Class 3: Measuring Disease Frequency I

EPIDEMIOLOGY HLSC 2003
FACULTY OF HEALTH SCIENCES
UNIVERSITY OF LETHBRIDGE
ALI WALKER

Point Prevalence measures:

A. The proportion of the population that has newly acquired the disease
B. The proportion of the population that currently has the disease.
C. The proportion of the population that once had the disease, but has now recovered.
D. The proportion of the population that has died of the disease.

16 people per 1000 became HIV-positive in 2007. This is an example of:

A. Prevalence
B. Mortality Rate
C. Incidence rate
D. Cumulative incidence

When calculating cumulative incidence, the denominator includes:

A. The whole population at the beginning of the time period

B. The segment of the population at risk of acquiring the disease, and the amount of time they were followed

C. The segment of the population at risk of acquiring the disease at the beginning of the time period

D. None of the above

Which of the following represents the relationship between prevalence (P) and incidence?

A. P= Duration of disease / Incidence
B. P= Incidence * Duration of disease
C. P= Incidence + Duration of disease
D. There is no relationship between prevalence and incidence.

Cumulative Incidence is a ratio and a rate:

A. TRUE

B. FALSE

Should Tobogganing be banned as a preventative measure for reducing unintentional injuries?

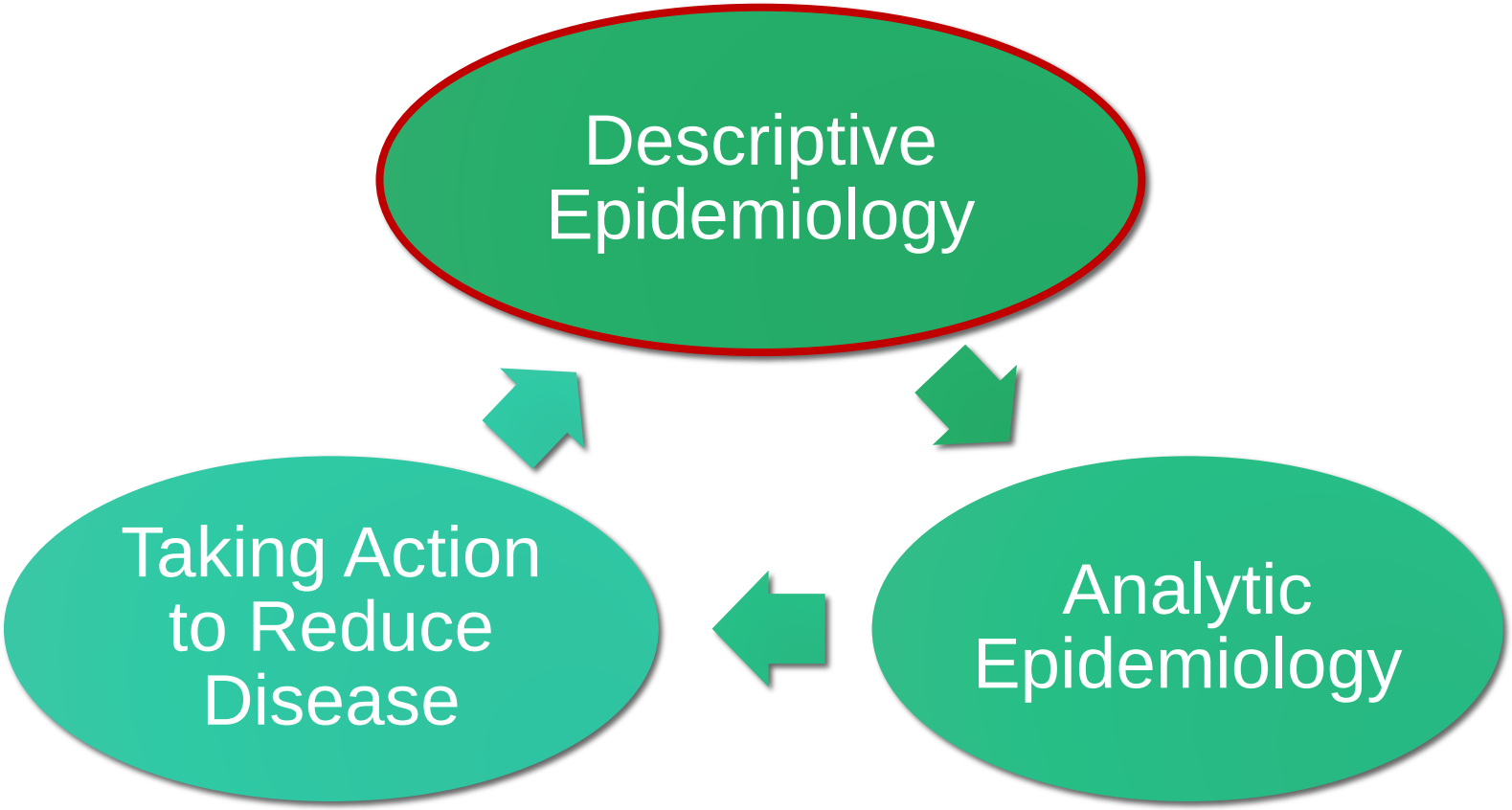
A. Yes

B. No

Class 3 & 4: Learning Objectives

1. Learn how to calculate Incidence Rates (two methods)
2. Understand what health surveillance data is, how it is used, and how to calculate incidence rate using surveillance data.
3. Understand various measures of mortality
4. Understand when crude, & standardized mortality rates are useful.

Cycle in Epidemiologic Work



Two Types of Incidence

1. CUMULATIVE INCIDENCE

2. INCIDENCE RATE (TWO METHODS FOR CALCULATING)
   - Person-time method
   - Surveillance/Routine Data Method

Incidence Rate

- Measures the *rate* at which people are developing disease.
- It is used as a more accurate measure of incidence as participants are at risk for different lengths of time.
- The numerator is the same as cumulative incidence (i.e. the number of new cases within time period)
- The denominator changes…it is no longer the population at beginning of observation period, it is now duration of time observed represented in **person-time units**

Calculating Incidence Rate
(Person-Time Method)

Calculation: **New cases** / person-time at risk

- Only those at-risk of the disease in denominator
- Interpreted as *person-years/days/months*
- Preferred, more accurate method
- Tells us how quickly (the speed) people are acquiring the disease

What are Person-Time Units?

They represent a single, combined measure of:

- The number of persons at risk of a disease, and
- The amount of time they were actually followed and at risk

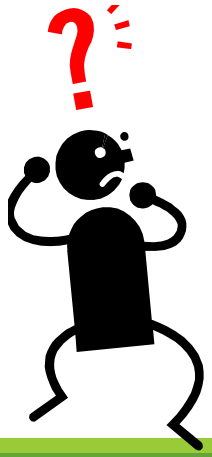
The most common person-time units are person-years, but units may be expressed in person-months, person-days

1 person-year =

- 1 person at risk of the disease for 1 yr
- 2 persons at risk for half a yr each.

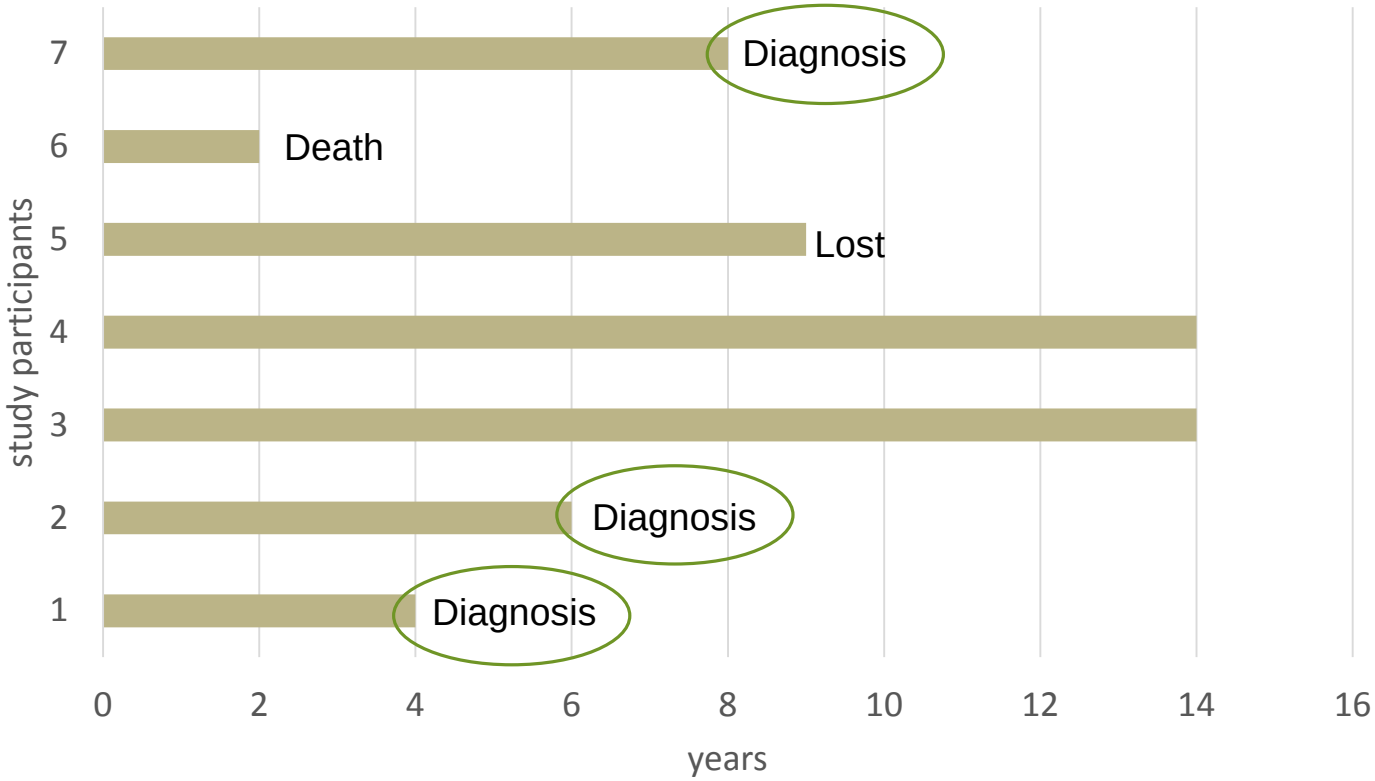
4 person-years =

- 4 persons at risk for 1 yr
- 1 person at risk for 4 yrs
- 2 persons at risk for 2 yrs.



Calculating Person-Years for Incidence Rates:

A study observes 1865 people for 14 years. Data in graph below:



Participant 1 - 4
Participant 2 – 6
Participant 3 – 14
Participant 4 – 14
Participant 5 – 9
Participant 6 – 2
Participant 7 – 8

TOTAL = 57 pyrs

Incidence Rate = 3/57 = 0.053 *1000 = 53

The Incidence Rate is 53 cases per 1000 *person-years*

What is the incidence rate for heart attacks in this 10-year study?

A	B	A x B
Number of Subjects	Length of observation (years)	Person-years
30	10	
10	9	
7	8	
2	7	
1	1	
Total 50		
Number of health events (heart attacks) observed during the 10-year period: 5		
Incidence rate =		

The only thing certain in Epidemiology is that there is always uncertainty

When does a subject become a “case”?

