prematurely. STEFAN WERMUTH/REUTERS

FILED UNDER: Tech & Science, Volkswagen

The Volkswagen scandal now has a death toll forecast.

By the end of 2016, VW's cars, rigged with "defeat devices" to cheat on

See the new look we're trying in beta »

Justin Trudeau tells Paris climate summit Canada ready to do more

'Canada is back, my friends. Canada is back, and here to help,' prime minister tells delegates

By James Fitz-Morris, CBC News Posted: Nov 30, 2015 10:56 AM ET | Last Updated: Nov 30, 2015 7:20 PM ET

Justin Trudeau lays out five principles for Canada's climate change plan 2:11

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Prime Minister Justin Trudeau told delegates at the Paris climate change

Use of GIS in Epidemiology

Remember that **Geography** class?

Descriptive Epi describes health phenomenon by person, **place**, and **time**…there is a need for *spatial and temporal awareness*.

Geographic Foundations in Epidemiology and Public Health:

WHERE

- ...Do people live/spend their time?
- ...Are the agents of disease?
- ...Is disease incidence higher?
- ...Can we intervene to eliminate or reduce risk?
- ...Can we improve health service delivery?

*Interactions between host, agent, and environment are geographically variable. (e.g. based on host movement through variable the environment)

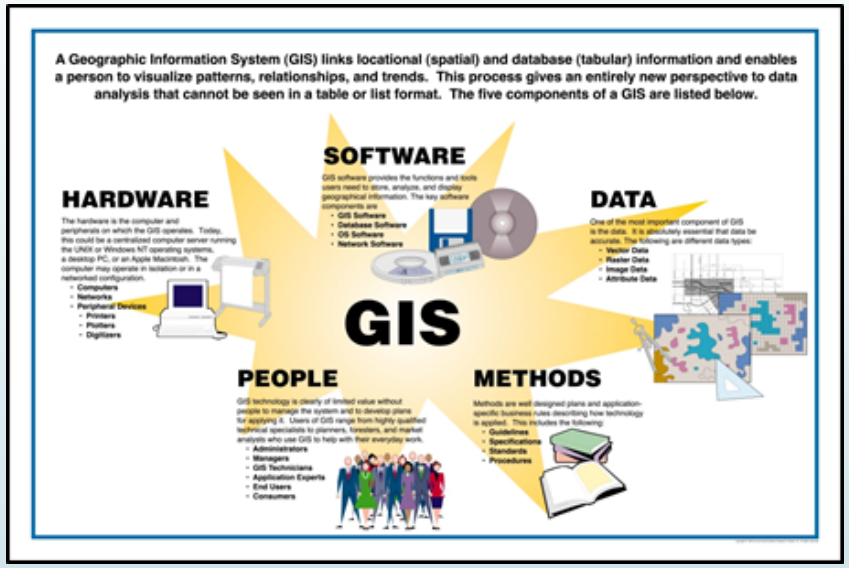
TED TALK Bill Davenhall: your health depends on where you live.

What are the reasons for Geographic Variations to disease?

1. **Local differences in reporting and detection** (of host movement, disease agents, and environments)
2. **Social and demographic composition** (e.g. clustering of racial, ethnic, or religious groups influencing lifestyle and behaviours; socioeconomic status linked to environmental exposures)
3. **Influences of local environmental factors** (e.g. pollution, climate, relationship to naturally occurring carcinogens)

