

*HSS1101D: Determinants of Health*

## Health Models/Frameworks and Health Indicators

January 27, 2012

**\*NOTE:** Original lecture developed by Prof Thy Dinh.  
Current lecture modified++ by Prof Sonia Gulati.  
Information is taken from sources as indicated at  
the bottom of or within the slides.

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**Professor:  
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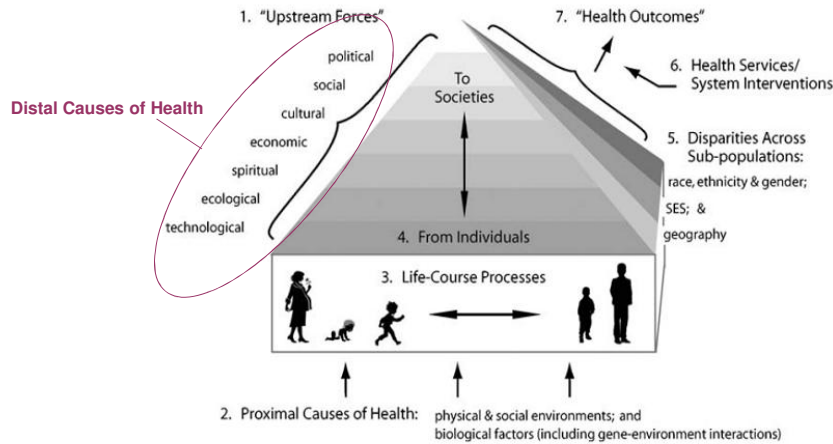
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### **Topics to be Covered**

- Population Health Models/Frameworks
  - Pyramid Model (Etches et al., 2006)
- Health Belief Model (HBM, Rosenstock, 1966)
- International Classification of Functioning, Disability and Health (ICF, WHO, 2001)
- Health Indicators / measures of health

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## Population Health Frameworks – The Pyramid (Etches et al., 2006)



V. Etches, J. Frank, E. DiRuggerio, and D. Manuel. (2006). Measuring population health: a review of indicators. *Annual Review of Public Health*, Volume 27, pp. 29-55.

Measuring Population Health (Etches et al., 2006)  
Understanding Population Health Terminology (Kindig, 2007)



## Population Health Frameworks

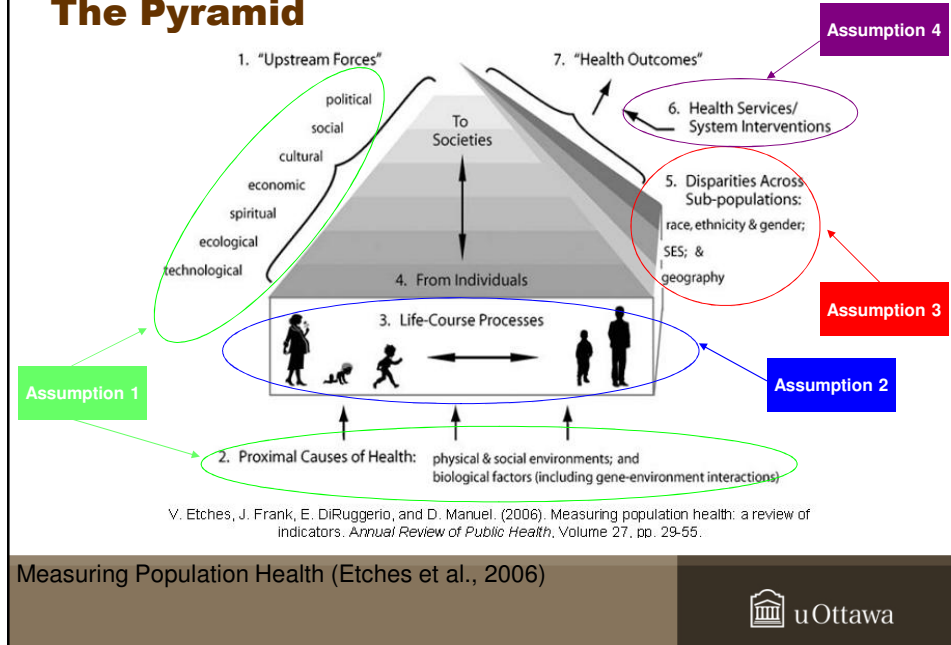
### Theoretical Assumptions in Population Health (field of study)

1. Health outcomes (states) are influenced by multiple determinants that work sometimes separately, but most often, interact to exert their influence
2. Health outcomes are influenced by multiple determinants over the life-course
3. There are disparities in health outcomes across subgroups of the population (also referred to as health inequalities)
4. Health interventions that take into consideration the previous (#1-3) assumptions, and that target the different sectors and levels of the population, are more likely to succeed in improving health outcomes