- Subjects may only be examined at certain intervals (e.g. once per year)
- Investigator must determine when a newly diagnosed case actually acquired the disease
- May select the midpoint between intervals, or may choose to calculate the precise day of diagnosis and calculate a fraction of the year
- Once a subject becomes a case, or when the subject being followed is lost, they are then removed from the person-time unit denominator

Calculating Incidence Rate when person-time data is not available

(Surveillance/routine data method)

- estimate used when direct measures of person-time are not available
- Assumes that everyone in the population is at risk
- Uses the midpoint population* the duration of the period (this becomes the denominator)
- This is an adequate estimate, provided that the population remains stable throughout the period and that the condition of interest is rare (less than 10%)

*note: If the midpoint population is not known, it is an average of the population at the beginning of the time period and the population at the end of the time period. The numerator is still the number of new cases diagnosed during the time period

Midpoint (mean) population

- For a one year incidence rate, midpoint population is:

$$\frac{\text{start-of-year population} + \text{end-of-year population}*1}{2}$$

For five-year incidence rate, the denominator would be:

The population at midpoint *5 years

Mid-Interval Population Calculation Example – Lethbridge Census

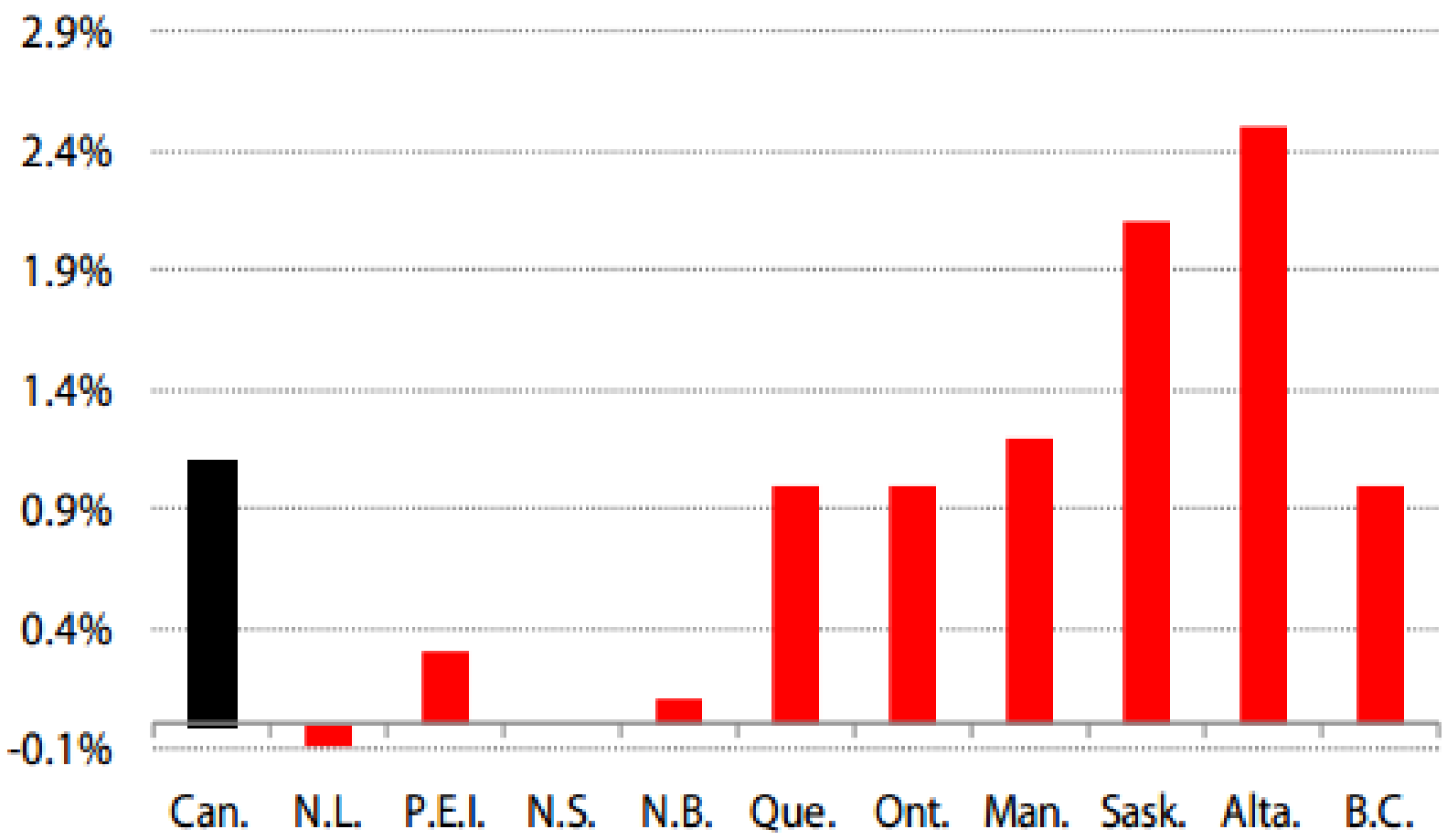
Lethbridge population: beginning of 2013 = **89,074**

Lethbridge population: end of 2013 = **90,417**

Denominator for incidence rate for the population of Lethbridge for 2013 = **89,746**

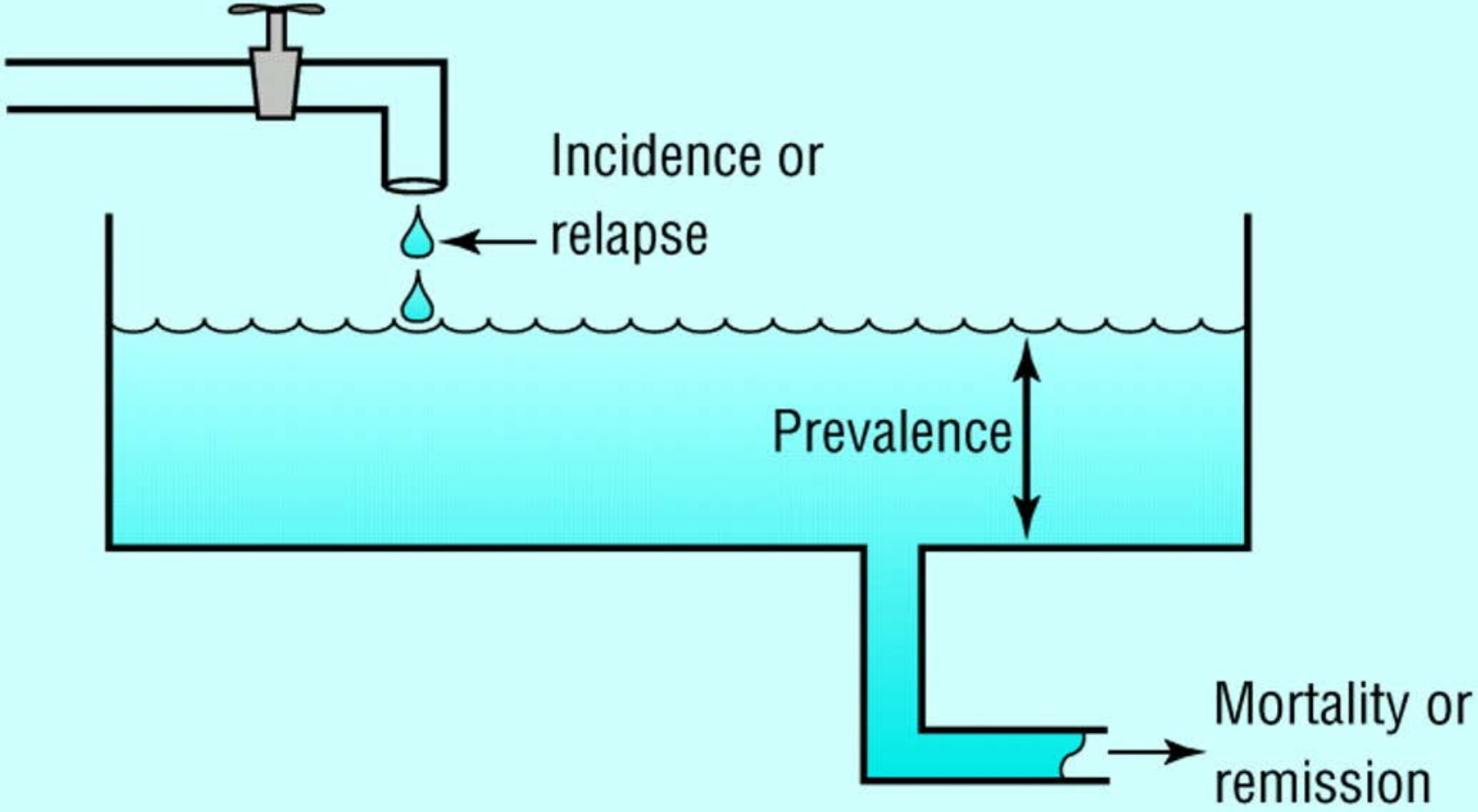
If the number of new cases of Cancer in Lethbridge in 2013 was 43, what would be the incidence rate based on this census data?

Population Growth: 2011-2012



Source: Statistics Canada

Link to report



IN-Class Activity #1

Class 3

Aircraft Pictures Corporation 1917

Amazon, Blue Q

Process for 1st in-class Assignment

CDC fact Sheet Tuberculosis: An Overview

1. Get into groups of four (this will be your group for all in-class assignments)
2. Put group member names on Assignment #1 (only include group members present in class today)
3. Select a group facilitator (this will be a different person each time) to ensure that all group members are being heard, included, and that the group is on-track
4. Complete the assignment (discuss answers as a group; work together; complete all answers)
5. Submit ONE copy of the assignment to instructor prior to leaving class

Epidemiology in the News

January 14, 2016

Zika virus link to birth defects in Brazil boosted: CDC

Small percentage of pregnant women with Zika symptoms gave birth to babies with small heads

The Associated Press Posted: Jan 14, 2016 9:18 AM ET | Last Updated: Jan 14, 2016 9:18 AM ET

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Brazilian health authorities are convinced that baby Luiza's head condition is related to the Zika virus that infected her mother during pregnancy. (Felipe Dana/Associated Press)

Researchers have found the strongest evidence so far of a possible link between a mosquito-borne virus and a surge of birth defects in Brazil, the U.S. Centers for Disease Control and Prevention said Wednesday.

The health agency said evidence of the dengue-like Zika virus was **found in the placentas** from two women who miscarried and the brains of two newborns who died. Those who were born had small heads, a rare condition known as microcephaly.

- **B.C. resident diagnosed with Zika virus after trip to El Salvador**
- **Alberta tourist diagnosed with rare virus after trip to Thailand**

"The evidence is becoming very, very strong of the link between the two," said Dr. Lyle Petersen, director of mosquito-borne diseases at the CDC.

Finding the virus present in brain tissue is "very significant," he said.

Petersen warned that the link is not yet definite and said that a team of CDC investigators is travelling to Brazil in a few weeks to conduct more studies and learn what risks face pregnant women. "It's possible that there may be some other co-factors involved."