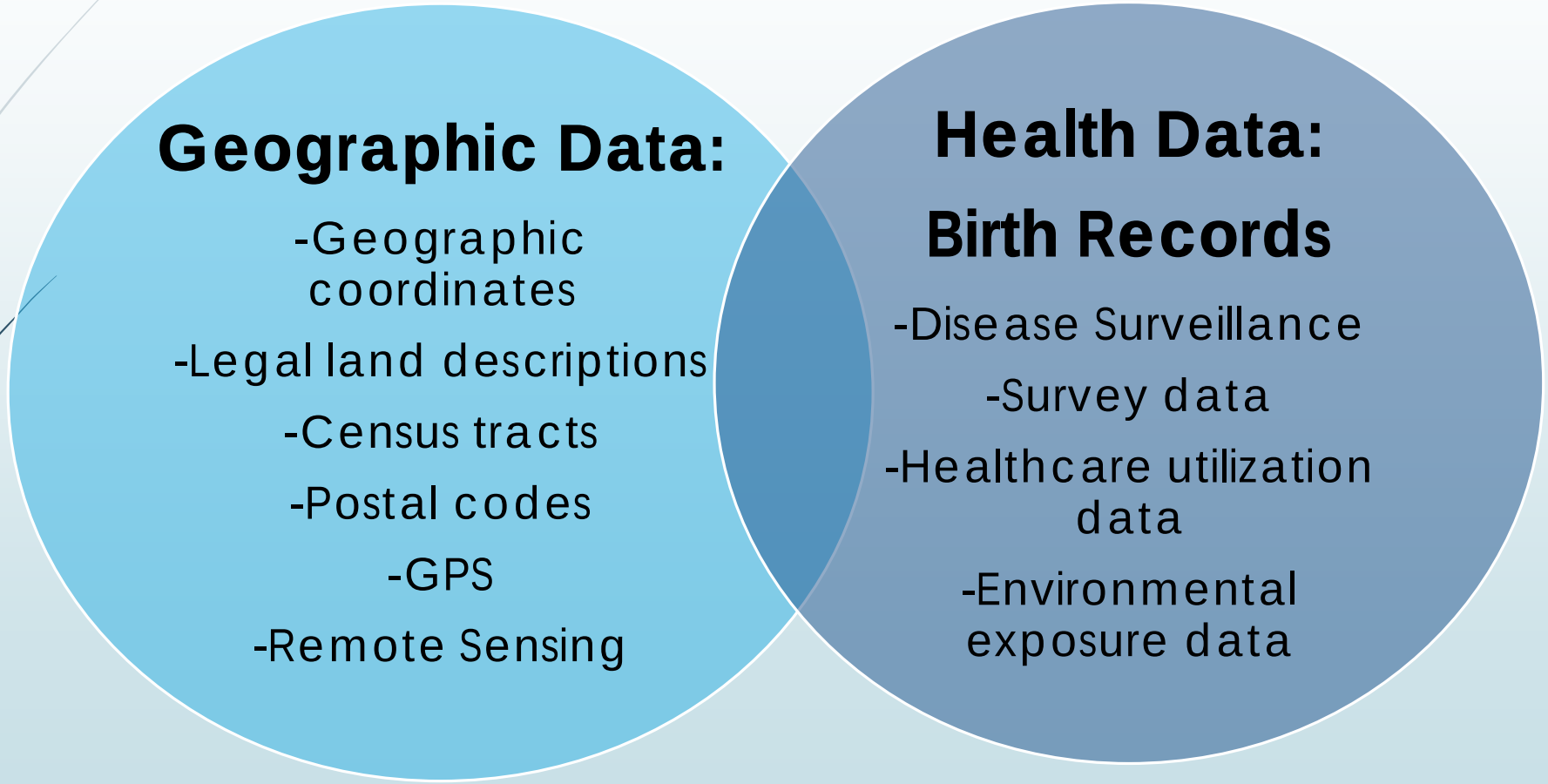
Geographic Information System (GIS):

- " A geographic information system is an organized collection of computer hardware and software, people, money, and organizational infrastructure that makes possible the acquisition and storage of geographic and related attribute data, for purposes of retrieval, analysis, synthesis, and display to promote understanding and assist in decision making."



-Kennedy (2006)

A GIS does not create data, but uses a system to combine and relate data (i.e. health data) to **spatial** and/or temporal reference points:



GIS manage, synthesize map, display, and analyze this combined data.

Maps can be used to tell stories…

GIS combines multiple (and often complex) data sets and tries to make the information accessible in simple and clear visual representations.

John Snow: Early Disease Tracking

Geospatial Revolution, Episode 4 (Ch. 3: Tracking Disease)

“ GIS has generated much excitement in the epidemiology community with respect to fresh applications…it is an advance that has enormous possibilities for defining new methods of comprehending data.”

- Friis and Sellers (2014)

Applications of GIS in Epidemiology and public health

Disease surveillance

- Compilation and tracking of data on incidence, prevalence and spread of disease
- Encompasses disease mapping and disease modelling (predictive)

Risk analysis

- Relates various sources of exposure to populations

Health access/planning

- Concerned with population's ability to use health services when needed

Community health profiling

- Compilation & mapping of information which communicates the health of a population (health status indicators & related behaviors/characteristics)

(Nykiforuk & Flaman, 2009)

Disease Surveillance

- [AIDSVu Online Mapper]

AIDSVu

LOCAL STATISTICS | TESTING & CARE | RESOURCES

HOME :: COLORADO

Colorado

Number of People Living With HIV/AIDS in 2010: 11,006

Estimated HIV Prevalence Rate Ratios by Race/Ethnicity: 2010

The rate of black males living with an HIV infection diagnosis is 3.2 times that of white males.

