Measuring the Burden of Disease

Epidemiology HLSC 2003
Class 5

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The demographic transition refers to:

A. The shift from infectious to chronic disease prevalence,
B. A shift from high to low mortality and fertility rates in developed countries
C. More diseases being identified as occurring in geographic clusters
D. The apparent trend toward lower socioeconomic status populations having poorer health outcomes

Alberta Health Services

Report on Cancer Sta

Summary

- Approximately **1 in 60** men and **1 in 74** women will develop invasive melanoma of the skin within their lifetime.
- As of December 31, 2006, approximately **5,520** Albertans were alive who had previously been diagnosed with melanoma of the skin.
- As of December 31, 2006, approximately **5,520** Albertans were living with melanoma of the skin.
- In 2006, there were **482** new cases of melanoma of the skin in Alberta and **70** deaths due to the disease.
- If current trends continue, approximately **320** male cases and **260** female cases of melanoma of the skin are expected to be diagnosed in 2011.
- The five-year relative survival for melanoma of the skin in Alberta is approximately **89%** for those diagnosed between 2004 and 2006.

A. Incidence

B. Prevalence

Alberta Health Services

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A. Incidence

B. Prevalence

Incidence Rate:

A. Measures the rate of disease development
B. Typically uses person-time units in the denominator
C. Is the most accurate measure of incidence
D. Takes into account variable periods of "at risk" observed
E. All of the above

Personnel who interview hospital lab staff about rare laboratory findings is a form of:

A. Passive Surveillance
B. Rumor Surveillance
C. Active Surveillance
D. Sentinel Surveillance

i-clicker

Case fatality is a rate measurement:

A. True

B. False

Class 5: Learning Objectives

1. Learn 2 key **maternal and child health mortality** measures and why they are important

2. Learn 3 key **burden of disease** measures and why they are important

Mortality Rates – Childbirth and Early Life:

Maternal Mortality Rate

Fetal Death Rate

Infant Mortality Rate

Child Mortality Rate

Perinatal Mortality Rate

Post-neonatal Mortality Rate

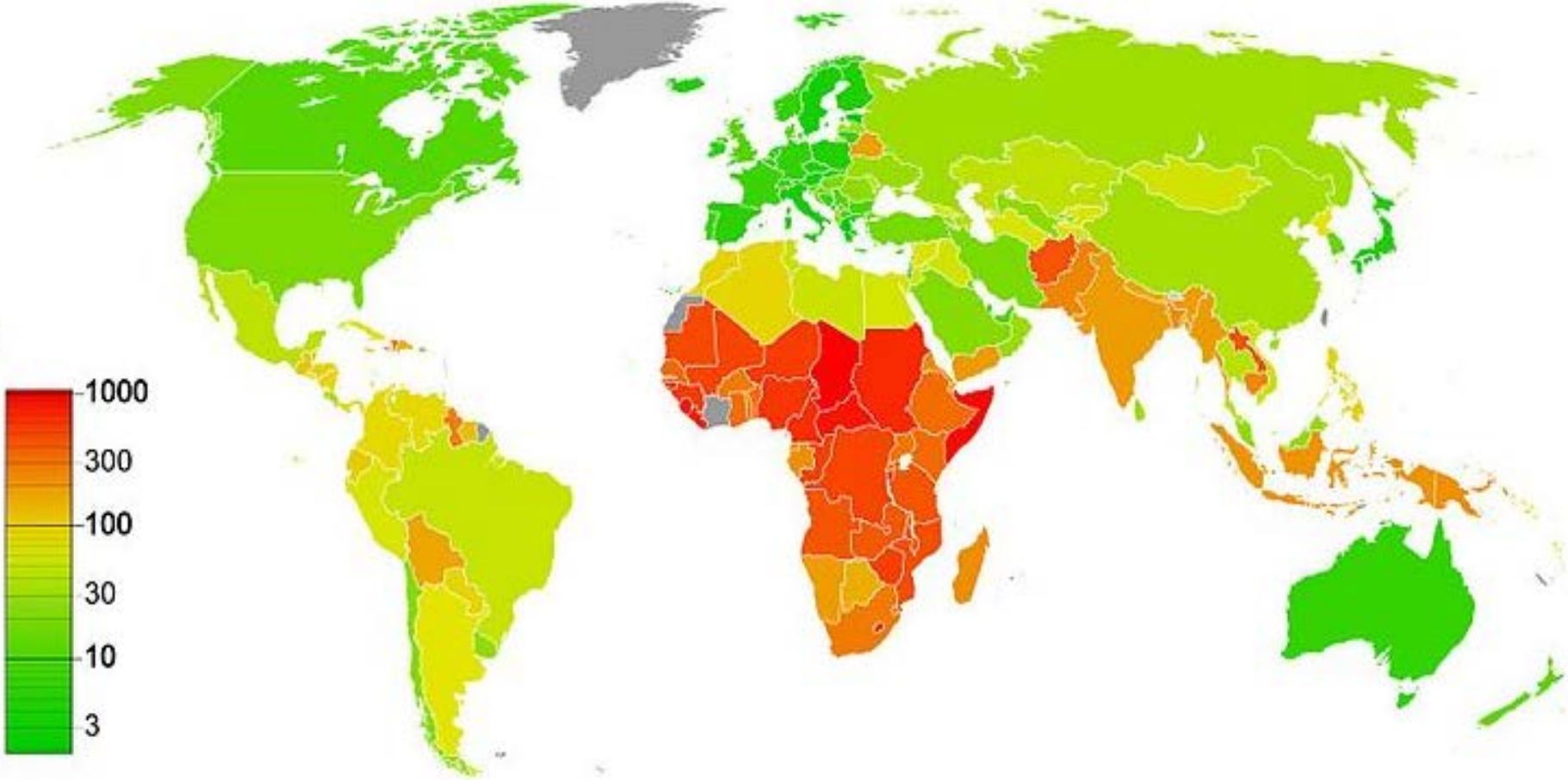
Neonatal Mortality Rate

1. Maternal Mortality *Ratio*:

***Indicator of the health of a population as it reflects health care access, economic conditions, and gender inequality experienced by women in a society.**

$$\frac{\text{Number of female deaths related to childbirth in yr}}{\text{Number of live births in yr}} \times 100{,}000 \text{ live births}$$