Related Stories

- B.C. resident diagnosed with Zika virus after trip to El Salvador
- Alberta tourist diagnosed with rare virus after trip to Thailand

External Links

- Zika virus travel health advice, Public Health Agency of Canada
- Zika Virus in Puerto Rico, U.S. Centers for Disease Control and Prevention
- Zika Virus in the Americas, New England Journal of Medicine

(Note: CBC does not endorse and is not responsible for the content of external links.)

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- Greyhound bus flips over south 82

Must Watch

LINK to News article

LINK to New England Journal of Medicine Article on Zika Virus

LINK to ECDC summary report

LINK to public health agency of Canada notice on Zika

SURVEILLANCE

Readings: Bonita et al. (Ch.7); Gillam et a. (Ch. 13)

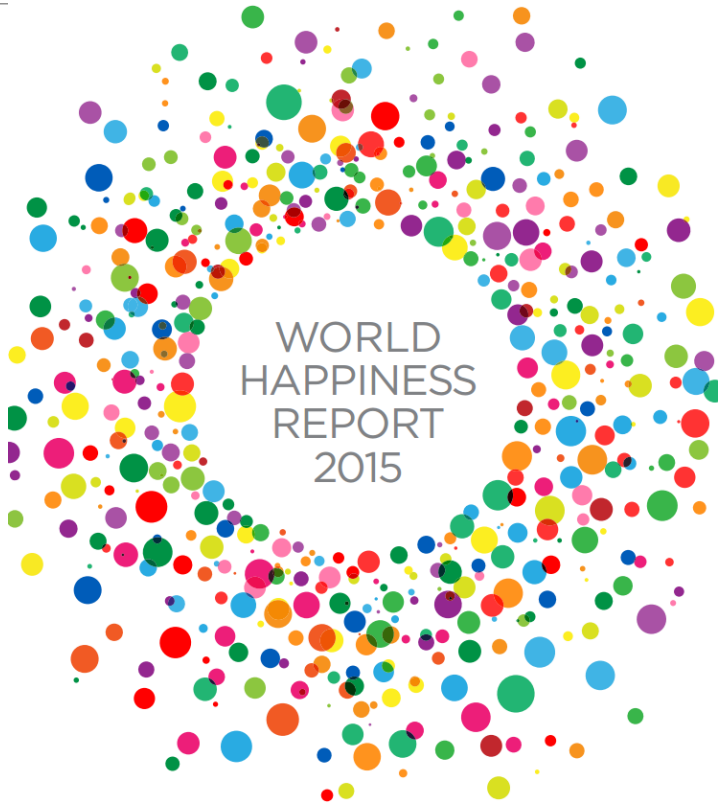
HEALTH SURVEILLANCE:

The ongoing systematic collection, analysis and interpretation of health data essential for planning, implementing, and evaluating public health activities….and the timely dissemination of this information to those who need to know so that necessary action can be taken.

-CDC; Gillam et. al; Bonita et al.

Why do Surveillance?

- Necessary for descriptive epidemiology – monitor morbidity and mortality, and prevalence and incidence of disease.
- Measures other health related data such as vaccination rates, drug resistant disease frequency, epidemic monitoring, risk factors, and positive health states.
- Helps identify trends in health phenomenon of interest
- Identify populations at greater risk
- Allows for the generation of hypotheses about certain health conditions Offers close to real time data



Link to Report

Drug and Alcohol Dependence 128 (2013) 166–170

Contents lists available at SciVerse ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Short communication

Epidemiology of adolescent *Salvia divinorum* use in Canada

Cheryl L. Currie*

Faculty of Health Sciences, University of Lethbridge, M3083 Markin Hall, Lethbridge, Alberta, Canada T1K 3M4

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Correlates
Canada

ABSTRACT

Background: Salvia divinorum is a potent, naturally occurring hallucinogen gaining popularity as a recreational drug in North America. To date, detailed epidemiologic information about the use of this substance among adolescents living outside the United States has been limited. This study provides information on the prevalence and correlates of *Salvia divinorum* use among adolesecents in Canada using a nationally representative sample.

Methods: Data were obtained from a representative sample of 42,179 Canadian adolescents aged 12–17 years living across all 10 provinces who completed the Youth Smoking Survey in 2008–09.

Results: Overall, 3.8% of adolescents reported using *Salvia* in the past year and 6.2% had used the substance in their lifetime. A conservative estimate suggests 23.2% of youth were repeat users. *Salvia* use was highest among youth in British Columbia and Quebec. Comparatively, the prevalence of 12-month *Salvia* use was higher than 12-month cocaine and amphetamine use but lower than 12-month ecstasy, cannabis, and other hallucinogen use. Correlates of *Salvia* use included older age, male gender, high available spending money, binge drinking, illicit drug use and smoking in fully adjusted models. Findings suggest low self-esteem may be an important correlate specific to the use of this substance among youth.

Conclusions: Salvia divinorum use is prevalent among Canadian adolescents. *Salvia* may be a significant public health issue in Canada given it is readily available, under limited regulation, and little is known about the abuse liability of the substance, interactions with other substances, and potential complications from use.

CanJPsychiatry 2012;57(12):745–751

Original Research

Adolescent Use of Prescription Drugs to Get High in Canada

Cheryl L Currie, PhD[1]; T Cameron Wild, PhD[2]

[1]Assistant Professor, Faculty of Health Sciences, University of Lethbridge, Lethbridge, Alberta.
Correspondence: Faculty of Health Sciences, M3051 Markin Hall, 4401 University Drive, University of Lethbridge, Lethbridge, AB T1K 3M4; cheryl.currie@uleth.ca.

[2]Professor and Associate Dean (Research), School of Public Health, University of Alberta, Edmonton, Alberta.

Key Words: prescription drug misuse, Canada, epidemiology, adolescent, Aboriginal, school connectedness

Received February 2012, revised, and accepted May 2012.

Objective: To present epidemiologic information on adolescent use of prescription drugs to get high, and not for medical purposes, in Canada.

Methods: Data were obtained from 44 344 adolescents in grades 7 to 12 living across Canada's 10 provinces who completed the Youth Smoking Survey in 2008/2009.

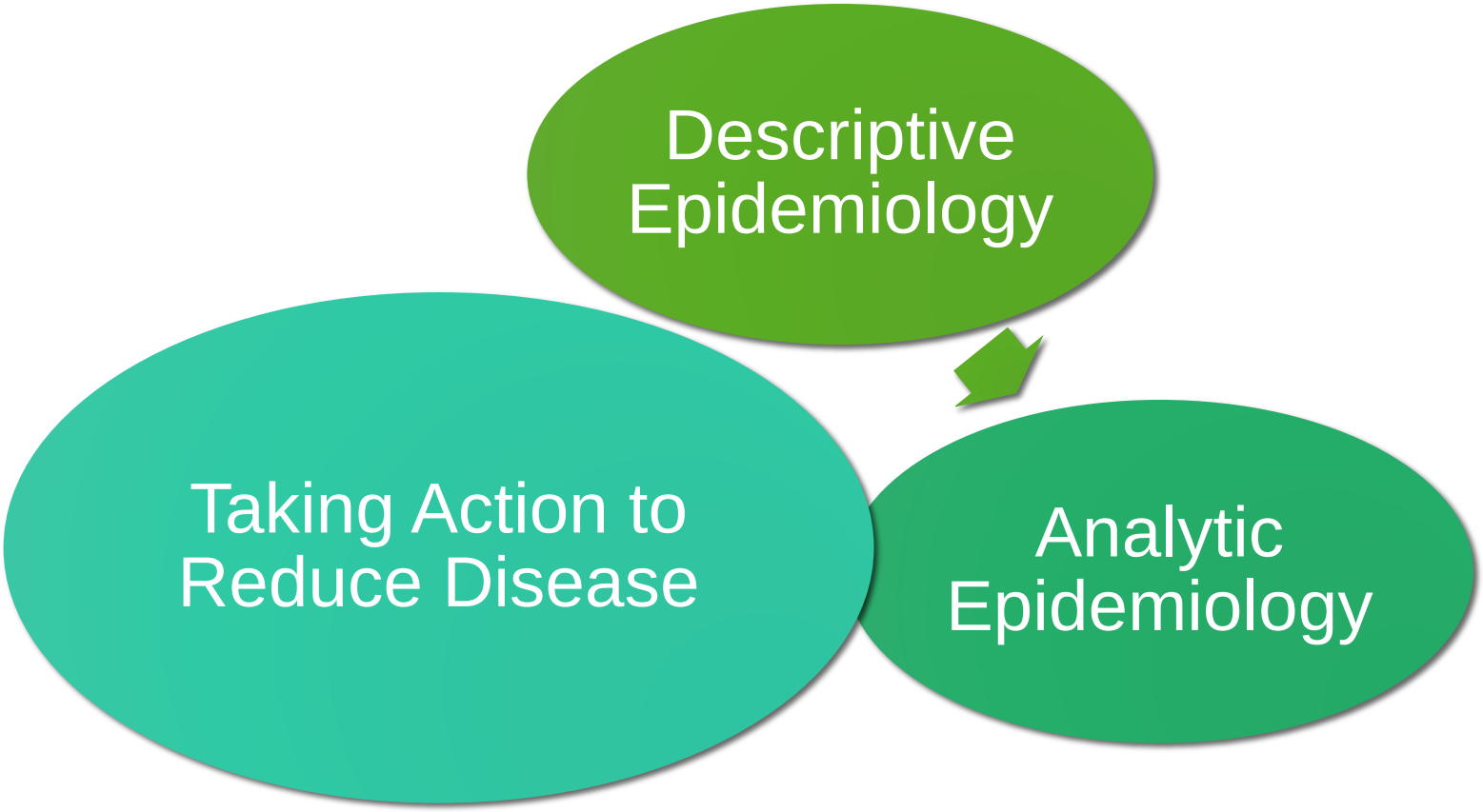
Results: Nationally, 5.9% of adolescents in grades 7 to 12 reported the use of prescription drugs to get high in the past 12 months in 2008/2009. Females were more likely to report use of pain relievers, sedatives, or tranquilizers to get high, while males were more likely to report the use of prescription stimulants for this purpose. The use of prescription drugs to get high was elevated among older youth, those living in British Columbia, and those who identified as First Nations, Métis, or Inuit. School connectedness was associated with a reduction in this form of prescription drug misuse for all adolescents; however, this protective effect was particularly strong for Aboriginal youth, and may be an important preventative factor for this population.

Conclusions: Use of prescription drugs to get high was prevalent among adolescents in Canada in 2008/2009. Findings highlight the need for clinicians to include questions about prescription drugs when screening adolescents for substance abuse in Canada. Findings also highlight the need for evidence-informed strategies to reduce prescription drug misuse among Aboriginal youth living outside First Nations communities in Canada. The results of this study suggest school connectedness may be a particularly important target for these interventions.