The rate of Hispanic/Latino males living with an HIV infection diagnosis is 1 times that of white males.

The rate of black females living with an HIV infection diagnosis is 15.7 times that of white females.

The rate of Hispanic/Latino females living with an HIV infection diagnosis is 2 times that of white females.

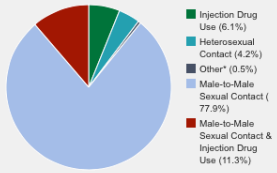
Late HIV Diagnoses: Estimated Percent of Adults/Adolescents Diagnosed with AIDS Within 12 Months of Initial HIV Infection Diagnosis: 2010

United States, 32%

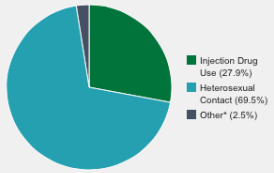
Colorado, 38.6%

Estimated Percent of Persons Living with an HIV Diagnosis at the End of 2010

Male Transmission Categories



Female Transmission Categories



*Includes hemophilia, blood transfusion, perinatal exposure, and risk factor not reported or not identified.

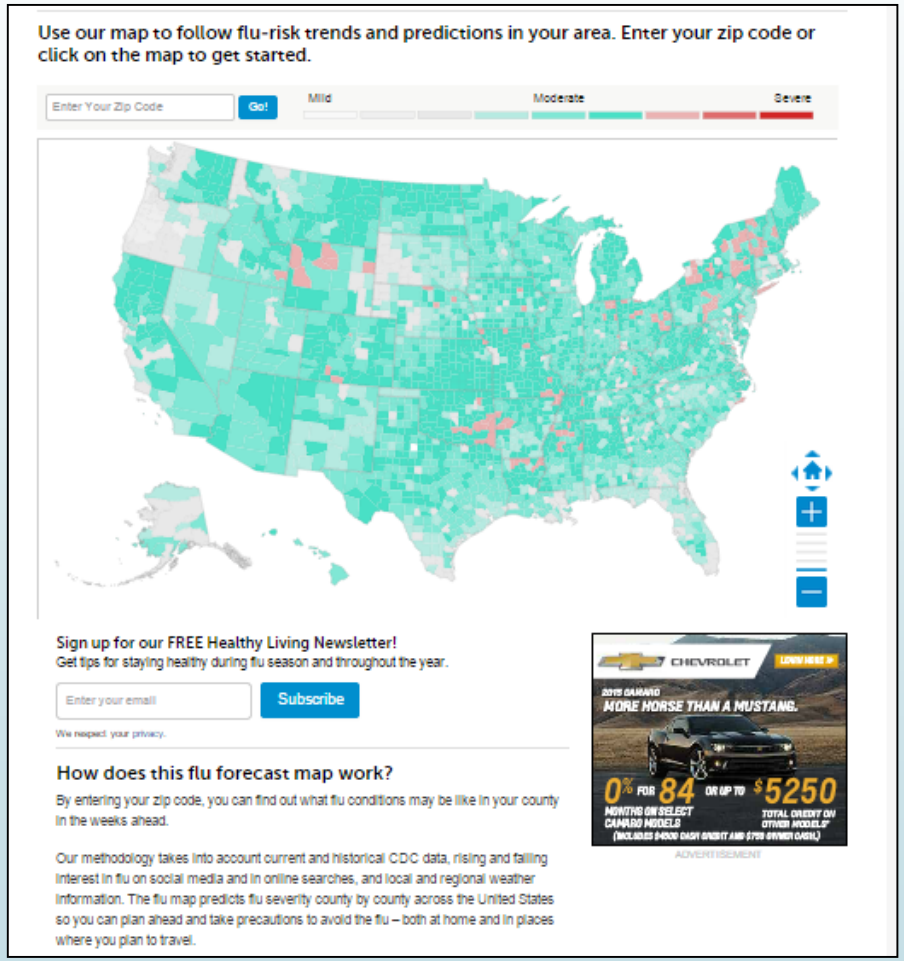
HIV Quick Facts
Demographics
STD Quick Facts
HIV Federal Funding/Programs
Health Department Websites
Link to Map