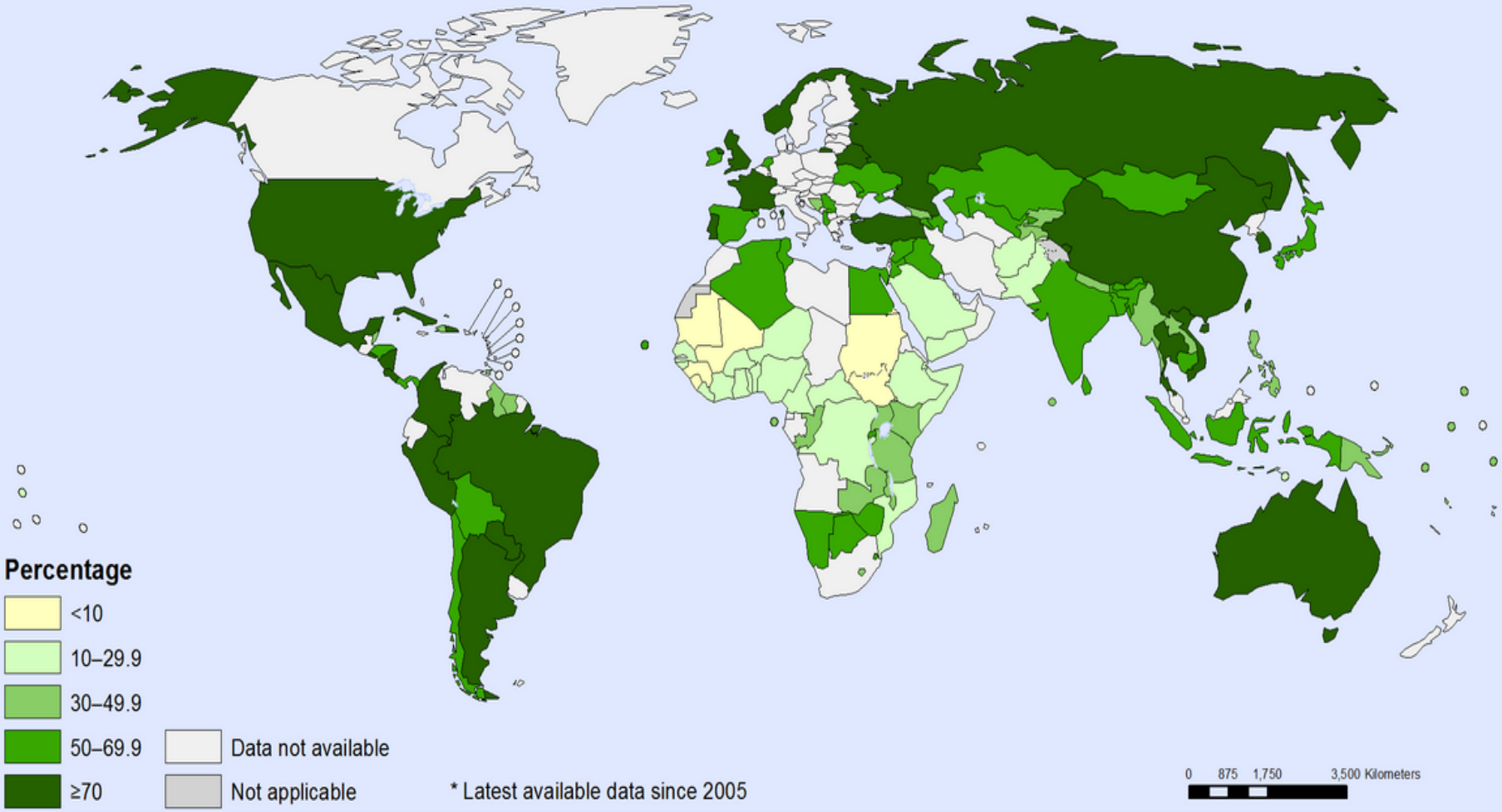
Maternal Mortality Ratio per 100,000



Chad = 1,100 **India** = 200

US = 21 **Canada** = 12

Contraceptive prevalence rate (%) *



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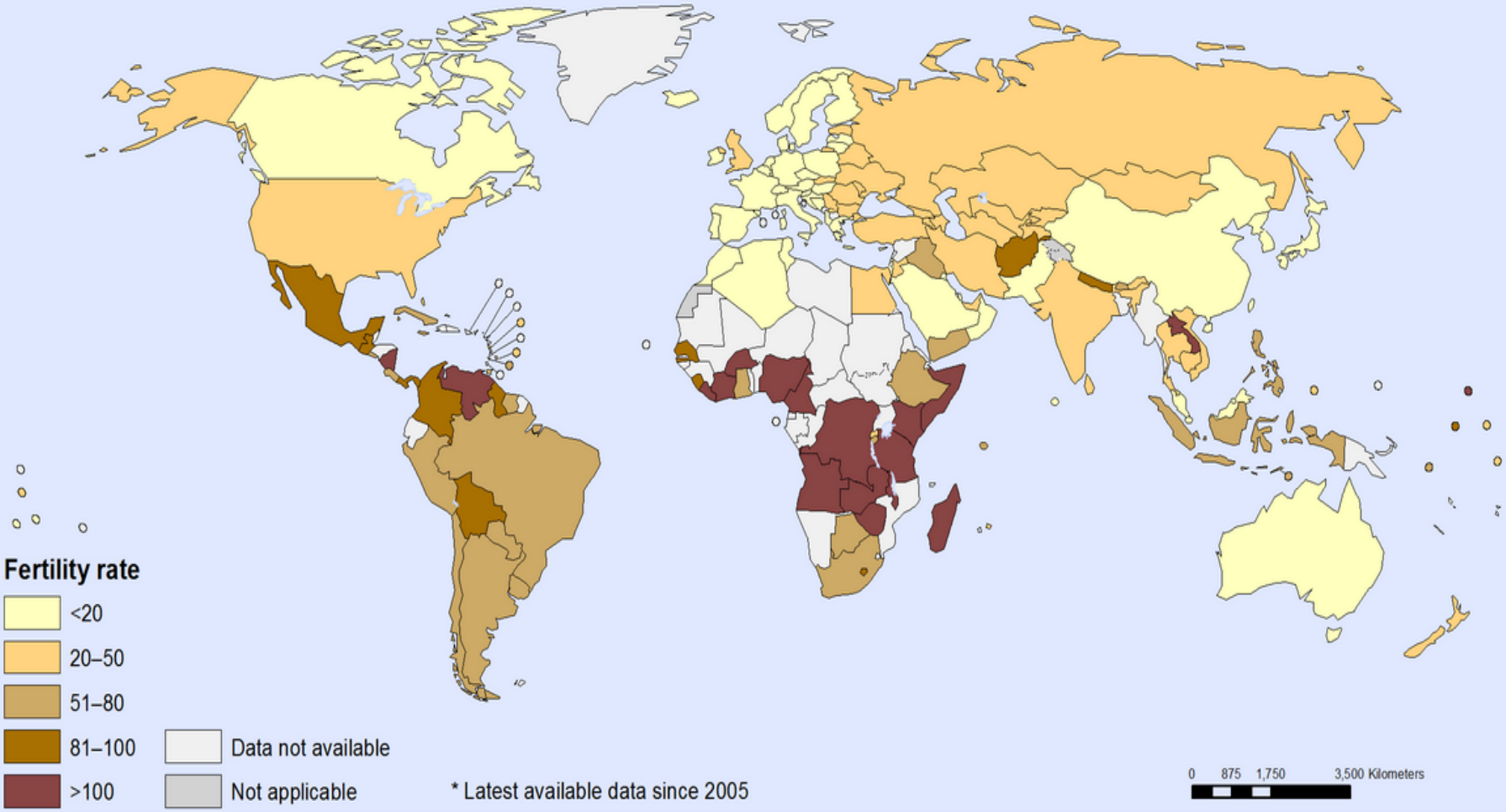
Adolescent fertility rate (per 1000 girls aged 15-19 years)*



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Who Cares?

MDG 5: Improve Maternal Health

Target 5.A:
Reduce by three quarters the maternal mortality ratio

- Maternal mortality has nearly halved since 1990. An estimated 287,000 maternal deaths occurred in 2010 worldwide, a decline of 47 per cent from 1990. All regions have made progress but accelerated interventions are required in order meet the target.
- In Eastern Asia, Northern Africa and Southern Asia, maternal mortality has declined by around two-thirds.
- Nearly 50 million babies worldwide are delivered without skilled care.
- The maternal mortality ratio in developing regions is still 15 times higher than in the developed regions.
- The rural-urban gap in skilled care during childbirth has narrowed.

Target 5.B:
Achieve universal access to reproductive health

- More women are receiving antenatal care. In developing regions, antenatal care increased from 63 per cent in 1990 to 81 per cent in 2011.
- Only half of women in developing regions receive the recommended amount of health care they need.
- Fewer teens are having children in most developing regions, but progress has slowed.
- The large increase in contraceptive use in the 1990s was not matched in the 2000s.
- The need for family planning is slowly being met for more women, but demand is increasing at a rapid pace.
- Official Development Assistance for reproductive health care and family planning remains low.

Promoting Maternal & Child Health

- Determines health of next generation
- We know the **determinants**
  - Poverty
  - Preconception health
  - Age
  - Health care access (presence of trained personnel at birth)
  - Unsafe abortions

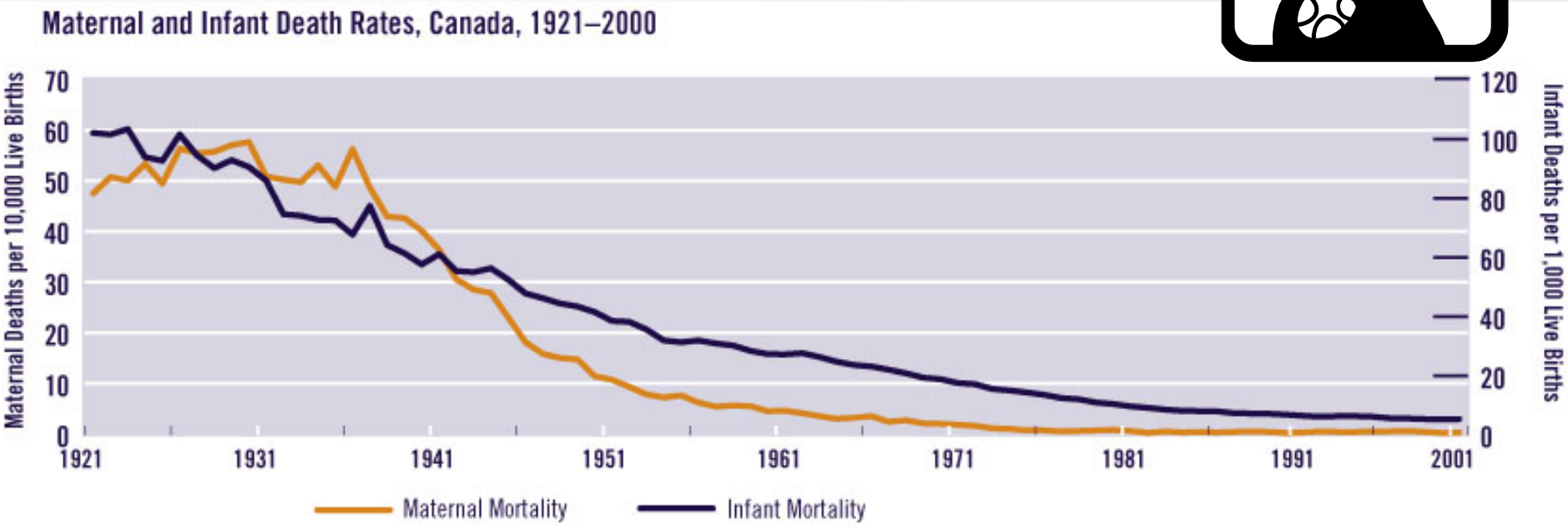
- **Actions** can be taken to reduce the risk of maternal & infant mortality and disability, and enable children to reach their full potential

Promoting Maternal & Child Health

- Waiting until mothers are at least 18 before pregnancy improves maternal and child health.
- Waiting at least 2 yrs after a birth before conceiving another child improves maternal & child health outcomes
- Creating access to skilled care – before, during and after delivery.

Credit: Canada. Dept. of Mines and Technical Surveys / Library and Archives Canada / PA-019079

Maternal Mortality by Time



Sources: Statistics Canada. Selected Mortality Statistics, Canada 1921–1990. 1994 — Catalogue 82-548.
Statistics Canada. Canadian Vital Statistics System, 1991–2000.

- Much of the improvement has been due to improved sanitation, nutrition, standard of living and level of education in Canada.

THE DEATH OF SUMITRA DEVI: POOR QUALITY OF CARE

December 15, 2007, Uttar Pradesh: Sumitra Devi was a 28-year-old poor, illiterate, *Dalit* woman, and a mother of three children. She was in the final term of her pregnancy and in overall good health when she experienced the onset of labor pains. She proceeded to the nearest Primary Health Center (PHC) by foot and rickshaw. Once admitted, she was given three injections by the ANM, which injections her family had to purchase from a pharmacy and bring to the hospital. Sumitra inquired about the purpose of the injections and was told that they would help her deliver quickly. Sumitra was at the PHC for four hours with no doctor present. Sumitra's family made several requests to the ANM for a doctor to be called, but they were told that none were available. Sumitra was given a total of 14 injections during this four-hour period by the ANM, a few of which were inserted with a bottle of glucose, without an explanation as to why so many injections were necessary. Sumitra felt very uncomfortable and she started to scream. The ANM swore at her and slapped her, accusing her of shouting without any reason. Shortly thereafter, Sumitra's entire body went cold. The ANM told the family to remove Sumitra from the bed and lay her on the floor. She told them to pay the medical fees and take Sumitra elsewhere, but she was already dead. Sumitra's family took the dead body home.

Source: SAHAYOG, *Case Study: Sumitra Devi* (2007) (on file with CRR)

EXAMPLES OF HUMAN RIGHTS VIOLATED

Right to life: Sumitra died due to the poor quality of care and inappropriate handling of her case. The right to life obligates states to take steps to protect women against the unnecessary loss of life due to causes relating to pregnancy and childbirth.

Right to freedom from cruel, inhuman and degrading treatment: Sumitra was physically and mentally traumatized by the ANM's mishandling of the case and the physical and verbal abuse. The right to life and human dignity requires states to ensure that individuals are protected from cruel, inhuman and degrading treatment caused by acts leading to physical pain and mental anguish.

Right to health: Sumitra was not examined by a doctor, despite several requests by her family. The inappropriate care she received from the ANM, which included 14 injections in four hours, directly threatened her health and most likely led to her sudden death. Governments are obligated to ensure that health facilities, goods and services are scientifically and medically appropriate and of good quality, which includes ensuring the availability of skilled providers.

Maternal Mortality in India: A Human Rights Crisis

Issues: Maternal Death, Safe & Healthy Pregnancy

Regions: India, Asia

Work: Reporting on Rights

In a new report, the **Center for Reproductive Rights** calls for legal action in response to India's staggering maternal mortality problem. Despite the country's growing economy and an ambitious rural health initiative, over 100,000 women **die from pregnancy-related causes** each year, more than anywhere else in the world. Many more suffer debilitating complications that they endure in silence due to impunity and lack of accountability in the health system. *Maternal Mortality in India: Using International and Constitutional Law to Promote Accountability and Change* assesses the crisis and urges a human rights approach to solving it.

Gender Inequality Drives Maternal Mortality

The medical causes of maternal mortality are well known and largely preventable, yet government policies have failed to have an impact. There are several reasons for this: the prevalence of **child marriage** and early pregnancy, malnutrition, poor quality **healthcare**, complications from **unsafe abortion**, and inadequate access to **family planning** information and services.

These are all issues addressed in the Program of Action of the International Conference on Population and Development (ICPD), which took place in Cairo, Egypt, in 1994. As the year 2009 marks the fifteenth anniversary of the Cairo Conference, governments must renew and reinvigorate their efforts to eliminate these preventable causes of women's mortality and ill health.

At the root of India's maternal mortality crisis is **gender inequality**, implying that the problem cannot be resolved merely through the nation's health policies. Solutions must be grounded in broader recognition of women's human rights to health, non-discrimination, equality, and most of all, life.

Human Rights Law Can Help Fight Maternal Mortality

Human rights law and the Indian Constitution provide a strong basis for advocates to demand change and hold the government accountable for maternal deaths. *Maternal Mortality in India* provides litigators, activists, judges, and citizens with a resource for using human rights law and legal strategies to confront this critical threat to women's rights and lives.