Measuring Population Health (Etches et al., 2006)  
Understanding Population Health Terminology (Kindig, 2007)



## Population Health Frameworks – The Pyramid



## Population Health Theoretical Assumptions

**1) Health outcomes (states) are influenced by multiple determinants that work sometimes separately but most often, interact to exert their influence**

Examples:

- |                          |   |
|--------------------------|---|
| • Social & Economic      | <i>social support/capital, social status, income, education</i>   |
| • Physical environment   | <i>built environment, access to facilities/food/healthcare</i>    |
| • Ecological environment | <i>natural disasters, climate change, air &amp; water quality</i> |
| • Political              | <i>public policy, legislation, regulation</i>                     |
| • Health care system     | <i>health services access and quality, wait times, drugs</i>      |
| • Individual behaviours  | <i>smoking, exercise, diet, substance abuse</i>                   |
| • Biology & Genetics     | <i>psycho-bio mechanisms, genetic predisposition</i>              |
| • Interactions           | <i>gene-environment, gene-behaviour, environment-behaviour</i>    |

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Understanding Population Health Terminology (Kindig, 2007)

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## Population Health Theoretical Assumptions

### 2) Health outcomes are influenced by multiple determinants over the life-course

- Time and timing is important in the associations between exposures (determinants / risk factors) and outcomes at the individual and population levels (Davey Smith, 2007)
- Adverse exposures early throughout life increases later disease risk (cumulative effects)
- Time window of exposure also important (critical-period effects)
  - e.g., Prenatal infection, lead exposure, alcohol consumption, smoking, etc

Life-course approaches to inequalities in adult chronic disease risk (Smith, 2007)  
Measuring Population Health (Etches et al., 2006)



## Population Health Theoretical Assumptions

### 3) There are disparities in health outcomes across subgroups of the population (also referred to as health inequalities)

- Health disparities – “differences in health status that occur among population groups defined by specific characteristics, which mostly result from inequalities in the distribution of the underlying determinants of health across populations” (Public Health Agency of Canada, 2005)
- Inequities - Avoidable and unnecessary inequalities (Kawachi et al., 2002) in health that are deemed to be unfair or to result from some form of injustice
- Vulnerable subgroups: Low income or education, Aboriginals, immigrants, rural dwellers, those with diseases or disabilities, etc

Measuring Population Health (Etches et al., 2006)  
Understanding Population Health Terminology (Kindig, 2007)



## Population Health Theoretical Assumptions

### 4) Health interventions that take into consideration the previous assumptions and that target the different sectors and levels of the population are more likely to succeed in improving health outcomes

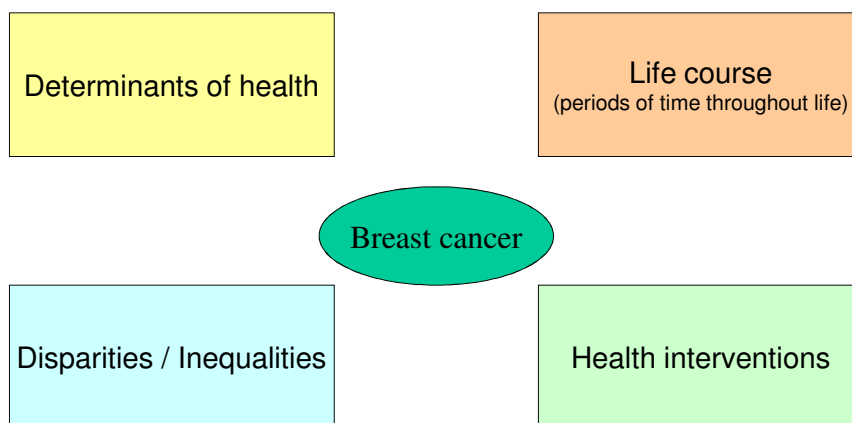
- Health interventions include services, programs, and policy (guidelines, laws and regulations) that affect health of individuals and populations
- Interventions that focus only on one determinant are likely to be less effective if complementary action is not in place which influences a linked factor in another area – interventions need to be both –
  - Upstream intervention act on the features of the social environment (e.g. income distribution, education and social networks)
  - Downstream intervention aim to change established health conditions (e.g., low birth weight or mental health)

Measuring Population Health (Etches et al., 2006)  
Understanding Population Health Terminology (Kindig, 2007)



## Class Exercise / Homework

Apply the population health assumptions to describe breast cancer disease



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## Class Exercise / Homework – RESULTS

### Determinants of health

Biological – genetic (BrCA1/2), age, co-morbidity, obesity, sex  
Behavioural – diet, alcohol, sleep patterns  
Social – income, religion, social support, residence, ethnicity  
Environmental (ecological) – contaminants in natural environment  
Health care – regular GP, access to treatments

### Life course

Exposures and factors that are also time - dependent:  
Exposure to contaminants (exogenous hormones)  
Birth control use  
Hormone replacement therapy use  
Alcohol use