Colorado
Denver Metro Area

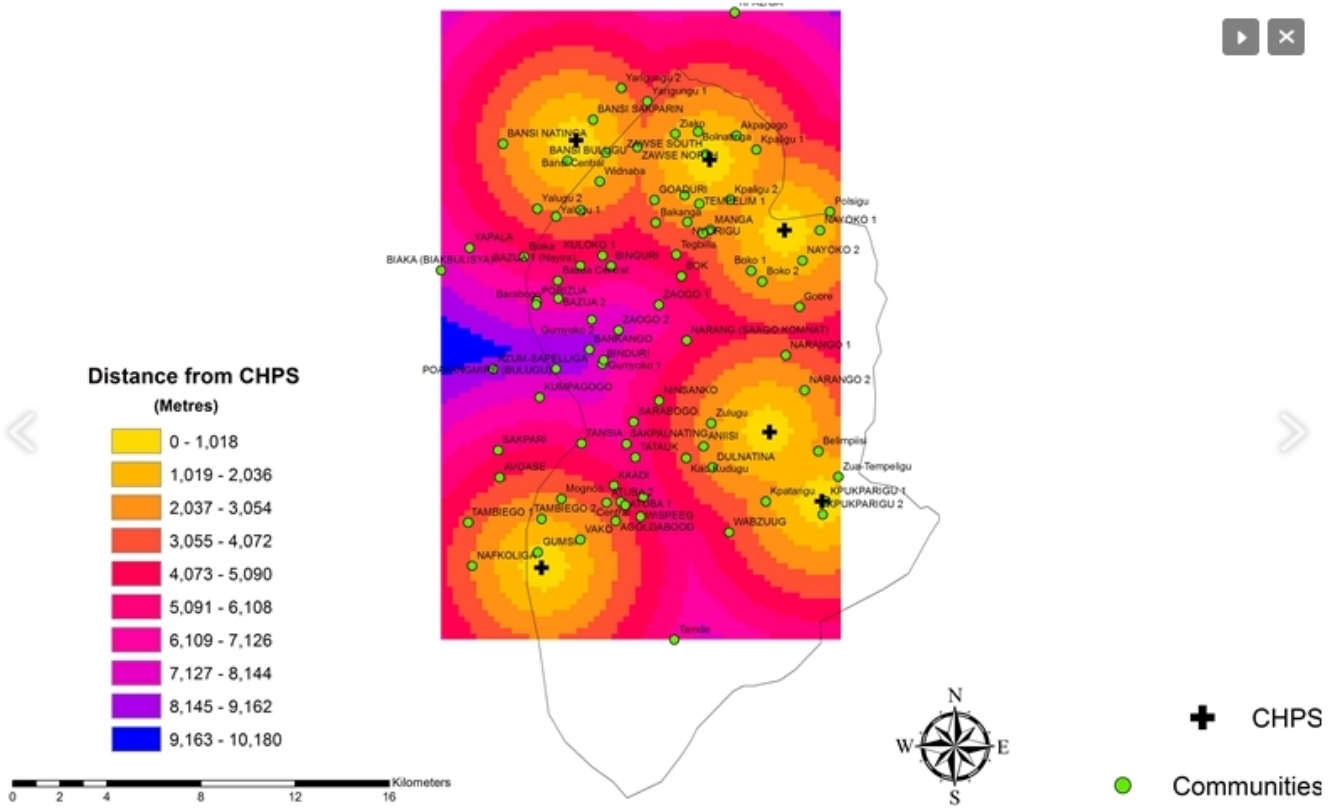
Disease Surveillance

- Disease Modelling

"Our methodology takes into account **current and historical CDC data**, rising and falling **interest in flu on social media and in online searches**, and local and regional **weather information**. The flu map predicts flu severity county by county across the United States so you can plan ahead and take precautions to avoid the flu – both at home and in places where you plan to travel."