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Maternal suicides need more attention, CMAJ editor argues

Canada needs to do more to understand and prevent maternal suicide

CBC News Posted: Sep 9, 2013 12:01 PM ET | Last Updated: Sep 9, 2013 12:37 PM ET

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The recent deaths of Lisa Gibson and her two young children in Winnipeg highlight the need to carefully investigate maternal deaths on a case-by-case basis, a Canadian medical journal editor says.

The body of the 32-year-old mother was found in the Red River in July three days after two-year-old daughter, Anna, and three-month-old son, Nicholas, died in hospital after emergency personnel found the children unresponsive in the family's home.

- **Winnipeg tragedy: Mothers lament postpartum depression stigma**
- **Lisa Gibson case with Manitoba's chief medical**

Family members say Gibson had sought help for postpartum depression. The official cause of her death is under investigation by Manitoba's Chief Medical Examiner.

In today's issue of the Canadian Medical Association Journal, an editor argues that Canada needs to do more to understand and prevent maternal suicide, with regular in-depth audits of deaths. She also wants health care

Family and friends gathered at a memorial service for Lisa

Related Stories

- Winnipeg tragedy: Mothers lament postpartum depression stigma
- Lisa Gibson case with Manitoba's chief medical examiner

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- It's time to put maternal suicide under the microscope, CMAJ
- Maternal mortality surveillance in

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It's time to put maternal suicide under the microscope

Kirsten Patrick MB BCh

See related research article by Vigod and colleagues at www.cmaj.ca/lookup/doi/10.1503/cmaj.122028

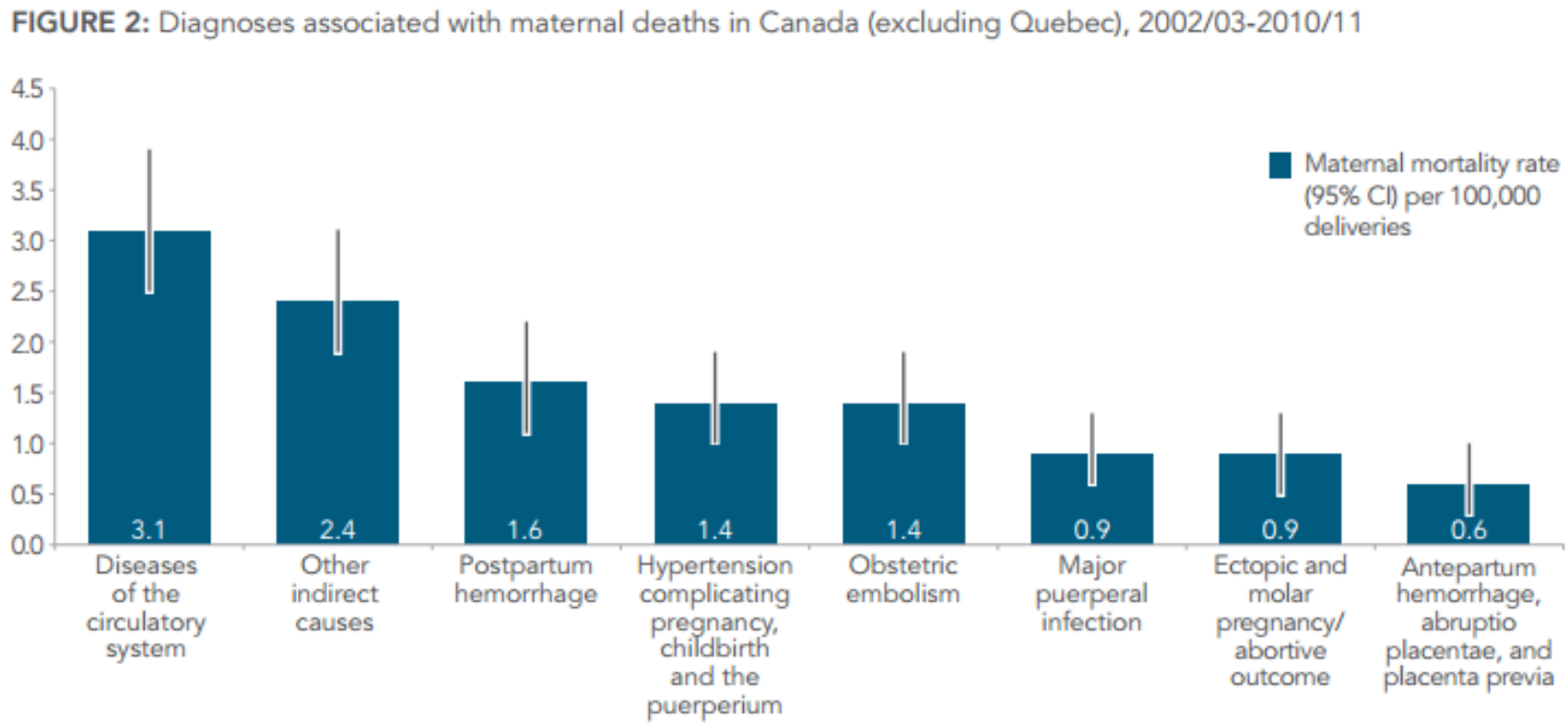
Police in Manitoba are currently investigating the July deaths of a 32-year-old mother and her 2 children in Winnipeg.[1] The children, one aged 3 months and the other 2 years, were found unconscious at the family home by emergency personnel responding to a 911 call. The body of the children's mother, Lisa Gibson, was found in the Red River 3 days later. Media reports have suggested that Ms. Gibson had sought help for postpartum depression after the birth of her second child.[1] This incident serves as a stark reminder that postpartum depression can be a killer, although the official cause of Ms. Gibson's death is yet to be established.

Many women struggle with the stigma of being desperately sad after what is popularly portrayed as the happiest of life events. It can be difficult to understand, let alone empathize with, how a mother could become so depressed as to commit suicide or, worse, infanticide. We may believe that maternal death due to psychiatric illness is vanishingly rare and therefore not a high priority. Yet consider the findings of The Sixth Report of the Confidential Enquiries into Maternal Deaths in the United Kingdom. In auditing maternal deaths in the UK in 2000 through 2002, the report found that psychiatric illness was the largest cause of maternal deaths overall during that period — more women who had delivered a baby in the previous 6 there were potential failings in care — not to lay blame, but to learn and to consider what might be done differently in future.

Second, physicians must recognize postpartum depression for the debilitating condition it is. Most women do not die from postpartum depression, but its effects have been shown to be severe and far-reaching for both mother and child. There are interventions to prevent and treat the condition, although universal screening for all women after birth is not well supported by current evidence.[4] However, a case-finding approach involving screening for women with known risk factors is strongly advocated. The risk factors for postpartum depression include a history of psychiatric conditions (particularly previous postpartum depression or depression during the index pregnancy), recent stressful life events, domestic violence, social isolation and lack of a supportive partner.

Connecting women with postpartum depression to the right resources can start with simply asking them directly whether they need help. A validated quick approach is to ask "During the past month, have you often been bothered by feeling down, depressed or hopeless?" and "During the past month, have you often been bothered by having little interest or pleasure in doing things?" If the woman answers "yes" to either of these two questions, asking "Is this something you feel you need or

LINK



Source: Canadian Institute for Health Information, Discharge Abstract Database (DAD).
Notes: CI - Confidence Interval. Diagnoses do not represent an underlying cause of death. Therefore, cases could have more than one associated diagnosis. The DAD does not include data from Quebec. Manitoba data, which were incomplete for earlier years, were included from 2004/05.

- Late maternal mortality (after 42 days) was 5.7

2. Infant Mortality Rate (IMR):

$$\textbf{Infant mortality ratio} = \frac{\text{Number of deaths of infants under 1 yr}}{\text{Number of live births in that same year}} \times \text{*1,000 live births}$$

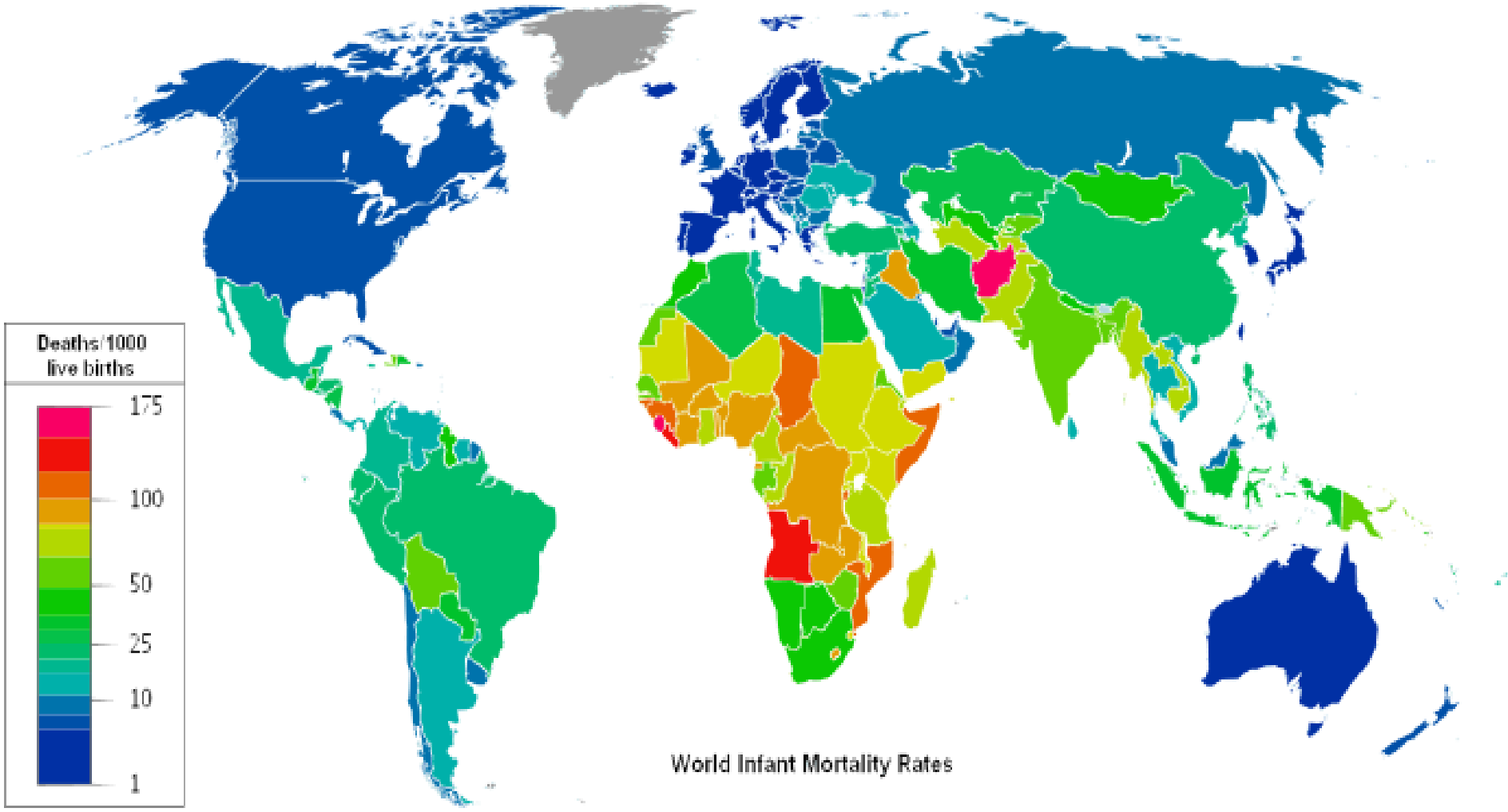
Sample calculation: In the U.S. during 2003, there were 28,025 deaths among infants under 1 year of age and 4,089,950 live births. The infant mortality rate was (28,025/4,089,950) x 1,000 = 6.85 per 1,000 live births.