Surveillance Systems Should:

- Include conditions for which surveillance will lead to effective prevention
- Reflect disease burden
- Have clear case definitions
- Be uniform and continuous
- Have rapid collection, analysis, interpretation, and reporting

Cycle in Epidemiologic Work



Passive vs. Active Surveillance

PASSIVE

Reporting is mandated or requested

Responsibility falls on the health care providers

Allows for comparison and can identify areas needing urgent intervention

ACTIVE

Project staff make periodic field visits to health care facilities/populations to collect data

Interview physicians, patients, look through medical records, survey rural villages

Hans Rosling: The good News of the Decade (TED, Ideas Worth Spreading, September 2010)
http://www.ted.com/talks/hans_rosling_the_good_news_of_the_decade.html (minute 1:45-4:55)

Types of Surveillance Data:

- Case reports, case series (HIV, SARS, H5N1)

http://www.cbc.ca/homestretch/episode/2014/01/08/bird-flu-death

- Population surveys
- Routine data collection (surveillance data collected by Governments or other national/international statistical organizations)
  - Mortality data (death certificates, verbal autopsy)
  - Morbidity data (disease registries, hospital records, notifiable diseases)

Notifiable Diseases

- Identified by the government as priority for monitoring and control efforts
- This list is revised as needed
- Must have a clear case definition (to include signs, symptoms, and tests)
- Historically only infectious diseases are notifiable.

Why is there uncertainty in this surveillance method?

Notifiable Diseases

Click on the disease name for links to other information on the disease.

Current List of Nationally Notifiable Diseases and Years of Notifiable

Current Notifiable Diseases	Years Notifiable	Notes
AIDS	1986 - present	
Acute Flaccid Paralysis (AFP)	2000 - present	
Anthrax	1930 - 1982, 2002 - present	
Botulism	1933 - present	
Brucellosis	1928 - present	Originally called 'undulant fever'
Campylobacteriosis	1986 - present	
Chickenpox (Varicella)	1924 - 1958, 1986 - present	
Chlamydia	1991 - present	See 'sexually transmitted infections' in the listing of links
Cholera	1930 - present	Asiatic' cholera specified between 1930 and 1958
Clostridium difficile Associated Diarrhea (CDI)	2009 - present	
Congenital Rubella Syndrome (CRS)	1979 - present	
Congenital Syphilis	1993 - present	See 'sexually transmitted infections' in the listing of links
Creutzfeldt-Jakob Disease (CJD)	2000 - present	Not presented on the application
Cryptosporidiosis	2000 - present	
Cyclosporiasis	2000 - present	
Diphtheria	1924 - present	
Giardiasis	1983 - present	
Gonorrhea	1924 - present	See 'sexually transmitted infections' in the listing of links
Group B Streptococcal Disease of the Newborn (GBS)	2000 - present	
Invasive *Haemophilus influenzae*, type b Disease	1986 - present	Invasive *Haemophilus influenzae* disease was collected from 1979 onward, but with no type specified
Invasive *Haemophilus influenzae*, non-b Disease	2007 - present	
Hantavirus Pulmonary Syndrome	2000 - present	
Hepatitis A	1927 - 1958,	Originally named 'infectious jaundice'. Between

Link

Ebola Haemorrhagic Fever*

Created Dates

Case Definition	December2014
Reporting Requirements	December2014
Remainder of the Guideline (i.e., Etiology to References sections inclusive)	December2014

Case Definition[1]

Confirmed Case

Laboratory confirmation of Ebola virus infection using at least one of the methods below:

- Isolation and identification of virus from an appropriate clinical specimen (e.g., blood, serum, tissue, urine specimens or throat secretions)

OR

- Detection of virus-specific RNA by reverse-transcriptase PCR from an appropriate clinical specimen (e.g., blood, serum, tissue) using two independent targets or two independent samples

OR

- Demonstration of virus antigen in tissue (e.g., skin, liver or spleen) by immunohistochemical or immunofluorescent techniques AND another test e.g., PCR

OR

- Demonstration of specific IgM AND IgG antibody by EIA, immunofluorescent assay or Western Blot

OR

- Demonstration of seroconversion or a fourfold rise in IgG serum antibody by EIA, immunofluorescent assay or Western Blot from serial samples

Probable Case

Clinical illness[1] with at least one of the following high-risk exposures within the 21 days before the onset of symptoms:

- Percutaneous or mucous membrane exposure or direct skin contact with body fluids of a person with a confirmed or probable case of Ebola virus disease (EVD) without appropriate personal protective equipment (PPE)

OR

- Sexual contact with a probable or confirmed EVD case

OR

- Laboratory worker processing body fluids or tissues of probable or confirmed EVD cases without appropriate PPE or standard biosafety precautions

OR

- Healthcare worker (HCW)[2] not wearing PPE and/or not adhering to appropriate infection prevention and control precautions, who directly or indirectly cared for a probable or confirmed case of EVD (e.g., direct patient care or contact with environment or fomites of a case)

OR

*Denotes potential bioterrorism agent.

Alberta Government

LINK

National Notifiable Disease systems are a form of:

A. Active Surveillance
B. Rumour Surveillance
C. Case Reports
D. Passive Surveillance

Challenges to Health Surveillance:

Inaccuracy of data

Timeliness

Conformity

Uniformity

Method of storage and communication

Compilation of data

Inability to classify (lack of diagnostics)

Politics

Rumors

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Long-form census cancellation taking toll

Questions raised over how data can be used reliably

The Canadian Press Posted: Oct 27, 2012 12:14 PM ET | Last Updated: Oct 27, 2012 12:12 PM ET

The federal government's decision to cancel the long-form census is taking its toll on stakeholders requiring specific information. (Sean Kilpatrick/The Canadian Press)

17 shares

Facebook

Prime Minister Stephen Harper's cancellation of the long-form census has started to take a toll on Statistics Canada's data.

The agency released its final tranche of the 2011 census last week, focusing on languages, but it included a big warning that cautions data

Link

Large data SURVEILLANCE in CANADA:

Youth Smoking Survey (YSS) – Now called Health Canada's "Canadian Student Tobacco, Alcohol and Drugs Survey" (CSTADS)

https://uwaterloo.ca/canadian-student-tobacco-alcohol-drugs-survey/about

National Population Health Survey (NPHS)

http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3225&Item_Id=1824&lang=en

Canadian Community Health Survey (CCHS)

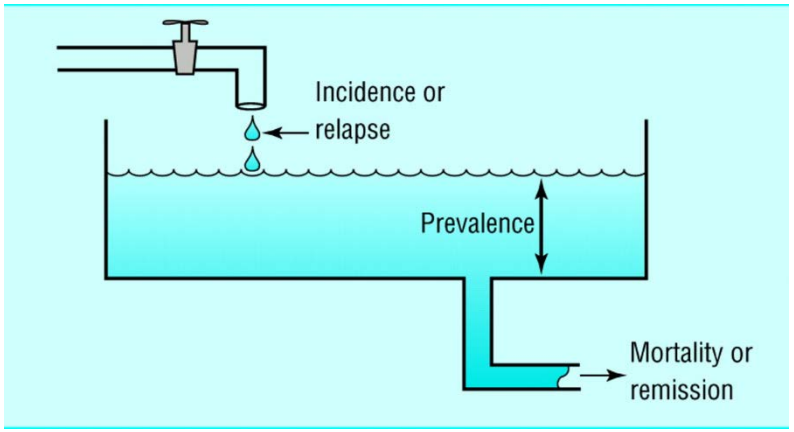
http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SurvId=3226&SurvVer=0&InstaId=15282&InstaVer=4&SDDS=3226&lang=en&db=imdb&adm=8&dis=2

Canadian Corhonic Disease Sruveillance System (CCDSS)

http://open.canada.ca/data/en/dataset/9525c8c0-554a-461b-a763-f1657acb9c9d

Making use of surveillance data: Guest Presentation

ERIN MASON, MSC CANDIDATE



Mortality Rates

(incidence of death)

Remember:

Mortality = death

Morbidity = disease

Monty Python – "bring out your dead"

Crude Mortality Rates(death rate):

All-cause mortality rate – deaths from all causes in a specific population.

Cause-specific mortality rate – deaths due to specific types of disease

Calculating Mortality rates:

All-cause mortality rate =

$$\frac{\text{\# of deaths in one year}}{\text{\# of persons at risk of dying (i.e. the population) at midyear}} \times 10^{(n)}$$

Cause-specific mortality rate =

$$\frac{\text{\# deaths due to a specific disease in one year}}{\text{\# of persons at risk of dying of that disease at midyear}} \times 10^{(n)}$$

**remember that both the numerator and denominator are over a specified period of time, typically one year*

Mortality Rates: Yes, but can we be more specific?

- Can also have age-specific, gender-specific, or other identifiable subgroup-specific mortality rates
- Whatever restriction you apply to the numerator, it must be applied to the denominator
- Time must be specified in the mortality rate

Table 1-1
Deaths and mortality rate, by selected grouped causes, sex and geography — Canada[1]

COUNTS

?

	Number of deaths			Crude mortality rate per 100,000 population [2]			Age-standardized mortality rate per 100,000 population [2]		
	Both sexes	Males	Females	Both sexes	Males	Females	Both sexes	Males	Females
Total, all causes of death (A00-Y89) [3,4,5]	**238,617**	**120,426**	**118,191**	**716.2**	**729.0**	**703.6**	**531.3**	**652.6**	**436.0**
Salmonella infections (A01-A02)	7	1	6	0.0	0.0	0.0	0.0	0.0	0.0
Shigellosis and amoebiasis (A03, A06)	1	0	1	0.0	0.0	0.0	0.0	0.0	0.0
Certain other intestinal infections (A04, A07-A09)	1,094	445	649	3.3	2.7	3.9	2.3	2.5	2.1
Tuberculosis (A16-A19)	**92**	**52**	**40**	**0.3**	**0.3**	**0.2**	**0.2**	**0.3**	**0.2**
Respiratory tuberculosis (A16)	70	40	30	0.2	0.2	0.2	0.2	0.2	0.1
Other tuberculosis (A17-A19)	22	12	10	0.1	0.1	0.1	0.1	0.1	0.0
Whooping cough (A37)	1	0	1	0.0	0.0	0.0	0.0	0.0	0.0
Scarlet fever and erysipelas (A38, A46)	3	2	1	0.0	0.0	0.0	0.0	0.0	0.0
Meningococcal infection (A39)	14	7	7	0.0	0.0	0.0	0.0	0.0	0.0
Septicaemia (A40-A41)	2,135	1,011	1,124	6.4	6.1	6.7	4.7	5.5	4.2
Syphilis (A50-A53)	5	4	1	0.0	0.0	0.0	0.0	0.0	0.0
Acute poliomyelitis (A80)	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Arthropod-borne viral encephalitis (A83-A84, A85.2)	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Measles (B05)	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Viral hepatitis (B15-B19)	446	292	154	1.3	1.8	0.9	1.0	1.4	0.7
Human immunodeficiency virus [HIV] disease (B20-B24)	407	313	94	1.2	1.9	0.6	1.1	1.6	0.5
Malaria (B50-B54)	2	1	1	0.0	0.0	0.0	0.0	0.0	0.0
Other and unspecified infectious and parasitic diseases and their sequelae [6]	497	241	256	1.5	1.5	1.5	1.2	1.3	1.0
Malignant neoplasms (C00-C97)	**70,558**	**37,077**	**33,481**	**211.8**	**224.5**	**199.3**	**163.6**	**197.0**	**139.9**
Malignant neoplasms of lip, oral cavity and pharynx (C00-C14)	1,105	749	356	3.3	4.5	2.1	2.6	3.9	1.5
Malignant neoplasm of oesophagus (C15)	1,732	1,357	375	5.2	8.2	2.2	4.0	7.0	1.5
Malignant neoplasm of stomach (C16)	1,949	1,164	785	5.9	7.0	4.7	4.5	6.2	3.2
Malignant neoplasms of colon, rectum and anus (C18-C21)	7,842	4,254	3,588	23.5	25.8	21.4	17.9	22.5	14.2
Malignant neoplasm of liver and intrahepatic bile ducts (C22)	1,898	1,227	671	5.7	7.4	4.0	4.4	6.4	2.8
Malignant neoplasm of pancreas (C25)	3,800	1,897	1,903	11.4	11.5	11.3	8.8	10.0	7.8
Malignant neoplasm of larynx (C32)	460	372	88	1.4	2.3	0.5	1.1	2.0	0.4
Malignant neoplasms of trachea, bronchus and lung (C33-C34)	18,704	10,336	8,368	56.1	62.6	49.8	44.2	54.7	36.2
Malignant melanoma of skin (C43)	901	568	333	2.7	3.4	2.0	2.2	3.0	1.5
Malignant neoplasm of breast (C50)	5,006	51	4,955	15.0	0.3	29.5	11.5	0.3	20.9
Malignant neoplasm of cervix uteri (C53)	...	...	361	...	...	2.1	...	...	1.7

Image linked to pdf

Why might using crude mortality rates be limiting for public health?