Health Access Planning: Ghana

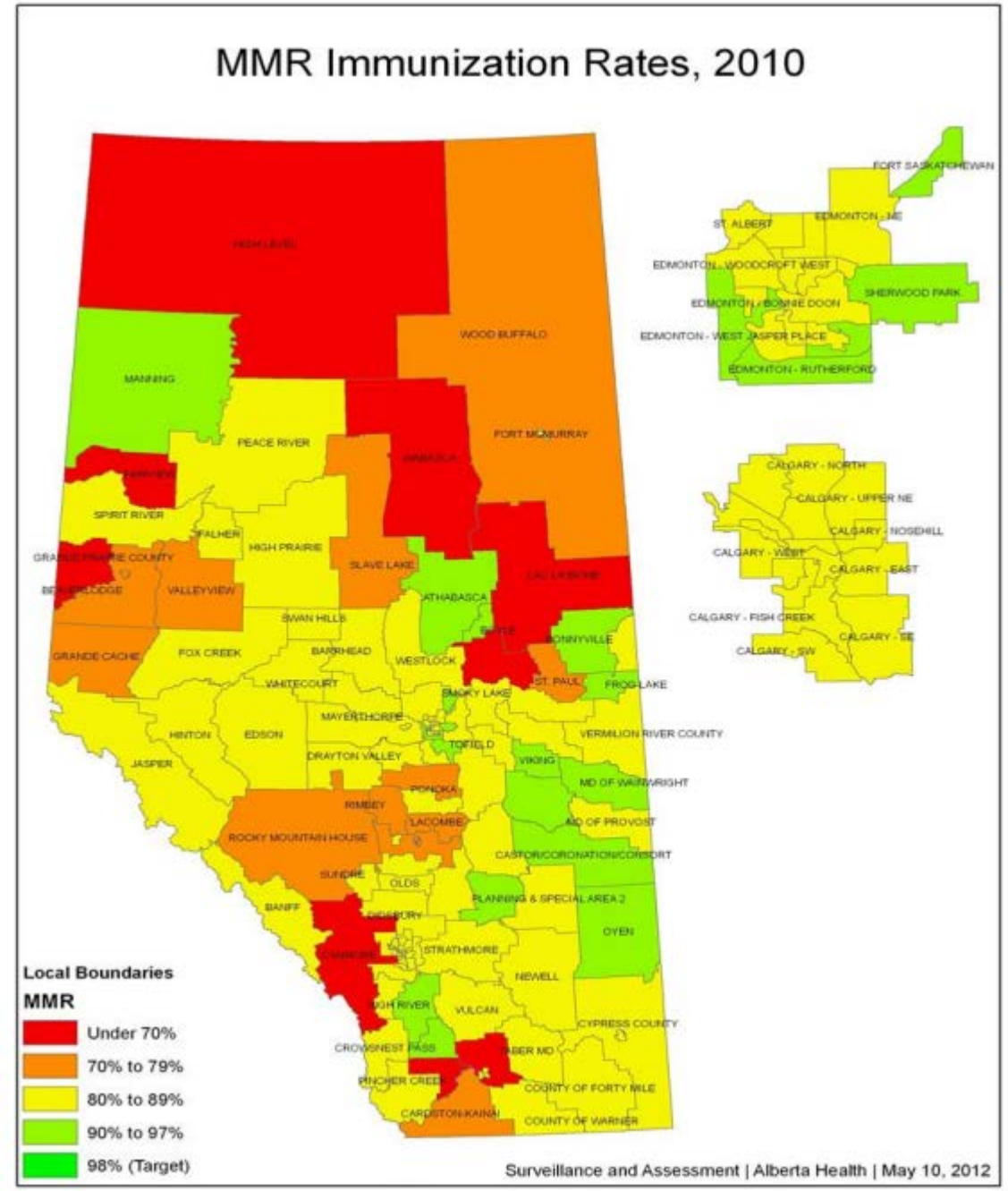


Spatial mapping shows the distance between individual communities and health centers (click on picture to see larger map). *Item 2 of 2*

- **Task:** to propose suitable locations to build new Community-based Health Planning and Service compounds in Ghana
- **Approach:** visually display communities and current health-care facilities (collected GPS coordinates of communities and combined with health facilities data). Then Calculated distance from communities to health-care facilities
- **Outcome:** GIS used to improve planning and knowledge of health access and planning for regional directors

Community Health Profiling

- Mapping Health behaviours influencing health.
- Interesting if we could overlay data about SES, ethnicity, religion, access to health services, etc…?