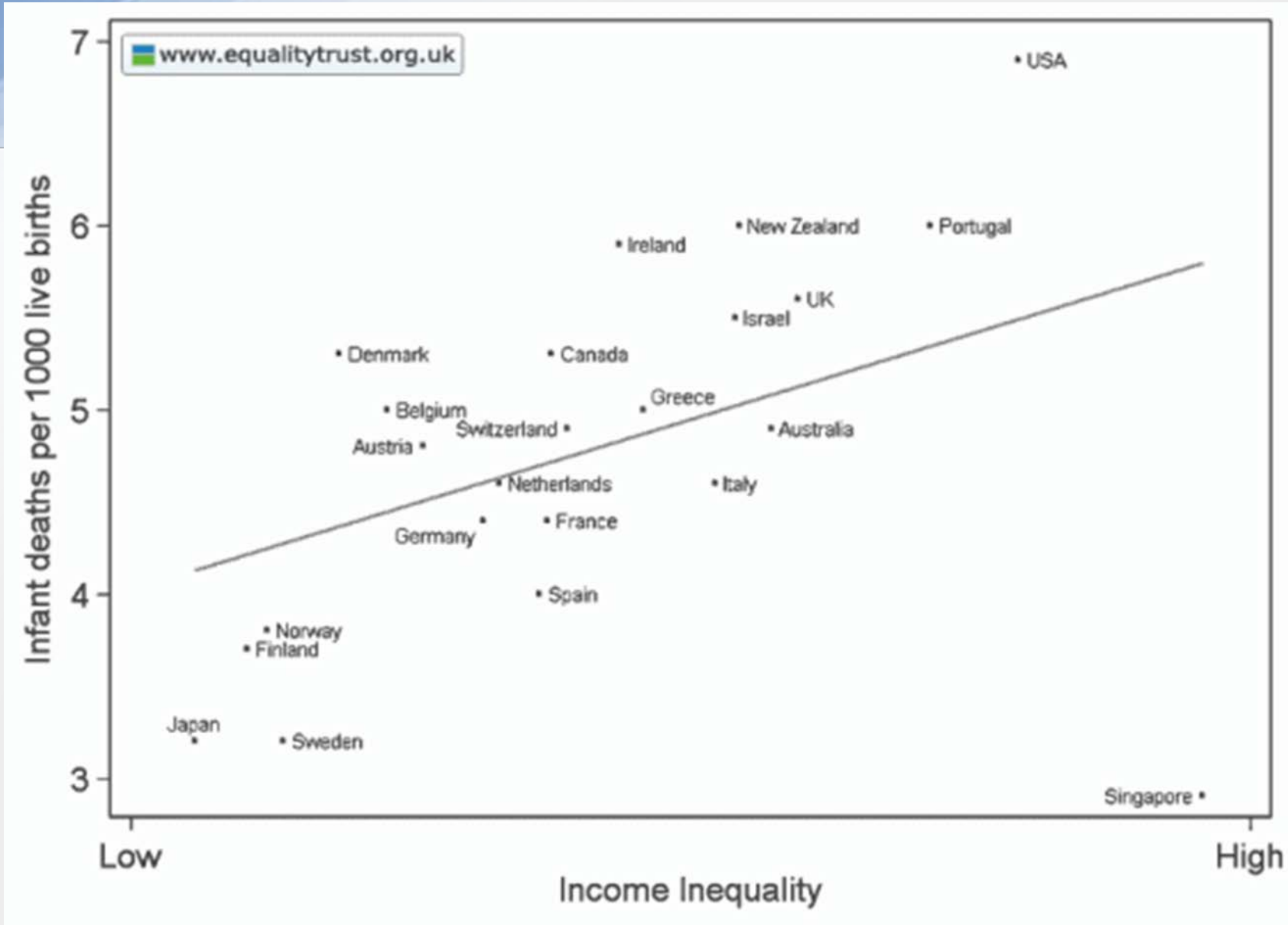
*should be expressed per 1000 live births

Infant Mortality:

- IMR is considered to be one of the most sensitive indicators of overall health of a society. (CDC, 2013; Webb & Bain, 2013)
- Reflects the economic and social conditions that affect health, as well as the effectiveness of the health care system (World fact book, 2009)
- Infant mortality "strongly correlated to those structural factors, like economic development, general living conditions, social wellbeing, and the quality of the environment, that affect the health of entire populations" (Reidpath & Allotey, 2003)

Infant Mortality Ratio by Place



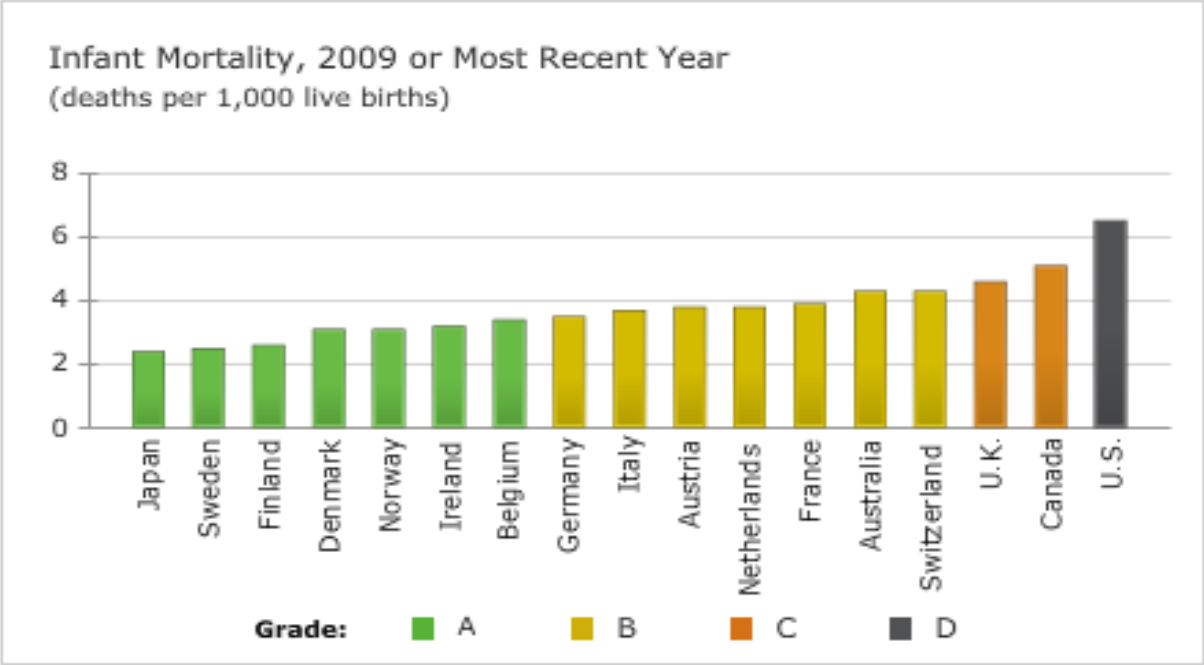

www.equalitytrust.org.uk
Infant deaths per 1000 live births
7
6
5
4
3
USA
New Zealand
Portugal
Ireland
UK
Israel
Denmark
Canada
Greece
Belgium
Switzerland
Australia
Austria
Netherlands
Italy
France
Germany
Spain
Norway
Finland
Japan
Sweden
Singapore
Low
High
Income Inequality

Infant Mortality

[February 2012]

Key Messages

- Canada gets a "C" and ranks second-to-last among 17 peer countries. Its infant mortality rate is shockingly high for a country at Canada's level of socio-economic development.
- Although Canada has dramatically reduced its infant mortality rate over the past few decades, other countries have done better.
- Infant mortality is a sentinel indicator of child health and the well-being of a society over time.



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REPORT CARD

Description	Grade
Infant Mortality	C

Assessment:

Shockingly poor performance

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Definition

Infant Mortality

The number of infant deaths per 1,000 live births.

Why is Canada's infant mortality rate higher than those of most peer countries?

Part of the answer may lie in international differences in the registration of babies with an extremely low birth weight or countries' classifications of births as live births or stillbirths. Some researchers suggest that comparisons between countries should therefore be interpreted with caution.[6] A European report on perinatal indicators, for example, noted a wide variation in how European countries define infant mortality, due to differences in birth and death registration practices (that is, differences in the cut-off points for acceptable weight or estimated gestation period to be registered as a birth and subsequent death).[7] This discrepancy can lead to under-reporting of infant deaths by some countries, particularly when compared with countries that use a broader definition for live birth. The international discrepancies in data may have existed for some time, but they have been overlooked because of much higher infant mortality rates. Now that rates are so much lower, however, differences in registration may be more important in explaining inter-country differences in infant mortality.[8]

Other researchers suggest that Canada's ability to reduce infant mortality is constrained by the successful delivery of more preterm babies and babies with very low birth weight. These babies face higher risk of death. Statistics Canada reports that the increase in the infant mortality rate in 2002 was entirely due to the deaths of infants less than one day old.[9] The factors underlying an increase in the number of low-birth-weight babies may include socio-economic and environmental determinants of maternal and child health, as well as health-system factors such as the use of new technologies in high-risk deliveries.

New fertility programs are also resulting in more multiple births (two or more babies). These babies are usually born preterm, with a higher risk of early death.

The greater number of low-birth-weight and preterm babies, coupled with the discrepancies among countries in defining "live births," could be contributing to Canada's relatively higher rate of infant mortality. These medical and methodological factors undoubtedly play a role in Canada's infant mortality rate.

But how much of a role? The fact that Canada does not seem able to break below the rate of 5 deaths per 1,000 live births, while 14 peer countries already have, suggests that further attention must be paid to better understanding international differences in infant mortality rates—whether they are due to methodological or socio-economic factors, or both.

Early infant mortality in Canada called 2nd worst in developed world

Some First Nations populations register mortality rates up to four times the national average

The Canadian Press Posted: May 08, 2013 11:24 AM ET | Last Updated: May 08, 2013 11:22 AM ET

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Babies born in Canada have a surprisingly high likelihood of dying on the day of their birth, a new study suggests.

A report from international aid organization Save the Children assessed infant mortality data from 176 countries worldwide, focusing specifically on how many newborns are able to survive beyond their first day out of the womb.

The report said Canada had the second-highest rate of first-day infant mortality in the industrialized world, with roughly 900 babies — or 2.4 per 1,000 births — ending in early tragedy.

Canada does not seem able to break below the rate of five deaths per 1,000 live births, experts say. (iStock)

Only the United States posted a higher number of babies who die within their first 24 hours on earth, with 11,300 or 2.6 per 1,000 births.

Switzerland rounded out the top three with 2.2 first-day deaths per 1,000 births, Save the Children said, noting the three countries fell well short of the nations that boast a first-day mortality rate of just 0.5.

Cyprus, Estonia, Iceland, Luxembourg, Singapore and Sweden all boast that distinction, the report said.

Experts said Canada's poor results come as little surprise, noting infant mortality rate has been an issue of increasing concern for the past several years.

Dr. Janet Smylie, a physician in the department of family and community medicine at Toronto's St. Michael's Hospital, said Canada's infant mortality rate — or number of babies who die within their first year of life — has averaged around five per 1,000 births for the past decade.