### Breast cancer

### Disparities / Inequalities

Apparent disparities across subgroups:  
Ethnic groups – lower incidence of disease in Aboriginal women but higher rates of mortality  
SES – women of higher SES tend to have higher incidence rates of disease than women of low SES – may be related to birth control use, but may have worse prognosis (i.e., increase rate of mortality)

### Health interventions

Upstream interventions (prevention): improve access to education, income distribution, access to general health care services  
Downstream interventions (care): health care policy – have a more comprehensive drug plan, improve access to screening and treatment, health promotion (education)

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## Health Belief Model

- The Health Belief Model, developed by Hochbaum et al., uses psychological theories about decision-making to determine what actions individuals choose when presented with multiple health care choices (Rosenstock, 1966).
- Health behaviours and choices tend to be influenced by:
  - i) individuals' belief that a certain course of action will lead to the desired outcome (Lewin et al., 1944), and
  - ii) the value that people place on their health (Wallston, 1992).
- The model considers the notion of internal vs. external locus of control, and is based on subjective beliefs and perceptions rather than objective measurements.
- People are more likely to follow treatment approaches that are personally meaningful.

Psychosocial Aspects of Health Care (Drench et al., 2012, p 122-123)



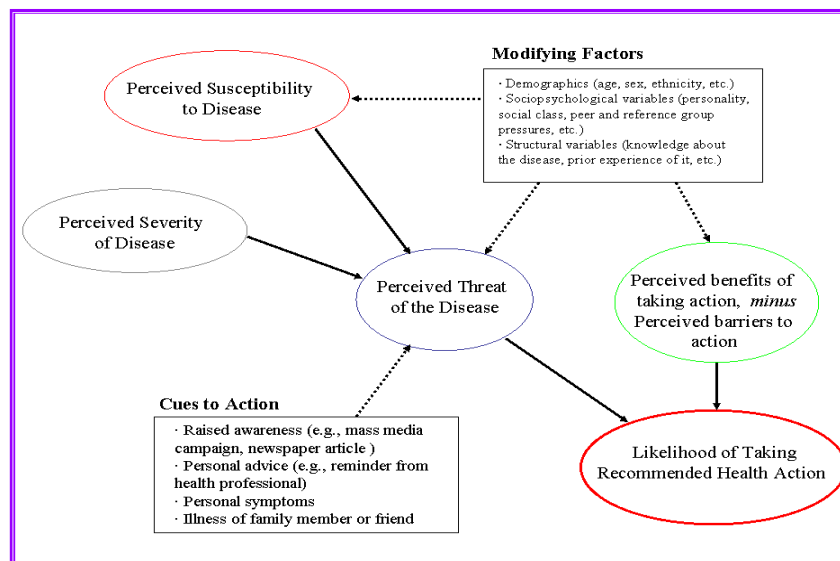
## Cont'd Health Belief Model

- Three factors help to explain whether or not a person will comply with recommendations to change their behaviour:
  1. Does the person feel ready to take action? This may be influenced by how susceptible one believes they are to the disease and how severe they think the disease may be.
  2. How does the person evaluate the recommended treatment or action, including whether the action will prevent the disease or reduce its severity, and the 'costs' and barriers associated with the proposed action?
  3. Is there some 'cue to action' present that triggers a change in health behaviour? This may be internal (e.g., obvious symptoms) or external (e.g., sibling gets sick).

University of Ottawa, 2011  
[http://www.med.uottawa.ca/sim/data/BehaviorChange\\_e.htm](http://www.med.uottawa.ca/sim/data/BehaviorChange_e.htm)