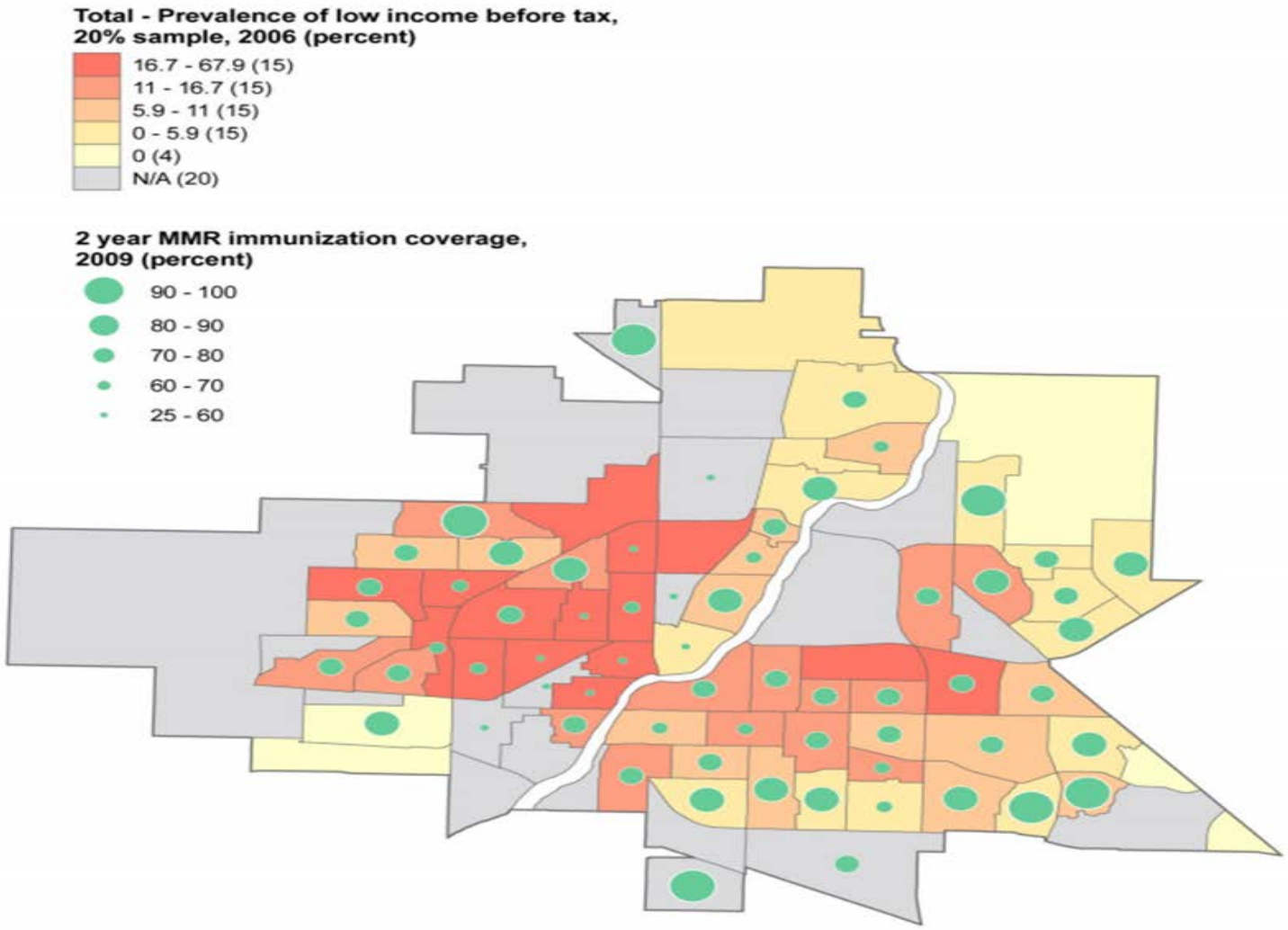


This coverage is for children at 2 years of age. The method used in these estimates use birth cohorts and account for migration into and out of the province, as well as migration between zones. Estimates exclude First Nations and Lloydminster residents.

Oh, wait…we can!
Or, at least Saskatoon can.

[Community View Collaboration]

LINK



Prevalence of low income before tax

Part A - Plain language definition:
Percentage of economic families or persons not in economic families who spend 20% more than average of their before-tax income on food, shelter and clothing.

Part B - Detailed definition:
The prevalence of low income before tax is the proportion or percentage of economic families or persons not in economic families in a given classification below the before tax low income cut-offs. These prevalence rates are calculated from unrounded estimates of economic families and persons not in economic families15 years of age and over.