Related Stories

- Canada's rank on infant mortality index called unfair
- Canada lags on childhood well-being, UNICEF says

External Links

- Surviving the first day, Save the Children Canada (.pdf)

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- Wife charged after husband's decomposing body found in Hamilton home 0

LINK

"At the root of it is a distribution problem…we are and affluent country, but at a systems level we're still not distributing all of out health and social resources equally to all groups"

Mortality Rate Calculations to Know:

1. All-cause mortality
2. Cause-specific mortality
3. Age specific mortality
4. Maternal mortality
5. Infant mortality
6. Case fatality
7. Proportionate Mortality

When calculating cancer-specific mortality rate for a population, the denominator is:

A. Person-years of population at risk
B. Number of people at risk for cancer in 2013
C. Population size at mid-year of 2013
D. None of the above

Case fatality rates are often used:

A. To indicate the overall health of a population
B. Disease survival rate is long
C. To indicate the severity of disease
D. To measure the relative importance of cause of death

Infant mortality is calculated by:

A. # live births / # infant deaths before age 1
B. # live births / #infant deaths before age 5
C. # infant deaths before age 1 / 1000 live births
D. None of the above

How might disease create burden for populations, beyond simply mortality.

The Problem with Mortality Rates

- Mortality rates do give us a broad view, but tell us nothing about the ***timing*** of death or health **quality** during life.
- **Measures of disease burden** allow us to combine the effects of multiple diseases, how severe they are, and when they occur in life.
- These measures often take into account pain, disability and loss of income associated with ill-health

Measuring the Burden of Disease:

What is the "Burden of Disease"?

- The overall loss of health in a society resulting from diseases and injuries.

We will focus on four measures of disease burden:

1. Life expectancy
2. Years of life lost *YLL*
3. Disability-adjusted life years *DALYs*
4. Health-adjusted life expectancy *HALEs*

1. Life Expectancy

- Accounts for the timing of death
- Number of years a person is expected to live in a given area *if current mortality rates continue*.
- Hypothetical - does not take future changes in treatment of disease & economic health of a country into account

What was the life expectancy at birth for females in Canada in 2009?

Life expectancy at birth, by sex, by province

	Males	Females
	years	
Canada		
1920 to 1922	59	61
1930 to 1932	60	62
1940 to 1942	63	66
1950 to 1952	66	71
1960 to 1962	68	74
1970 to 1972	69	76
1980 to 1982	72	79
1990 to 1992	75	81
2000 to 2002	**77**	**82**
2007 to 2009		
Canada	79	83
Newfoundland and Labrador	77	81
Prince Edward Island	78	83
Nova Scotia	78	82
New Brunswick	78	83
Quebec	79	83
Ontario	79	84
Manitoba	77	82
Saskatchewan	77	82
Alberta	79	83
British Columbia	80	84

Source: Statistics Canada, CANSIM, table 102-0512 and Catalogue no. 84-537-XIE.
Last modified: 2012-05-31.

Life Expectancy

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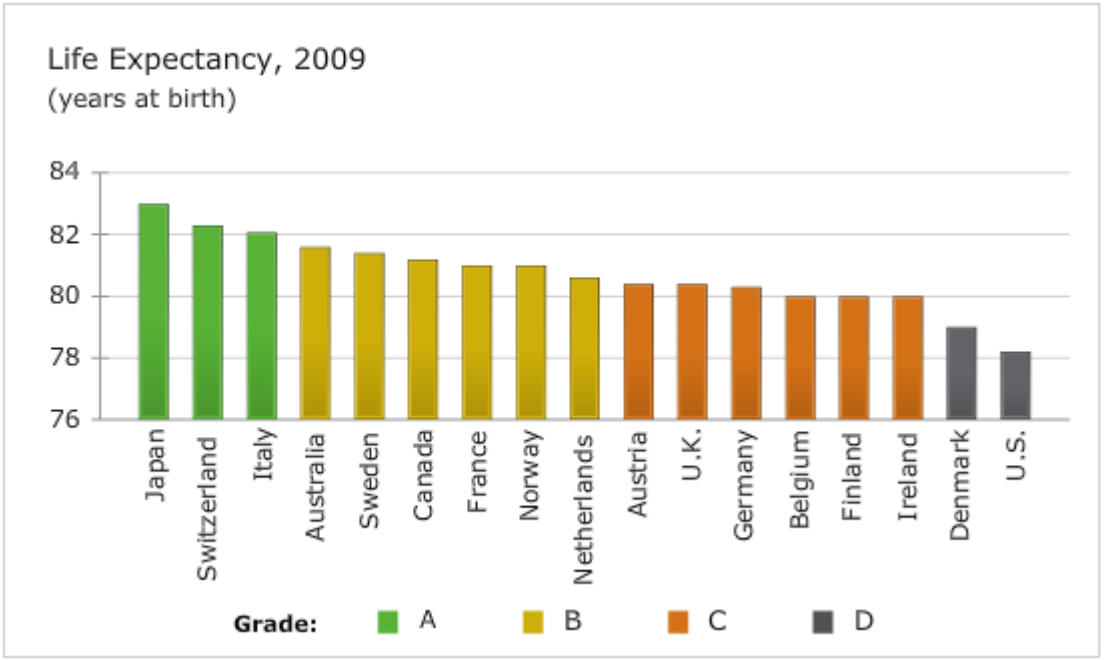
Key Messages

- Canada maintains its "B" grade and 6th-place ranking among 17 peer countries.
- The gap in life expectancy between Canada and the U.S. continues to widen; Canadians now live three years longer than Americans.
- Life expectancy is a good indicator of overall health in a country.



REPORT CARD B

Life Expectancy

The average number of years a person can be expected to live.

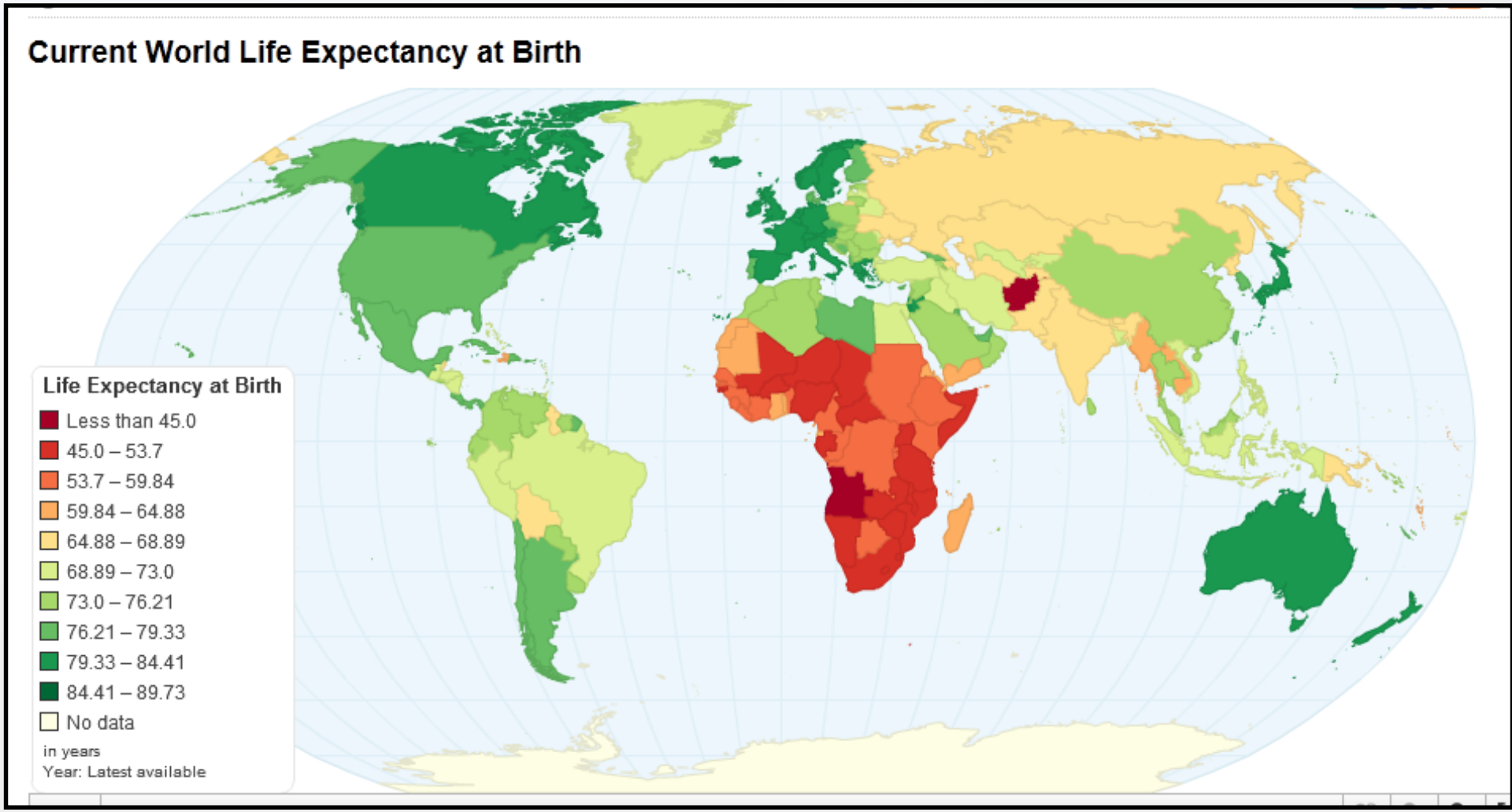
Please note:
The data on this page are current as of February 2012.

Link to report

"experts predict that today's children will be the first generation for some time to have poorer health outcomes and shorter life expectancy than their parents" ...why?

LINK to publication

Life Expectancy by Person, Place, and time:



News > World news > Japan

Japan's life expectancy 'down to equality and public health measures'

Diet is by no means the only factor that leads a girl born in Japan today to expect to live to 86, a new analysis finds

Sarah Boseley, health editor
The Guardian, Tuesday 30 August 2011 22.05 BST

It's not just the sushi – and it's definitely not the sake. Japan has the highest life expectancy in the world but the reasons, says an analysis, are as much to do with equality and public health measures as diet.

A baby girl born in Japan today can expect to live to 86 and a boy to nearly 80. But it has not always been so.

According to a paper in a Lancet series on healthcare in Japan, this is a rise of 30 years from the expected lifespan in 1947. While Japanese diet has contributed, it is far from the only factor.

The remarkable improvement in Japanese health began with the rapid economic growth of the late 1950s and 1960s. The government invested heavily in public health, introducing universal health insurance in 1961, free treatment for tuberculosis and cutting childhood deaths through vaccination and treatment of intestinal and respiratory infections.

Following the control of infectious diseases, Japan tackled its high death rate from stroke with salt reduction campaigns and the use of

Link to article

What's the secret to Japan's slender population? Serious 'eating education'

'We don't just teach them about cooking; we teach them about the importance of eating local,' teacher says

By Danielle Nerman, CBC News Posted: Jan 12, 2015 10:11 AM ET | Last Updated: Jan 13, 2015 8:54 AM ET

Slideshow: 'Eating education' for all 1:52

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Since McDonald's inaugural golden arches were erected in Tokyo more than 40 years ago, fast food franchises have flourished, but Japanese waistlines haven't. It's a trend government planners say is thanks to mandatory home economics classes.

Today, there are more than 3,000 McDonald's franchises in Japan. The public has also embraced other greasy chains, such as Wendy's, Burger King and Kentucky Fried Chicken. In fact, it's become an **annual tradition for Japanese families to down a bucket of deep fried poultry on Christmas Day**

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What has made the population of Japan healthy?