WHAT IS THE MOST IMPORTANT DETERMINANT OF MORTALITY?

Crude Mortality Rates

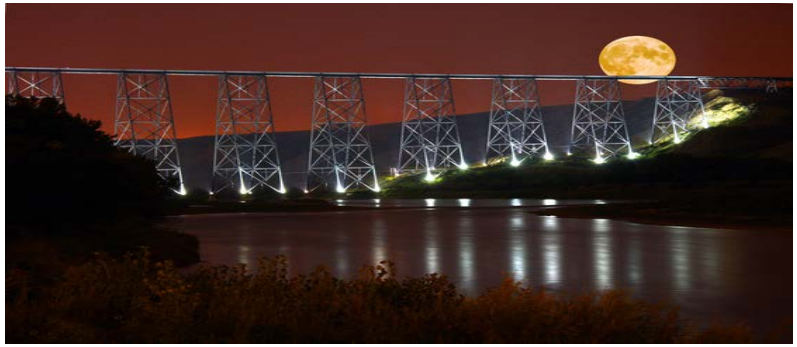
- Risk of becoming ill and dying varies with age.
- Incidence rates (including mortality rates) that **do not take the age structure or other variables of a population into account** are called **crude rates**.
- Crude rates tell **us** **the burden of a health problem** (how much disease a health system is coping with), but does not give us an accurate picture of health for populations comparatively across different populations.

Example: Lethbridge

Cause-specific mortality (crude rates) for heart disease is higher for the population of Lethbridge than the rest of Alberta

(172 per 100,000 vs. 106 per 100,000)

WHY IS THAT?



Crude Rates

- Use crude rates with caution when comparing disease frequencies **between populations**.
- Observed differences in crude rates in health may be the result of **differences in sociodemographic factors** (such as age) between populations rather than true variations in rates.
- Crude rates are useful only when you want to know **actual amount** of disease in a population, not when attempting to compare disease rates across different provinces or between countries

Crude Mortality Rates: Ischemic heart disease (IHD) in males

Country	Crude IHD mortality rate (per 10^5/year)
Germany	**211**
Australia	168
Canada	160
Singapore	118
Spain	116
Japan	50
Brazil	**47**

Table 2.4 - Textbook

Crude and age-specific mortality rates

Country	Crude rate (per 10^5/year)	Age-specific rates (per 10^5/year)	
		45-54 years	55-64 years
Germany	211	76	245
Australia	168	68	222
Canada	160	73	239
Singapore	118	100	346
Spain	116	59	156
Japan	50	20	60
Brazil	47	64	183

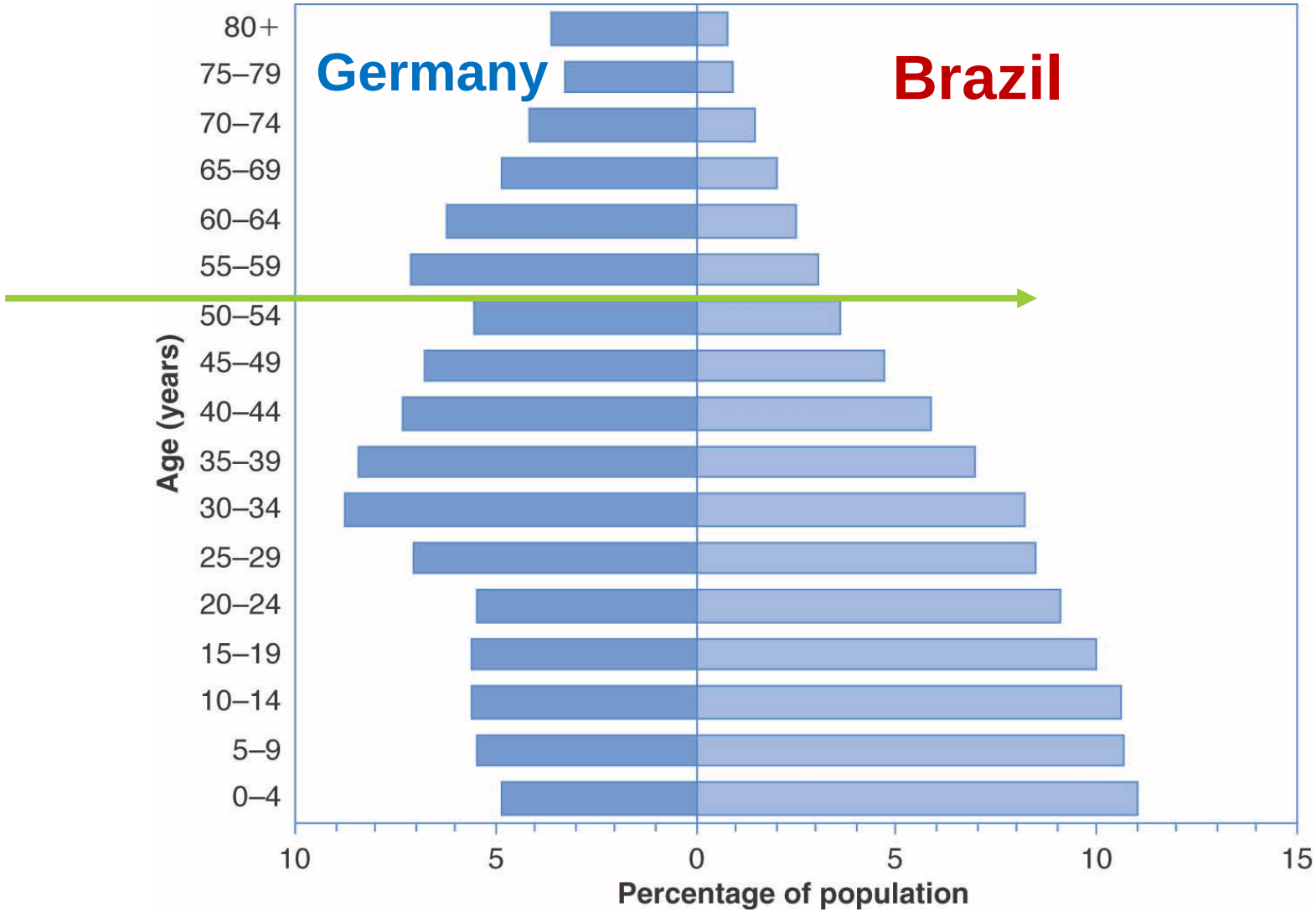


Fig 2.3
Age distribution of the population in Brazil and Germany (Gillam et al. – p. 48)