Source: Statistics Canada, 2006

Risk Analysis

Background: In 2002, the WHO declared interpersonal violence to be a leading public health problem. Previous research demonstrates that urban spaces with a high incidence of violent trauma (hotspots) correlate with features of built environment and social determinants. However, there are few studies that analyse injury data across the axes of both space and time to characterise injury–environment relationships. This paper describes a spatiotemporal analysis of violent injuries in Vancouver, Canada, from 2001 to 2008.

LINK

Conclusions: This work posits the value of exploratory spatial data analysis using geographic information systems in trauma epidemiology studies and further suggests that using both space and time concurrently to understand urban environmental correlates of injury provides a more granular or higher resolution picture of risk. We discuss implications for injury prevention and control, focusing on education, regulation, the built environment and injury surveillance.

Downloaded from http://bmjopen.bmj.com/ on April 10, 2015 - Published by group.bmj.com

Open Access Research

BMJ Open

A GIS-based spatiotemporal analysis of violent trauma hotspots in Vancouver, Canada: identification, contextualisation and intervention

Blake Byron Walker,[1] Nadine Schuurman,[1] S Morad Hameed[2,3]

To cite: Walker BB, Schuurman N, Hameed SM. A GIS-based spatiotemporal analysis of violent trauma hotspots in Vancouver, Canada: identification, contextualisation and intervention. *BMJ Open* 2014;**4**:e003642. doi:10.1136/bmjopen-2013-003642

▸ Prepublication history for this paper is available online. To view these files please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2013-003642).

Received 25 July 2013
Revised 16 January 2014

ABSTRACT

Background: In 2002, the WHO declared interpersonal violence to be a leading public health problem. Previous research demonstrates that urban spaces with a high incidence of violent trauma (hotspots) correlate with features of built environment and social determinants. However, there are few studies that analyse injury data across the axes of both space and time to characterise injury–environment relationships. This paper describes a spatiotemporal analysis of violent injuries in Vancouver, Canada, from 2001 to 2008.

Methods: Using geographic information systems, 575 violent trauma incidents were mapped and analysed using kernel density estimation to identify hotspot locations. Patterns between space, time, victim age and sex and mechanism of injury were investigated with an exploratory approach.

Results: Several patterns in space and time were

Strengths and limitations of this study

- High-resolution multidimensional patterns of violent trauma are identified using a population-based trauma registry.
- Neighbourhood characteristics are used to describe context-specific urban violent spaces in a high-income country.
- Owing to data recording procedures and confidentiality regulations, this study is limited to severe trauma and excludes cases where the patient expired prior to arrival at a trauma centre.

this mortality rate is more than 13 times the number of American 'War on Terror' casualties that same year.[2 3] While medical and criminal perspectives tend to dominate the

Int J Health Geogr. 2008; 7: 22. PMCID: PMC2426678
Published online 2008 May 21. doi: 10.1186/1476-072X-7-22

Using GPS-enabled cell phones to track the travel patterns of adolescents

Sarah E Wiehe,[1,2] Aaron E Carroll,[1,2] Gilbert C Liu,[1,2] Kelly L Haberkorn,[1] Shawn C Hoch,[1] Jeffery S Wilson,[3] and J Dennis Fortenberry[4]

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Abstract

Go to:

Background

Few tools exist to directly measure the microsocial and physical environments of adolescents in circumstances where participatory observation is not practical or ethical. Yet measuring these environments is important as they are significantly associated with adolescent health-risk. For example, health-related behaviors such as cigarette smoking often occur in specific places where smoking may be relatively surreptitious.

LINK

Food Insecurity – population health risk

Geospatial Revolution / Episode Four, Chapter Two: Preventing Hunger

LINK

AN INTERESTING FIELD…*but will it put food on the table?*

- Career research: Environmental Epidemiologist http://www.eco.ca/career-profiles/environmental-epidemiologist/
- AHS data analyst, Calgary, undergraduate degree: https://albertahealthservices.ats.hrsmart.com/cgi-bin/a/highlightjob.cgi?jobid=387953
- National Cancer Institute, Environmental Epi: http://www.iseepi.org/Resources/documents/EnvEpiFellowshipflyer.pdf
- Postdoctoral opportunity, McGill University: http://www.iseepi.org/Resources/documents/PostdoctoralOpening-VHEMBEStudy.pdf
- International field work opportunity, Lao, Vietnam, Cambodia: http://www.iseepi.org/Resources/documents/Expertonclimatechange_adaptationandhealthsector.pdf
- Professor in Environmental Sciences, John's Hopkins: http://www.iseepi.org/Resources/documents/ENVEPIrecruitmentad5-13-15v3.pdf
- Information Technology, Vancouver: http://jobs.phsa.ca/ca/vancouver/information-technology/jobid10047968-surveillance-analyst