Nayu Ikeda, Eiko Saito, Naoki Kondo, Manami Inoue, Shunya Ikeda, Toshihiko Satoh, Koji Wada, Andrew Stickley, Kota Katanoda, Tetsuya Mizoue, Mitsuhiko Noda, Hiroyasu Iso, Yoshihisa Fujino, Tomotaka Sobue, Shoichiro Tsugane, Mohsen Naghavi, Majid Ezzati, Kenji Shibuya

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People in Japan have the longest life expectancy at birth in the world. Here, we compile the best available evidence about population health in Japan to investigate what has made the Japanese people healthy in the past 50 years. The Japanese population achieved longevity in a fairly short time through a rapid reduction in mortality rates for communicable diseases from the 1950s to the early 1960s, followed by a large reduction in stroke mortality rates. Japan had moderate mortality rates for non-communicable diseases, with the exception of stroke, in the 1950s. The improvement in population health continued after the mid-1960s through the implementation of primary and secondary preventive community public health measures for adult mortality from non-communicable diseases and an increased use of advanced medical technologies through the universal insurance scheme. Reduction in health inequalities with improved average population health was partly attributable to equal educational opportunities and financial access to care. With the achievement of success during the health transition since World War 2, Japan now needs to tackle major health challenges that are emanating from a rapidly ageing population, causes that are not amenable to health technologies, and the effects of increasing social disparities to sustain the improvement in population health.

Introduction

Japan has caught the attention of the rest of the world because of the tremendous success it has achieved in improving the health status of its population in the 20th century. The improving health status of the Japanese population was noted as early as the 1920s when infant mortality rates started to fall.[1] Increased child survival rates were partly possible then through the enhanced education and increasing literacy of mothers—in the early 20th century, with the provision of free compulsory education, almost all girls attended primary schools.[2] However, after World War 2, Japan showed its strength in improving the health of its population. The country was devastated after its defeat. Per person gross domestic product was roughly international $3400 in 1950 (table), which is similar to that in India today (Gakidou E, Institute for Health Metrics and Evaluation, personal communication). The health status of the population was also poor—in 1947, male life expectancy in Japan at birth was only 50 years and female life expectancy was 54 years.[5]

Rapid economic growth started in the late 1950s and life expectancy started to increase at an unprecedented rate. Within a few decades Japan had caught up with and eventually surpassed many other developed nations (figure 1; figure 2). Since 1986, Japan has ranked first in terms of female life expectancy at birth, with the highest ever recorded worldwide life expectancy of 86 years in 2009.[9] The country had also maintained the best

Key messages

- The early establishment of free compulsory primary education and a social insurance system before World War 2 and universal health insurance coverage in 1961 enabled the provision of equal opportunities for health promotion.
- Disparities in health across regions and socioeconomic groups are fairly small in this homogeneous and egalitarian society and have narrowed over time with increased average population health. However, the downward trend in socioeconomic inequality in health has been less obvious since the 1990s, which has coincided with income inequality gradually increasing.
- Japanese life expectancy at birth increased rapidly in the 1950s and early 1960s as a result of decreased mortality rates for communicable diseases in children and young adults, which was largely attributable to the government's strong stewardship in investing in key interventions for public health.

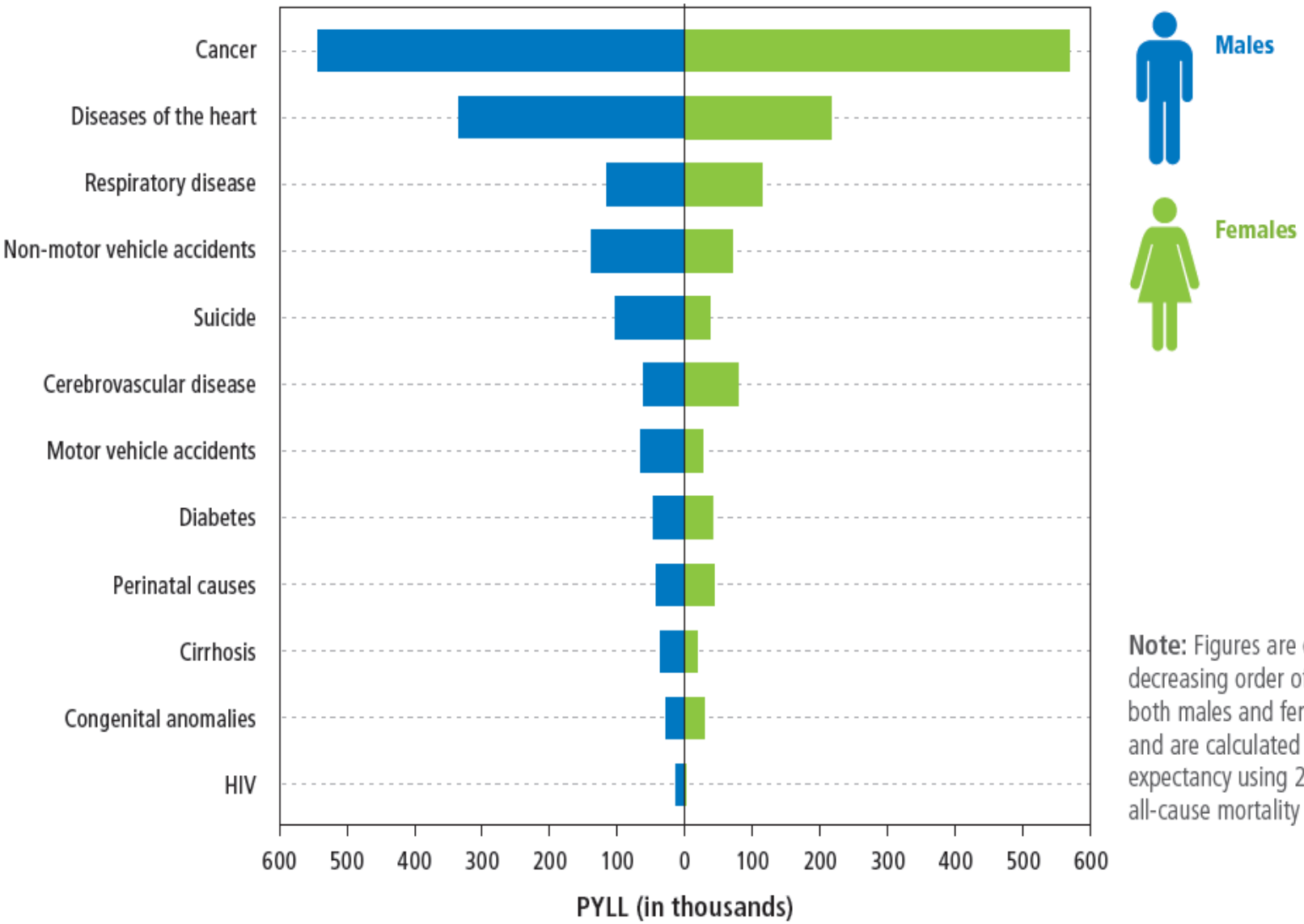
2. Potential Years of Life Lost (PYLL)

- Life expectancy examines years of life achieved. PYLL measures years of life lost **due to premature death**
- Premature death - Deaths **before 75** are now the standard life expectancy (We will use this as the arbitrary value in our class).
- Allows us to calculate the amount of premature death a population is experiencing due to specific causes.
- Deaths at a younger age are weighted more heavily
- Does not consider quality of life
- Cannot compare directly if population sizes are different

2. Potential Years of Life Lost

- PYLL provides an alternative to the information we learn from mortality rates, and can be more informative by:
  - Taking account **average life expectancy** in a population
  - Giving more weight to deaths that occur among **younger people**.

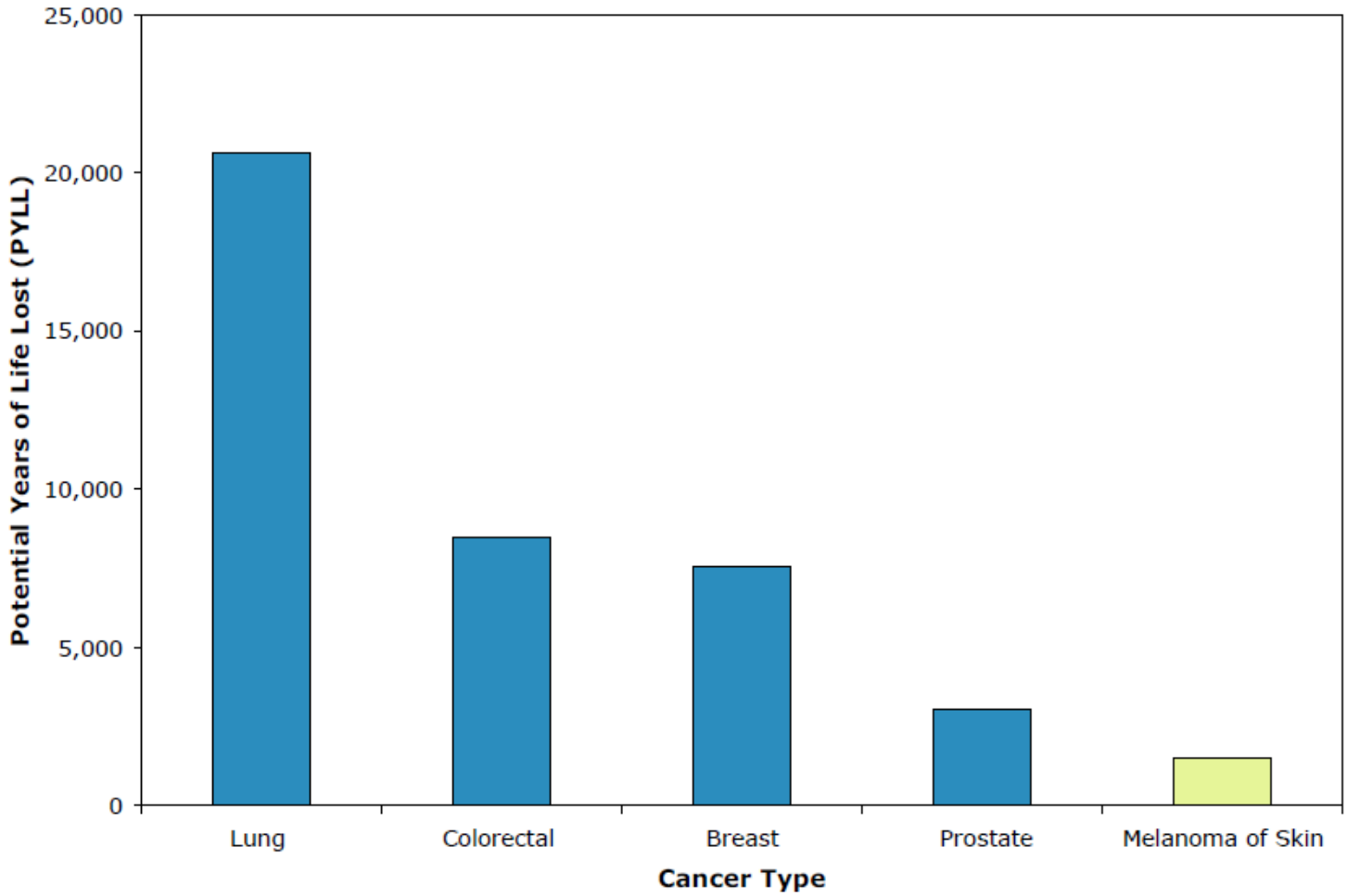
FIGURE W1 Selected causes of death and their associated potential years of life lost (PYLL), Canada, 2009



Note: Figures are displayed in decreasing order of total PYLL for both males and females combined and are calculated based on life expectancy using 2006–2008 all-cause mortality rates.