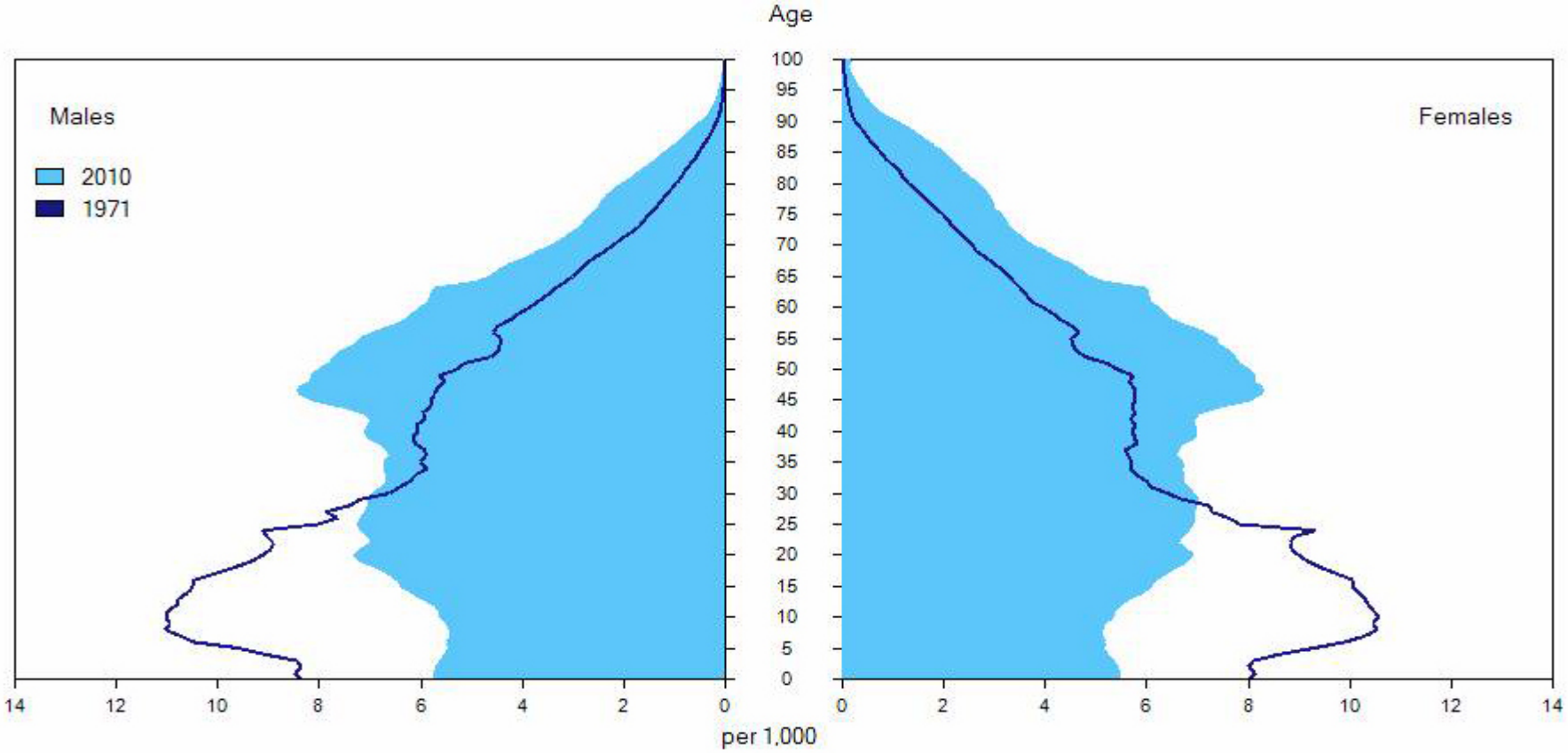
Populations change over time…

Figures for age and sex structure: Canada, provinces and territories, 2010

Figure 1

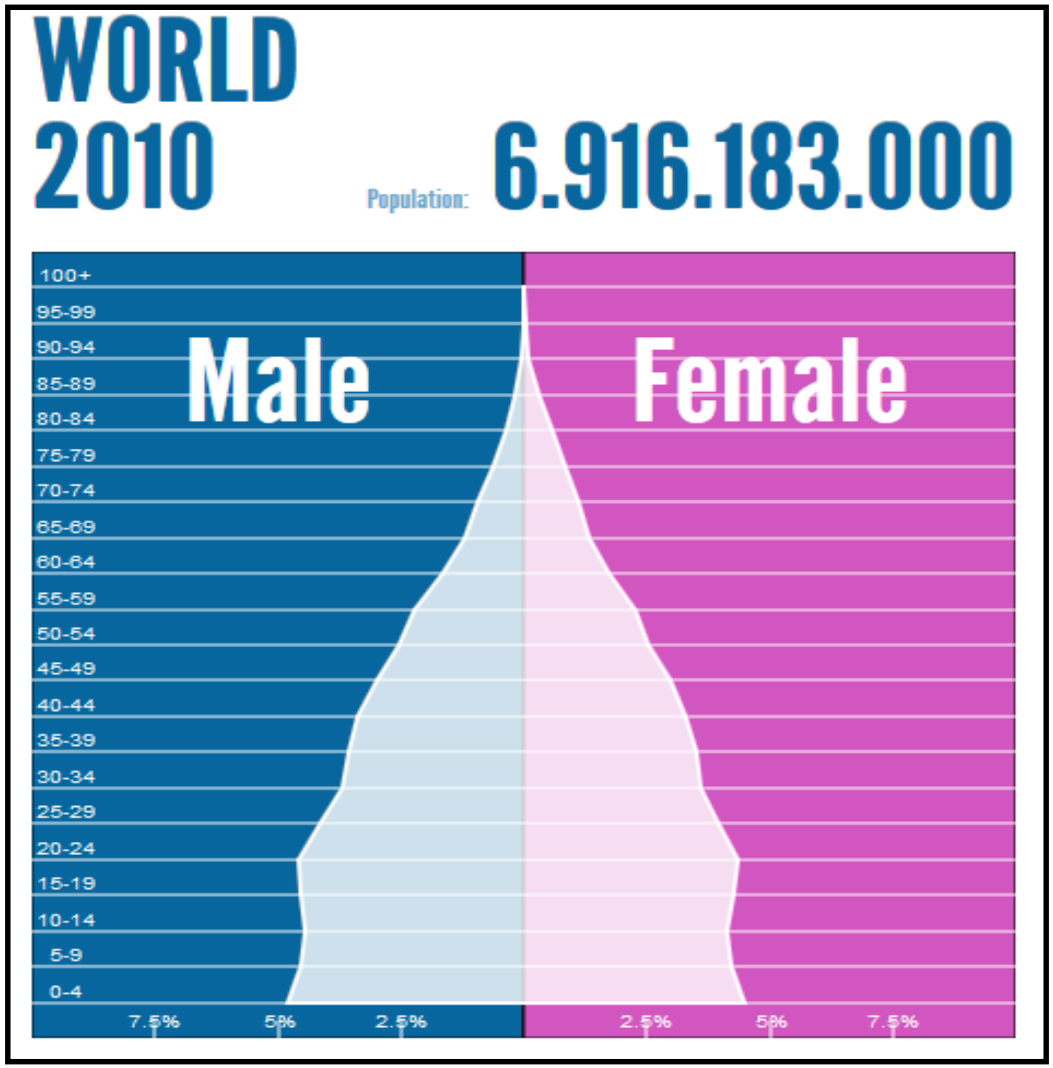
Age pyramid of the Canadian population as of July 1, 1971 and 2010

Data table for figure 1



http://www.statcan.gc.ca/pub/91-209-x/2011001/article/11511/figures/fig-eng.htm#a1

Between countries…

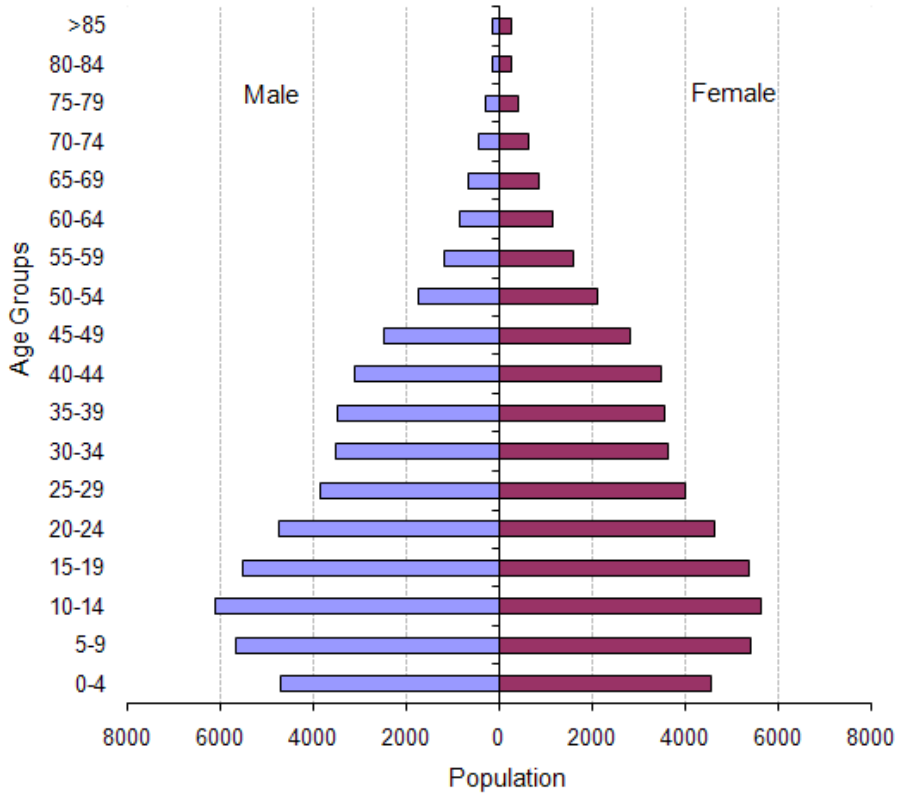


LINK

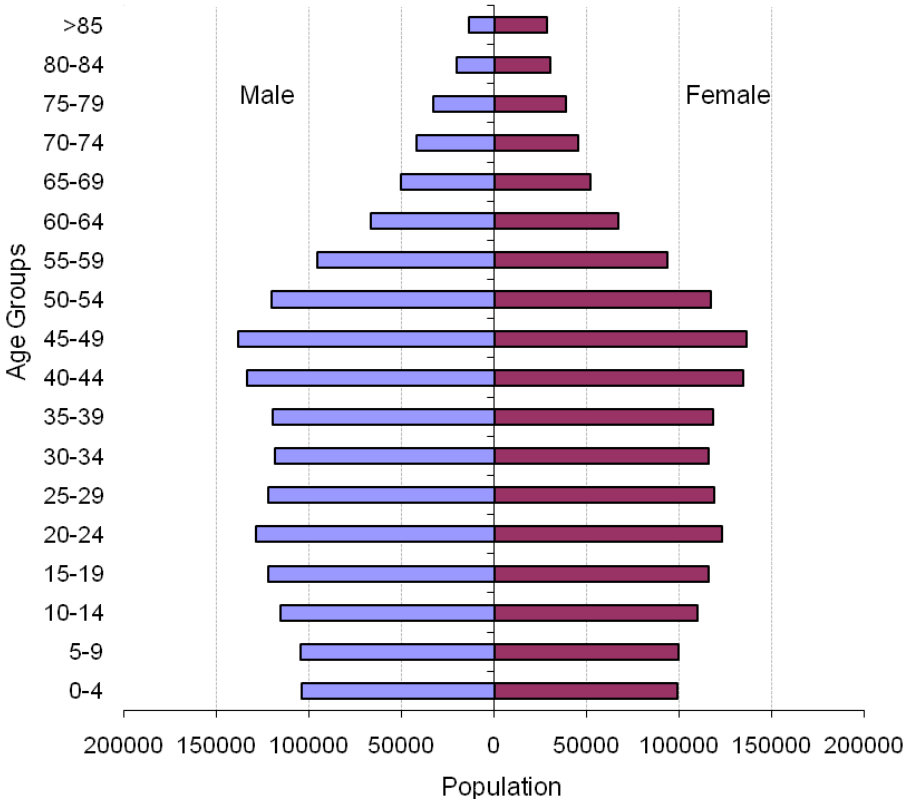
http://populationpyramid.net/world/

…and within sub-populations.

First Nations Population



General Alberta Population



Standardizing (i.e. adjusting) Rates:

- Standardizing rates enables for comparison between populations that have different socio-demographic structures (i.e. **age**, sex, economic status, employment, neighbourhood, etc.)
- Standardization is a statistical calculation (which you are not required to know at this point)

***Age** is the single most important predictor of mortality*

Crude and age-standardized mortality rates 2007-2008 in Canada:

	Crude rate [1]			Standardized rate [2]		
	2007	2008	Difference	2007	2008	Difference
Canada	**7.1**	**7.2**	**0.1**	**5.4**	**5.3**	**-0.1**
Males	7.3	7.3	0.0	6.6	6.5	-0.1
Females	7.0	7.0	0.0	4.4	4.4	0.0
Newfoundland and Labrador	8.9	9.0	0.1	6.7	6.6	-0.1
Prince Edward Island	8.3	8.6	0.3	5.6	5.7	0.1
Nova Scotia	8.9	8.8	-0.1	6.0	5.8	-0.2
New Brunswick	8.5	8.6	0.1	5.8	5.8	0.0
Quebec	7.4	7.4	0.0	5.4	5.3	-0.1
Ontario	6.8	6.8	0.0	5.3	5.1	-0.2
Manitoba	8.3	8.4	0.1	6.0	5.9	-0.1
Saskatchewan	9.1	9.1	0.0	5.8	6.0	0.2
Alberta	5.8	5.9	0.1	5.4	5.5	0.1
British Columbia	7.3	7.3	0.0	5.1	5.1	0.0
Yukon	5.9	6.0	0.1	7.6	8.1	0.5
Northwest Territories	4.0	4.6	0.6	7.1	7.7	0.6
Nunavut	4.1	4.7	0.6	10.0	10.2	0.2