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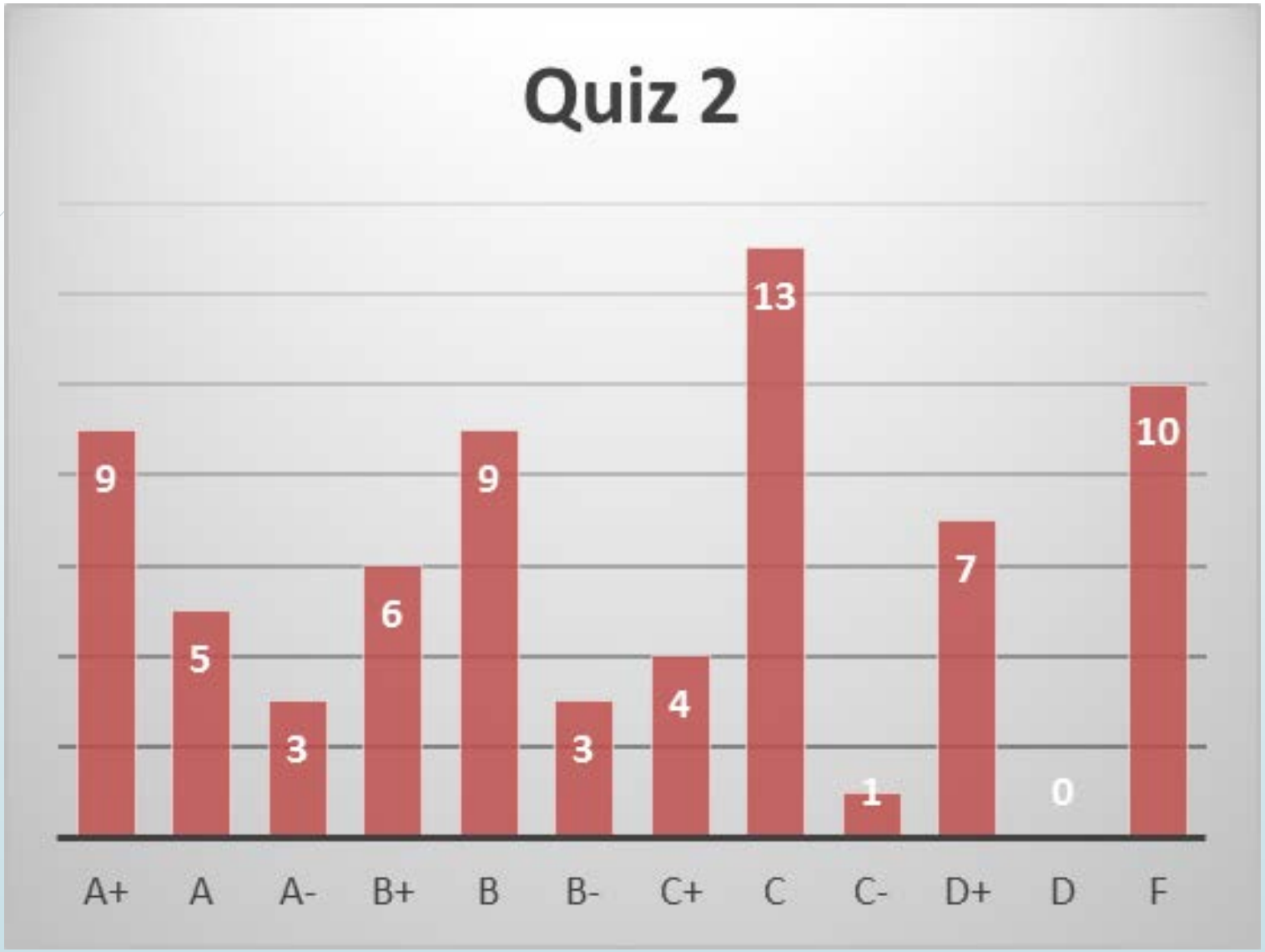

Class Average 75%

Marks will be posted immediately after class