Analysis by: Chronic Disease Surveillance and Monitoring Division, CCDP, Public Health Agency of Canada
Data source: Canadian Vital Statistics Death database at Statistics Canada

Figure 8-1: Potential Years of Life Lost (PYLL) from Melanoma of the Skin* Compared with Lung*, Colorectal*, Breast† and Prostate‡ Cancers, Alberta, 2006



* Male and Female
† Female only
‡ Male only

In 2006, **1,490** potential years of life were lost due to melanoma of the skin, which constitutes 1.8% of PYLL for all cancers (**Figure 8-1**).

Study: Tanning beds definitely cause cancer

MARIA CHENG | 07/29/09 03:57 PM ET | AP

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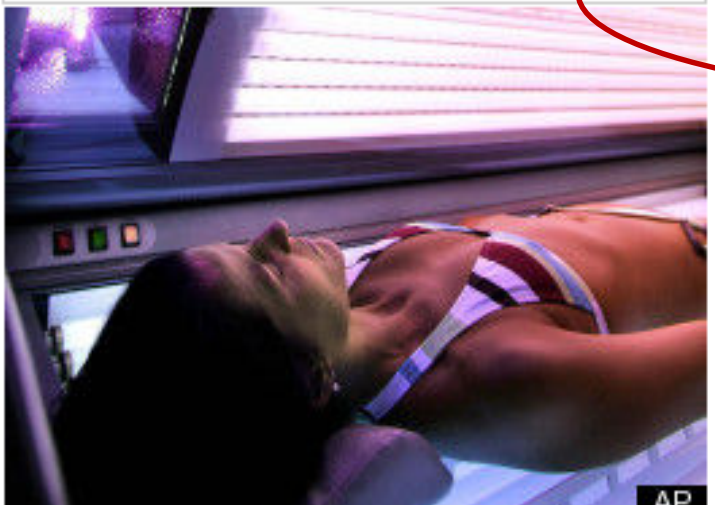


LONDON — International cancer experts have moved tanning beds and ultraviolet radiation into the top cancer risk category deeming both to be definite causes of cancer.

For years, scientists have described tanning beds and ultraviolet radiation as "probable carcinogens."

A new analysis of about 20 studies concludes the risk of skin cancer jumps by 75 percent when people start using tanning beds before age 30.

Experts also found that all types of ultraviolet radiation caused worrying mutations in mice, proof the radiation is carcinogenic. Previously, only one type of ultraviolet radiation was thought to be lethal.

The new classification means tanning beds and ultraviolet radiation are definite causes of cancer, alongside tobacco, the hepatitis B virus and chimney sweeping, among others.

EDMONTON SUN
TUESDAY SEPTEMBER 18 2012

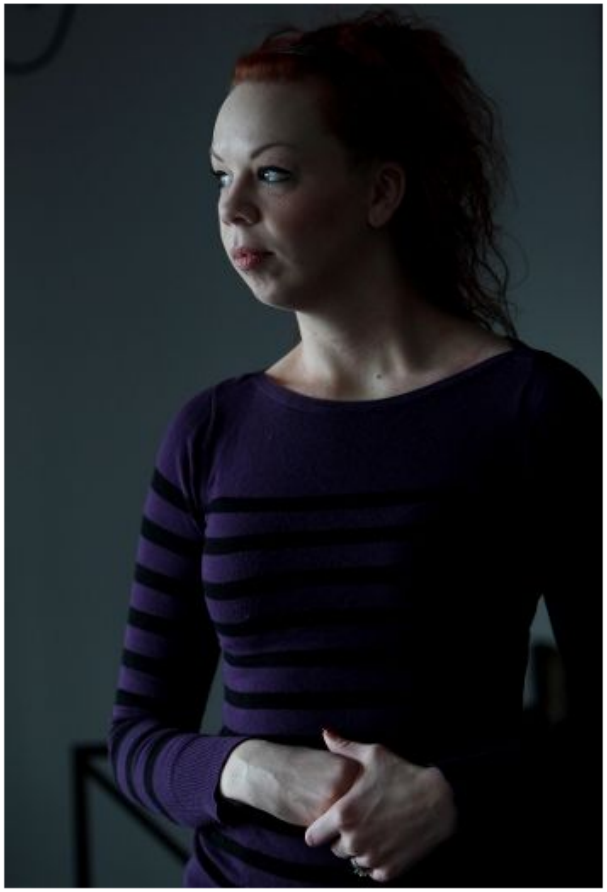
PYLL and Melanoma

Link to link to article

American dermatologist Dr. Henry Lim in Edmonton at the University of Alberta to call for a ban on indoor tanning amidst rise in Melanoma in girls aged 15 to 29.

BY MATT DYKSTRA ,EDMONTON SUN

FIRST POSTED: MONDAY, SEPTEMBER 17, 2012 07:42 PM MDT | UPDATED: MONDAY, SEPTEMBER 17, 2012 07:53 PM MDT



Erin Welsh poses for a photo in her Edmonton apartment. Welsh says she developed skin cancer after using tanning beds for several years. DAVID BLOOM/ EDMONTON SUN

An American dermatology expert is joining the call to ban the use of indoor tanning beds by minors in Alberta, where the cancer-causing pastime is both popular and entirely unregulated.

Dr. Henry Lim, an internationally renowned skin cancer expert, addressed the dangers of indoor tanning to a room full of medical students at the University of Alberta Monday evening.

Several studies conducted in the past five years have conclusively linked the use of artificial ultraviolet (UV) tanning beds to an increased risk of developing deadly skin cancers like melanoma, said Lim.

"The data is becoming very, very strong and from multiple sources," Lim explained, adding the World Health Organization officially designated tanning beds as a cancer causing agent on par with cigarettes in 2009.

"The sad part is that this is something that is totally preventable," said Lim. "If you do not go to tanning beds, you will have a far lower risk of developing skin cancer."

Currently Saskatchewan, Manitoba, Quebec, New Brunswick and Nova Scotia have banned indoor tanning to persons under 18, with British Columbia, Ontario, and the Maritimes in various states of approving similar legislation.

"This is a reflection of the science," said Lim. "People need to recognize that any type of tanning response from the skin is damaging to the skin."

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Tanning beds are most popular among fair-skinned and caucasian women between the ages of 16 and 25, said Lim. Melanoma, once regarded as a disease seen more often in the elderly, is now a common cancer diagnosed in

Table 2-6: **Incidence and Mortality Counts by Cancer Type and Sex, Alberta, 2010**

Cancer Type	Incidence Counts			Mortality Counts		
	Both Sexes	*Males*	*Females*	*Both Sexes*	*Males*	*Females*
All Cancers†	15,232	7,886	7,346	5,526	2,952	2,574
Bronchus/Lung	1,839	934	905	1,445	787	658
Prostate Gland	2,073	2,073	-	349	349	-
Breast	2,272	8	2,264	402	3	399
Colorectal	1,902	1,069	833	695	361	334
Non-Hodgkin Lymphoma	644	343	301	195	112	83
Pancreas	334	179	155	295	154	141
Leukemia	509	316	193	180	100	80
Melanoma of Skin	534	290	244	73	55	18
Kidney	428	267	161	122	75	47
Bladder	688	530	158	149	112	37
Stomach	246	160	86	162	110	52
Body of Uterus	440	-	440	63	-	63
Thyroid Gland	420	103	317	15	3	12
Brain	188	113	75	178	117	61
Liver	152	117	35	90	72	18
Oral	357	257	100	101	61	40
Ovary	171	-	171	125	-	125
Testis	129	129	-	3	3	-
Multiple Myeloma	190	113	77	82	51	31
Hodgkin's Disease	80	39	41	15	8	7
Esophagus	152	121	31	144	108	36
Cervix Uteri	150	-	150	33	-	33
Larynx	73	63	10	32	28	4
All Other Cancers	1,261	662	599	578	283	295

† Incidence counts exclude basal and squamous skin cancers
Data Source: Alberta Cancer Registry

PYLL - Melanoma among women who tan indoors in Alberta

Individual	Age at Death (yrs)	PYLL
1	22	75 – 22 = 53
2	46	75 – 46 = 29
3	35	75 – 35 = 40
4	74	75 – 74 = 1
5	56	75 – 56 = 19
		= 142 PYLL

Calculate the PYLL:

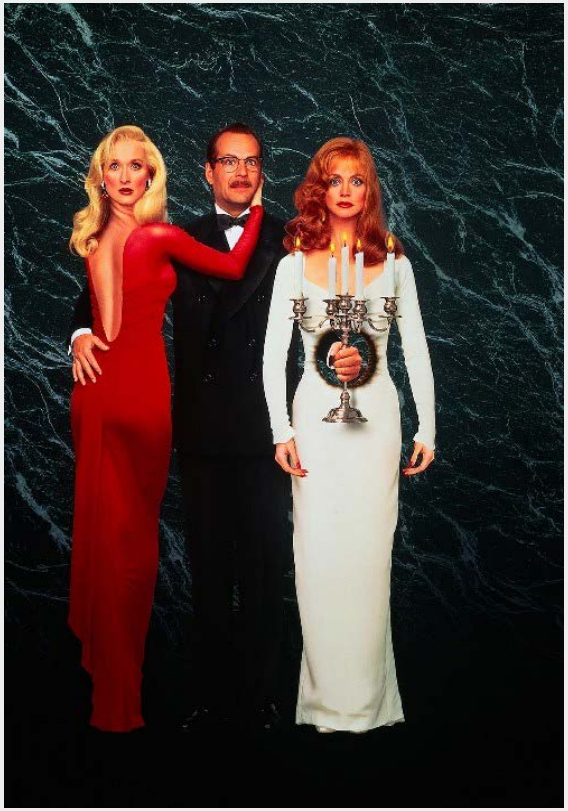
Number of Individuals	Age at Death (yrs)	PYLL
16	6	
4	7	
1	27	
1	29	
1	30	
1	47	
2	52	
1	56	
		PYLL =

WHAT IS THE POTENTIAL HEALTH IMPACT OF INCREASED NUMBER OF **YPLL** FOR POPULATION?

The Limitations of Life Expectancy and YPLL:

- Life expectancy and YPLL places emphasis on the health of a population based on **quantity of life.**

- But what about **health quality during life**?