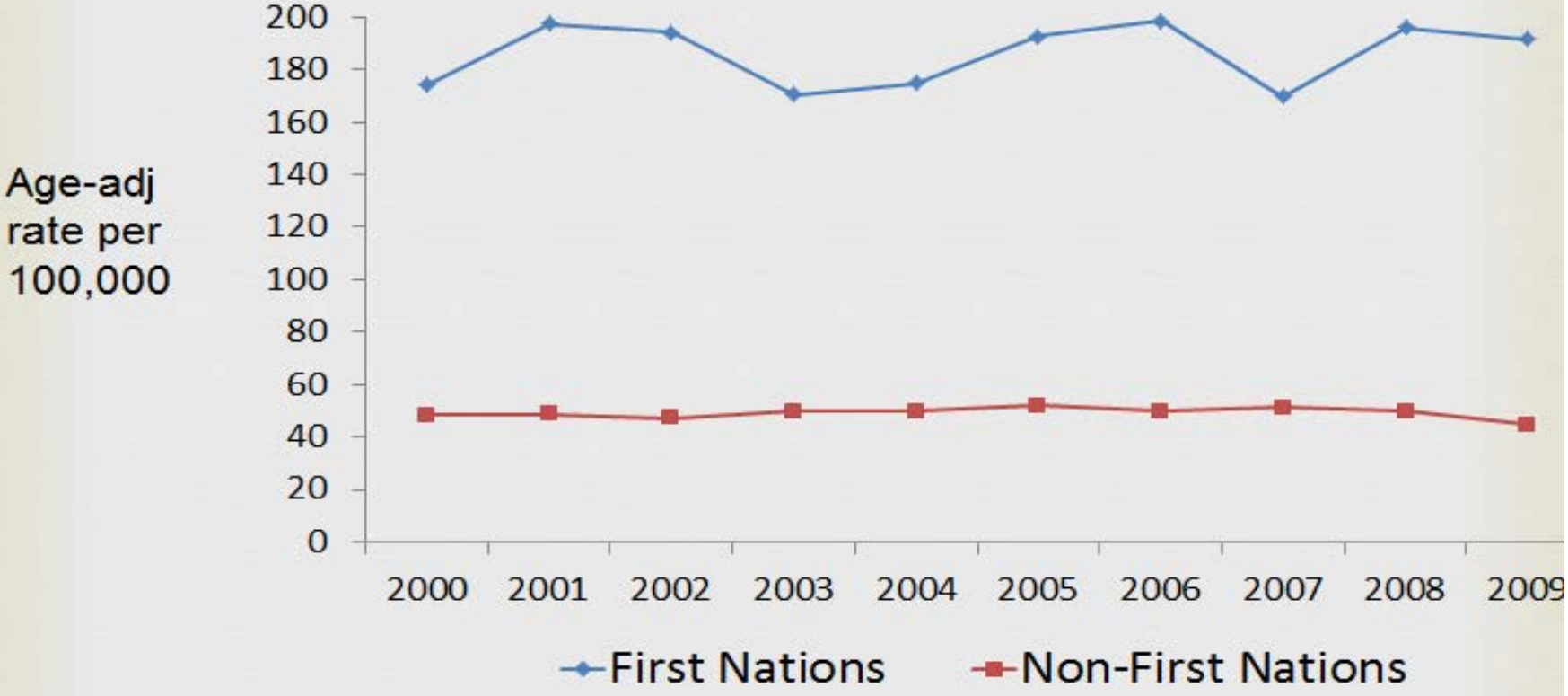
1. Crude mortality rates per 1,000 population.
2. Standardized mortality rate per 1,000 standard population (1991 Canadian population).

Source(s): Statistics Canada, CANSIM tables 102-0504 and 102-0552 and population estimates.

http://www.statcan.gc.ca/pub/84f0211x/2008000/t034-eng.htm

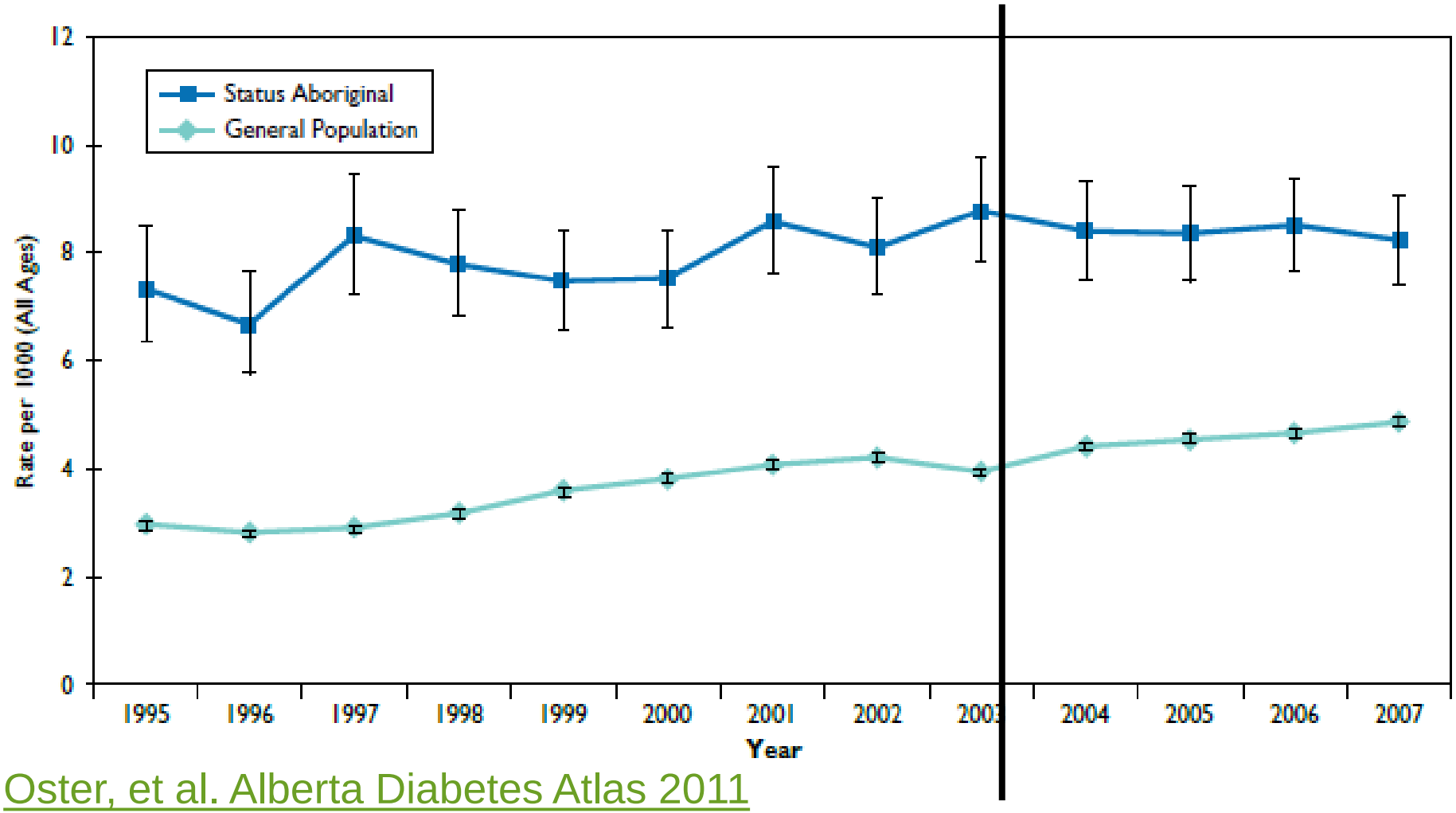
Alberta

Injury-Related Mortality



Diabetes - Alberta

Figure 10.4 **Age- and Sex-Adjusted Diabetes Incidence Rates, Among Status Aboriginal and General Populations, 1995-2007**



Oster, et al. Alberta Diabetes Atlas 2011

Mortality by education - specific rates

Link to full study

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University grads live longer: Study

Gap in life years 'substantial'

BY BEATRICE FANTONI, THE WINDSOR STAR AUGUST 23, 2012

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A lot of us can't wait to get out of school, but sticking with it a little longer might work in your favour ... at least when it comes to your health and longevity.

A study published by Statistics Canada last week looked at mortality rates based on level of education.

Using data from the 1991-2006 Canadian census mortality followup study, which included about 2.7 million people and 426,979 deaths, the researchers found that people with lower levels of education tend to have higher rates of disease and death, compared with people who have higher levels of education. (It involved some complicated calculations of age-standardized mortality rates, so take this here summary with a grain of salt.)

Michael Tjepkema, one of the authors of the study, called the gap in additional life years "substantial."

The researchers focused on the remaining years of life at age 25 of the subjects.

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Table 4
Age-standardized mortality rates per 100,000 person-years at risk for selected causes of death, age group and sex, cohort members aged 25 or older at baseline, Canada 1991 to 2006

Sex, age group at baseline and cause of death	Total	University degree	Post-secondary diploma	Secondary graduation	Less than secondary graduation	RR
Men						
25 to 44						
All causes	211.5	117.6	159.4	216.6	305.6	2.60*
Unintentional injuries	27.7	11.0	18.6	28.5	44.1	4.01*
Ischemic heart disease	30.6	14.4	22.7	30.7	47.8	3.31*
Suicide	23.8	12.5	17.7	25.2	33.2	2.66*
Trachea, bronchus, and lung cancers	13.1	4.9	8.8	14.5	19.9	4.07*
Women						
25 to 44						
All causes	134.5	87.2	109.6	131.5	193.1	2.22*
Trachea, bronchus, and lung cancers	13.9	5.2	9.9	14.2	22.6	4.38*
Ischemic heart disease	6.6	2.5	4.7	6.3	11.5	4.61*
Unintentional injuries	9.0	5.6	7.9	8.1	14.2	2.52*
Suicide	6.8	4.2	6.5	6.9	8.5	2.04*

The silent epidemic of male suicide

Issue: BCMJ, Vol. 53, No. 10, December 2011, page(s) 529-534 Articles

Dan Bilsker, PhD, Jennifer White, EdD

A lack of public awareness and too few explanatory frameworks and preventive efforts specifically targeting male suicide have made a major public health problem largely invisible.

Suicide in men has been described as a "silent epidemic": epidemic because of its high incidence and substantial contribution to men's mortality, and silent because of a lack of public awareness, a paucity of explanatory research, and the reluctance of men to seek help for suicide-related concerns. A statistical overview demonstrates a shockingly high rate of death by suicide for men compared with women, and a need to focus attention on prevention, screening, treatment, and service delivery. Promising lines of research include identification of clinical indicators specifically predictive of male suicide and exploration of precipitating and predisposing factors that distinguish male suicide and account for the substantial gender disparity. Only by breaking the silence—building public awareness, refining explanatory frameworks, implementing preventive strategies, and undertaking research—will we overcome this epidemic.

Suicide in men has been described as a "silent epidemic."[1] It has a disturbingly high incidence and is a major contributor to men's mortality. In British Columbia, suicide is one of the top three causes of mortality among men aged 15 and 44.[2] Among men of all ages in Canada, suicide ranked as the seventh leading cause of death in 2007.[3]

The silence surrounding suicide among men is also striking and warrants comment. First, there appears to be an overall lack of public awareness regarding the high rates of suicide among men, especially relative to other more highly publicized threats to men's health, such as HIV/AIDS, that account for far fewer premature deaths among males each year (e.g., in 2005 45 male deaths were attributed to AIDS in Canada in contrast to 2857 male deaths from suicide).[4,5]

Second, while accumulating empirical evidence confirms that men in Western nations consistently die by suicide at higher rates than women[6,7] (with the pattern reversed for nonfatal suicidal behaviors), surprisingly few explanatory frameworks have been developed to account for this persistent pattern.