Burden of Disease due to disability:

Epidemiologic transition is leading to an increased burden of disease globally

Other Disease Burden Measures

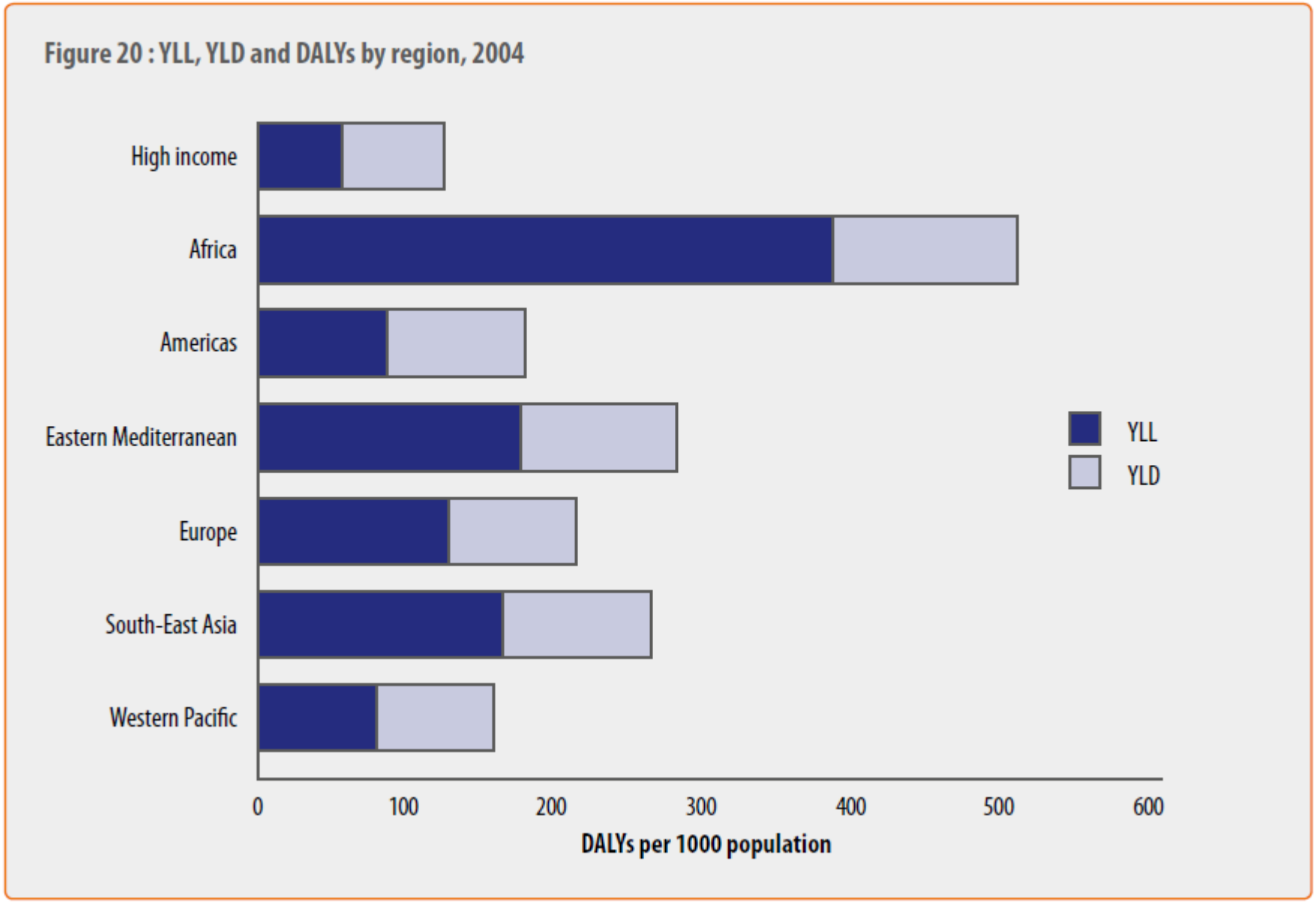
- We also want gain a fuller picture of a population's health before death.
- A country may have high life expectancy, but the extra years are lived in very poor health.
- May develop a treatment which extends life, but decreases quality of life

Problems with many disability measures…

- An arbitrary decision made to determine what level of disability = disabled.
- Years of life lived disabled are <u>not counted at all</u>, as though disabled = being dead.

3. DALYs (Disability Adjusted Life Years)

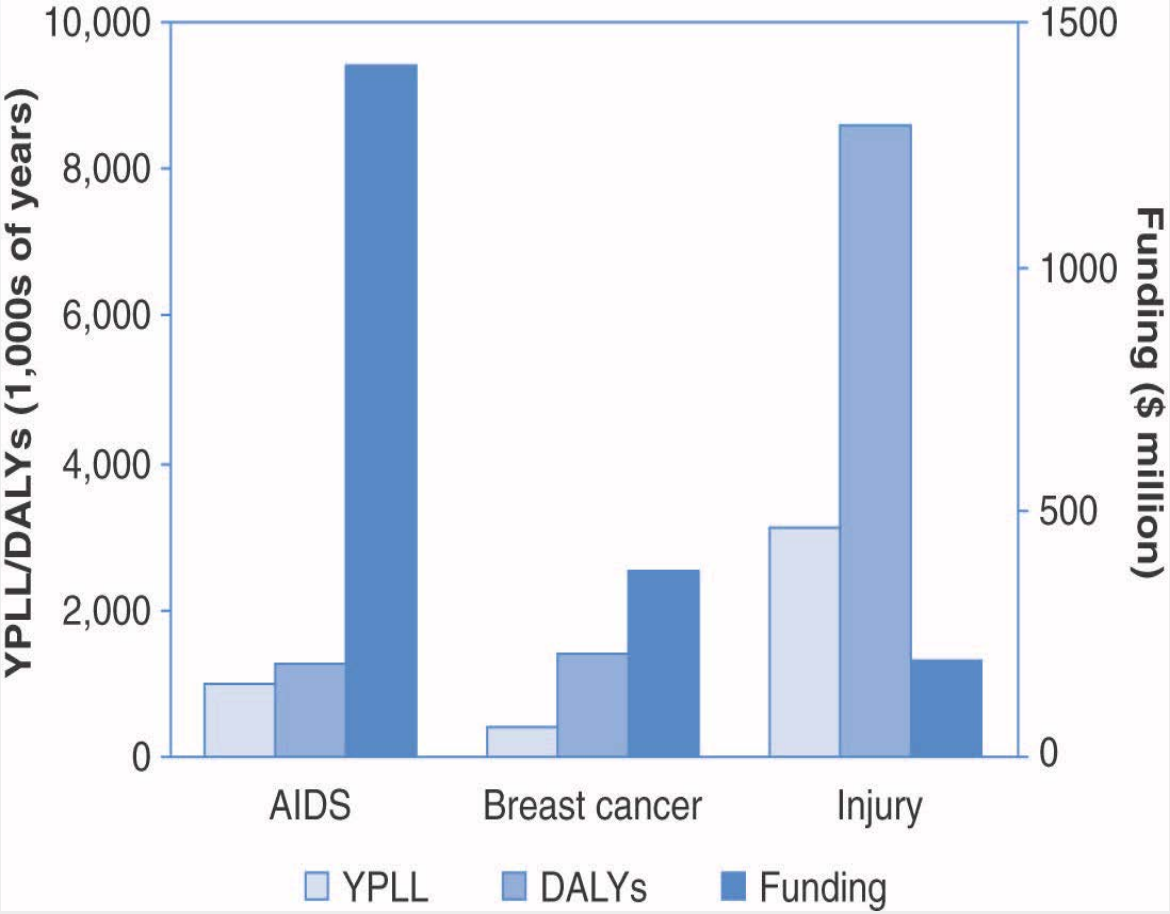
- **PYLL** + **YLD** (years lost due to disability)
- **1 DALY = 1 year of healthy life lost**
- WHO link
- **International standards** on how different disabilities are weighted so between country comparison is possible.



LINK to report

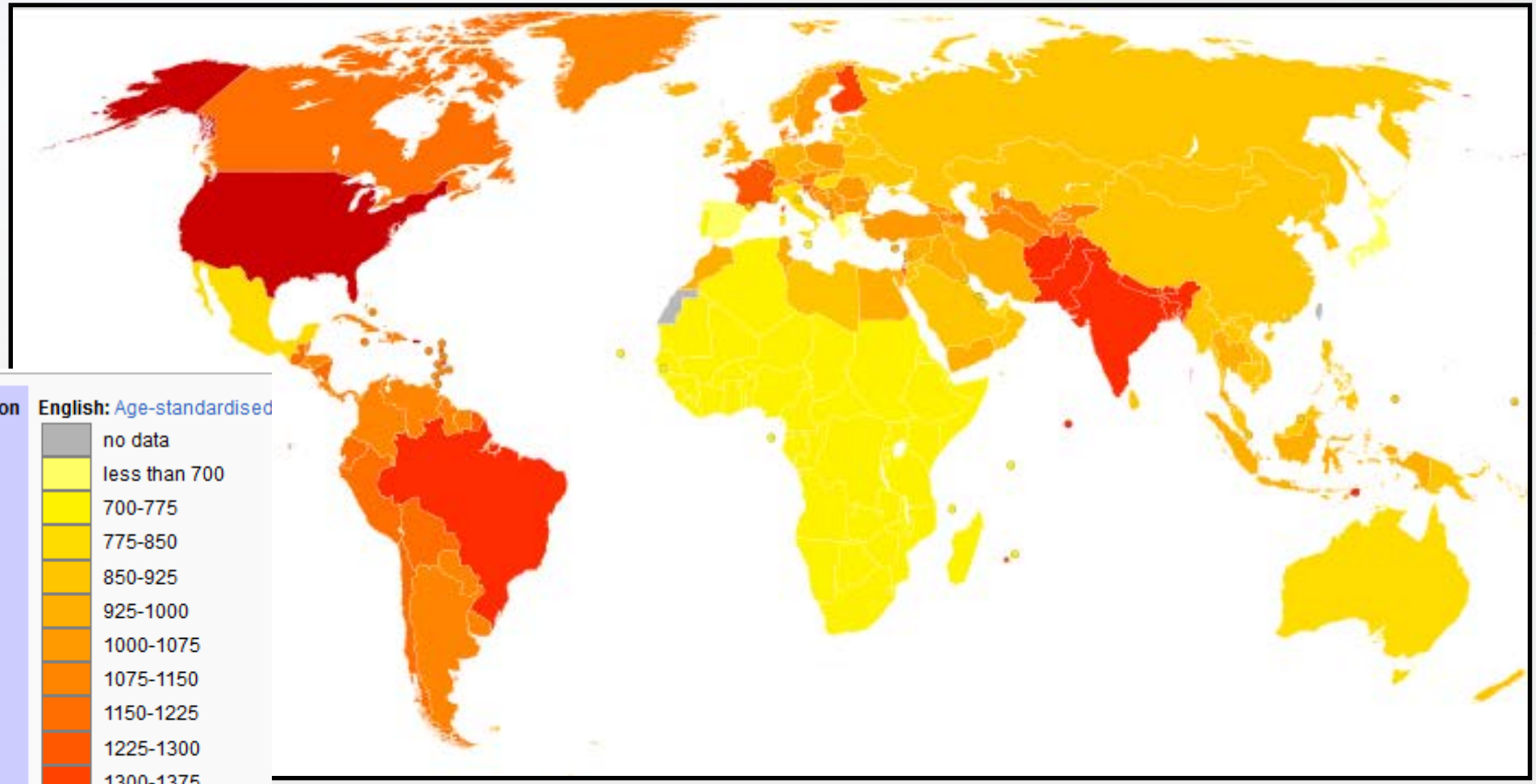
Importance of DALYs

- Can reorient health priorities in a region or country.
- Can help prioritize the development of new treatments
- Can highlight burden of disease attributable to entirely preventable risk factors
- Can capture the burden of disease not derived from mortality data



How do we define “disability”?

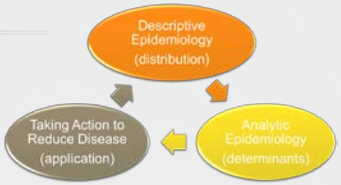
DALYs – Depression (per 100,000)



[Neuropsychiatric Disorders Dominate Disease Burden - Developed Countries]

World Health Organization

4. HALEs (Health-adjusted life expectancy)



- Incredible efforts (i.e. action) to reduce incidence, and reduce the impact of morbidity

- HALEs help to capture both fatal and non-fatal health outcomes (quantity AND quality)

- HALEs is the number of years that a person can expect to live in "full health" and takes into account average life expectancy at birth and then adjusts for time spent in poor health

LINK to Heart and Stroke Ad

LINK to HALEs in Canada

A HALE of 60 years equals?

- 60 years in full health
- 50 years in full health and 20 years at 50% health
- 50 years in full health and 30 years at 33% health