Third, few preventive efforts or policies specifically targeting male suicide have been developed or evaluated, which further contributes to its lack of visibility as a major public health problem. When gender is addressed it is often treated as a static demographic variable as opposed to a culturally mediated social construction that intersects with other diversity markers such as race, sexual orientation, and age in highly complex ways.[8,9]

CONTENT

Magnitude of the problem
Prevention
Screening and risk formulatior
Research possibilities
Summary
Competing interests
References

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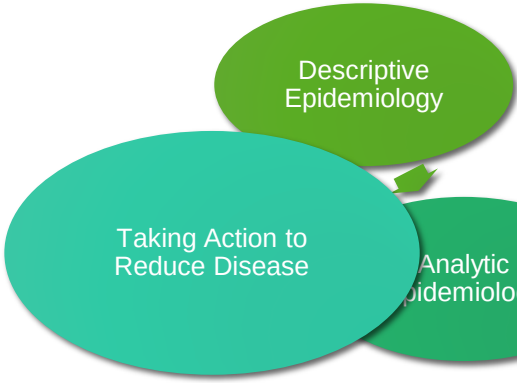

Case Fatality:

$$\frac{\text{\# deaths due to diagnosed case in a given period}}{\text{\# of diagnosed cases during the same period}} \times 100$$

*Typically used to measure **short-term mortality** from an **acute** disease
*important measure of disease severity
*Not a rate, but a proportion

Case Fatality vs. Mortality Rate

In a population of 100, 000, 5 people contract Rabies. In one year, 4 of them die from rabies.

The cause-specific mortality rate would be 4/100,000 = .00004 = 0.004%

The case-fatality rate/ratio would be 4/5 = 0.8 = 80%

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Albertan bitten by rabid bat while stopping fight with cat

Lethbridge woman being treated after testing positive for rabies

CBC News Posted: Aug 29, 2013 9:32 PM MT | Last Updated: Aug 29, 2013 9:29 PM MT

Health officials say a number of bats test positive for rabies in Alberta each year, but this is the first one in the Lethbridge area in many years. (iStock)

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A woman has tested positive for rabies after being bitten by a bat that was fighting with a cat in Lethbridge, according to Alberta Health Services.

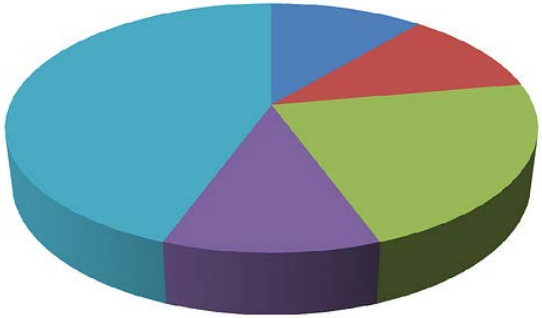
Medical health officer Dr. Vivien Suttorp says it's rare for animals to carry the disease. She says the woman has been given an anti-rabies vaccine.

"The bat was transferred to public health and then to the Canadian Food Inspection Agency laboratory here in Lethbridge," said Suttorp.

Epi in the News

Link to news report

Proportionate Mortality



Another measure of mortality which can give us an indication of major causes of death within a population.

$$\frac{\text{\# of deaths from a certain disease in a period}}{\text{\# of total deaths in that same period}} \times 100$$

Survival Rate:

$$\frac{\text{\# of cases that are alive in a given period following diagnosis}}{\text{\# of cases diagnosed at the beginning of that period}} \times 100$$

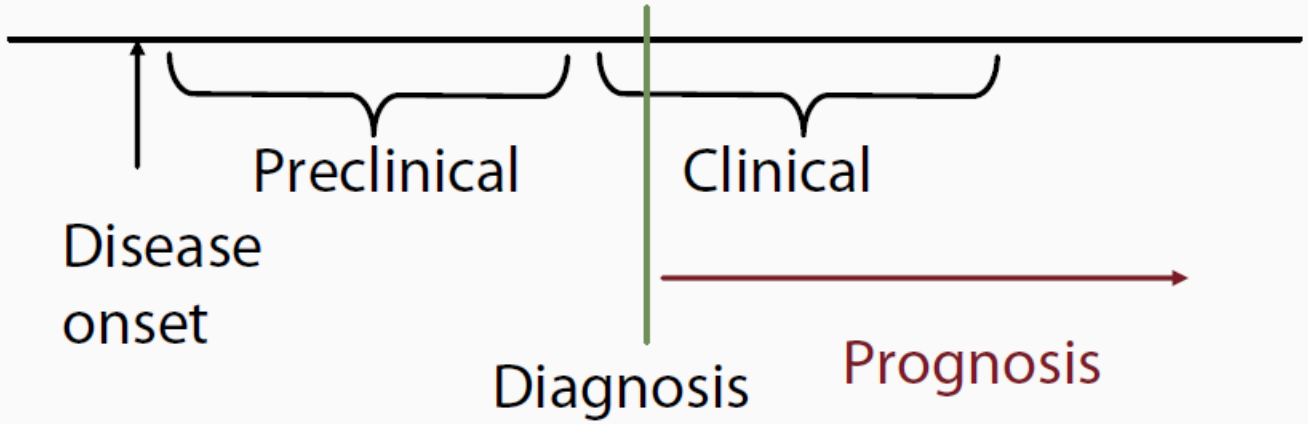
*Used to express mortality/prognosis of long-term chronic diseases (i.e. cancer, diabetes)

*often a 5-year time period is used

*not a rate, a proportion

The Problem with Survival Rates:

- Affected by screening programs (lead time bias)
- Often use a 5-year criteria (which excludes those diagnosed more recently)
- Inverse survival curves (can have the same survival rate, with completely different natural history of disease)
- Determined by availability of treatment or change of diagnosis (not reflected in the survival rate)



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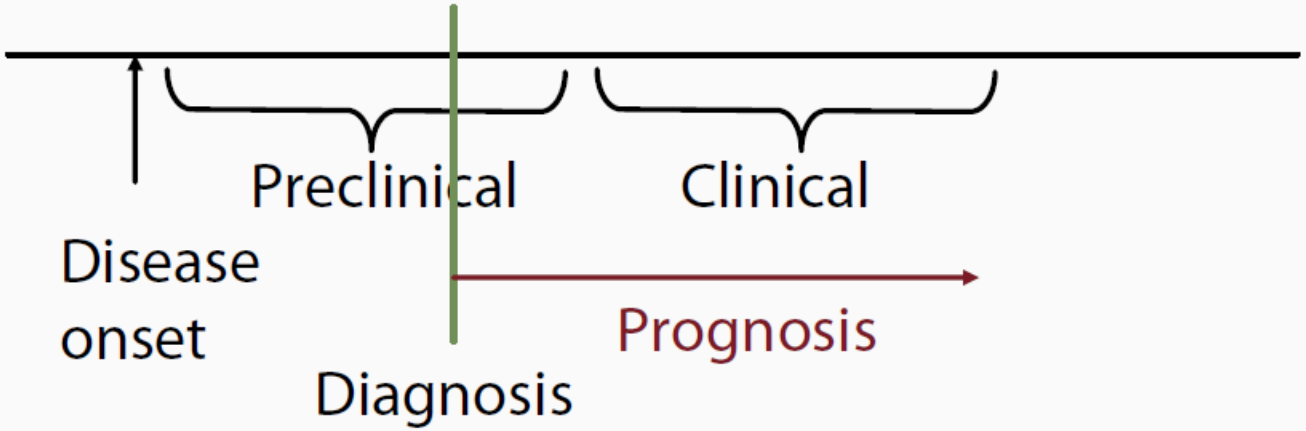
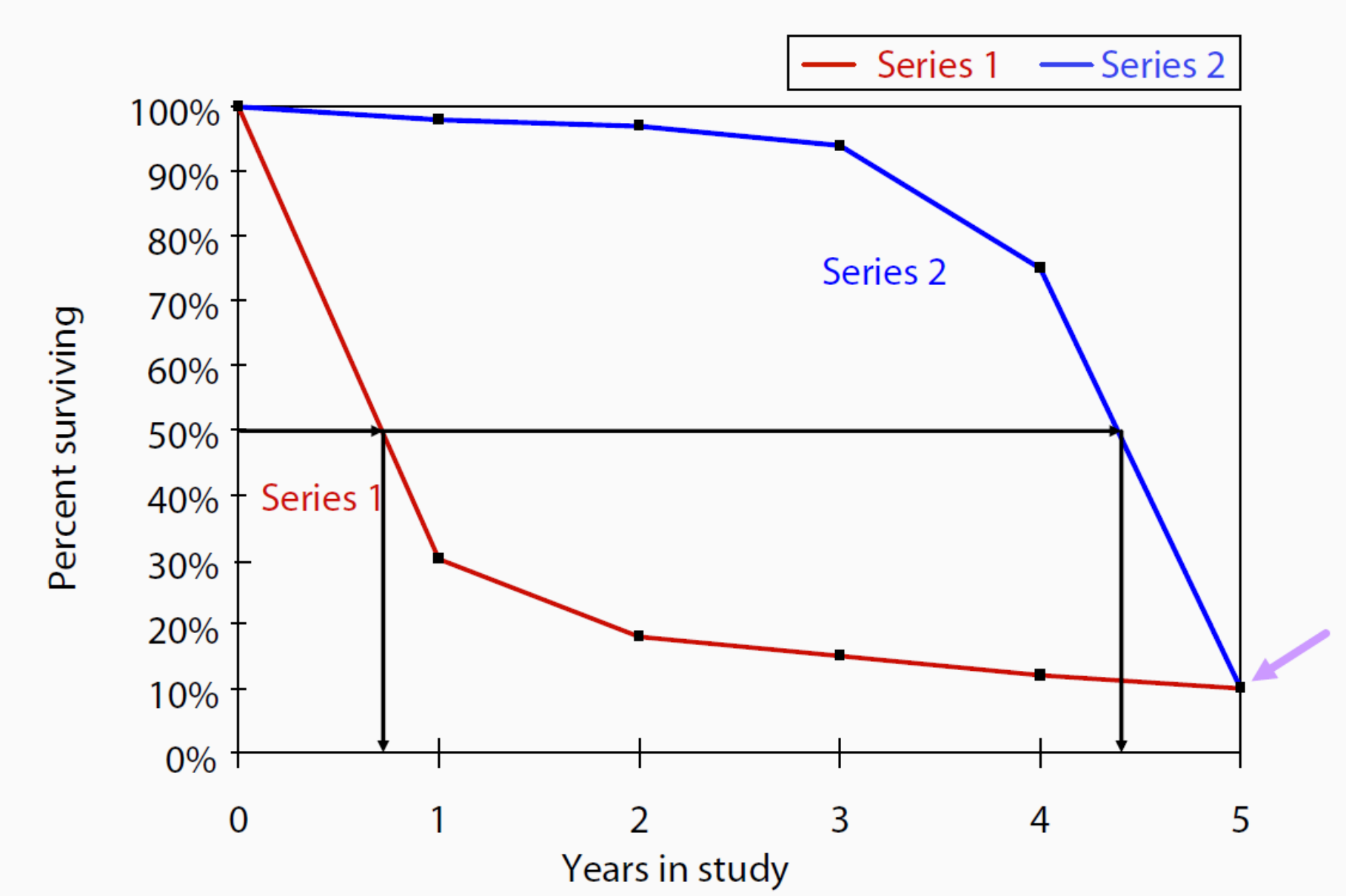


Kanchanarakas, S. (2008).ocw.jhsph.edu/courses/fundepi/PDFs/Lecture9.pdf



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