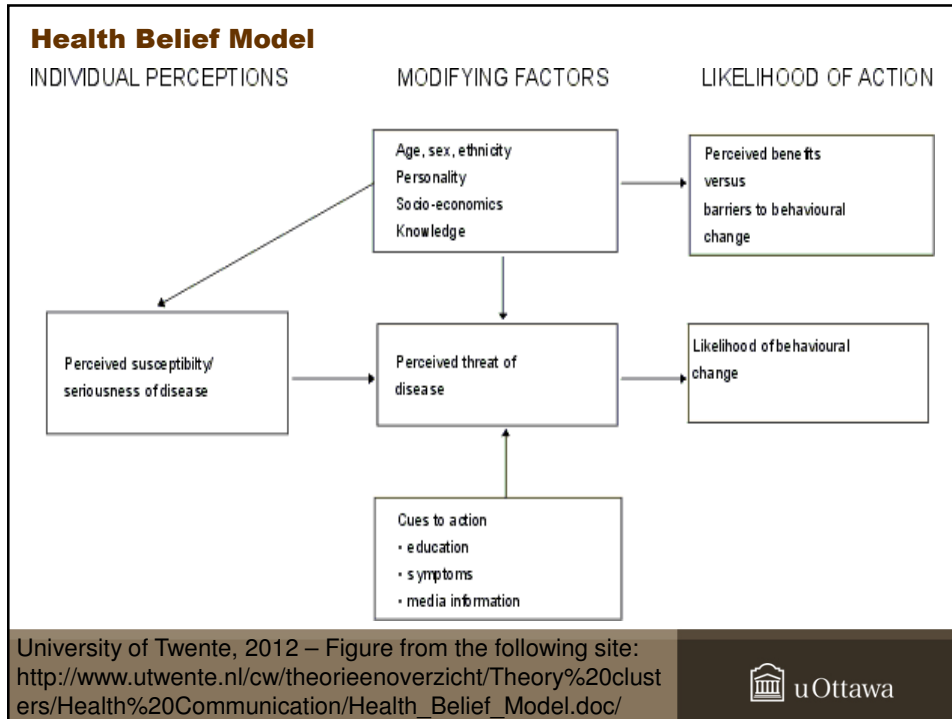


## Health Belief Model



University of Ottawa, 2011 – Figure from the following site:  
[http://www.med.uottawa.ca/sim/data/BehaviorChange\\_e.htm](http://www.med.uottawa.ca/sim/data/BehaviorChange_e.htm)





## What do these people have in common?

- A child wearing a hearing aid.
- A young girl with an acquired brain injury who does not remember her friends.
- An adolescent man playing wheelchair basketball.
- A college student discussing special exam accommodations with a counselor.
- A man who is morbidly obese.
- A woman experiencing shortness of breath frequently while walking.
- An older person who is unable to navigate stairs.

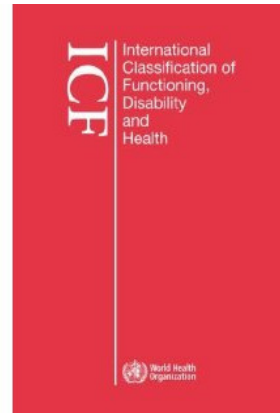
## **International Classification of Functioning, Disability and Health (ICF, World Health Organization, 2001)**

### ***Overall aim:***

To provide a unified and standard language and framework for describing health and health related states.

### ***Previous version:***

International Classification of Impairments, Disabilities and Handicaps (ICIDH, World Health Organization, 1980)



World Report on Disability 2011 – Chapter 1  
ICF, WHO, 2001

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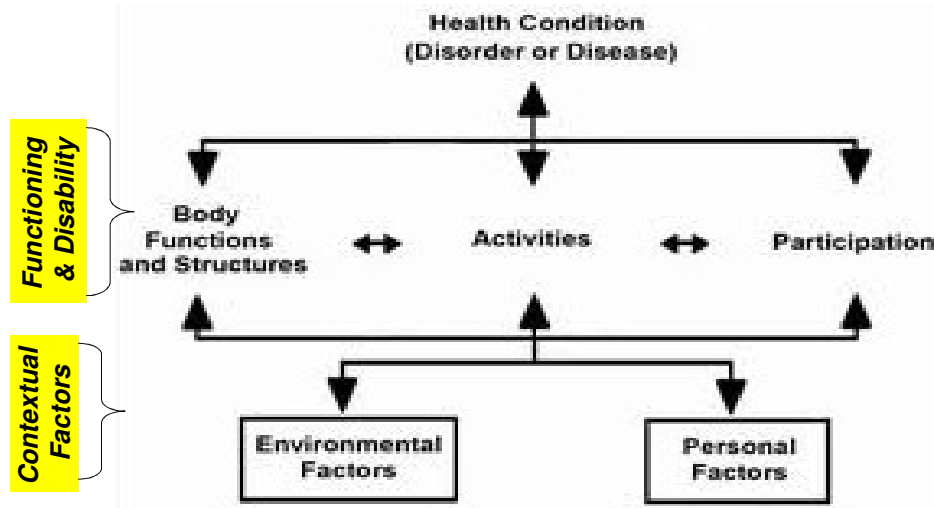
## **cont'd ICF...**

- **HEALTH:** Concerns both how long one lives and how well one lives (i.e., level of functioning).
- **FUNCTIONING:** An umbrella term for body structures and functions, activities, and participation.
- **DISABILITY:** An umbrella term for impairments (of body structures and functions), activity limitations, or participation restrictions.
- Has universal applicability (not only about people with disabilities).

World Report on Disability 2011 – Chapter 1  
ICF, WHO, 2001

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## Interaction between Components of ICF



World Report on Disability 2011 – Chapter 1  
ICF, WHO, 2001

## Dimensions of Functioning and Disability

	Functioning	Disability
Body Level	Structures and Functions	Impairments
Individual Level	Activities	Activity Limitations
Societal Level	Participation	Participation Restrictions

World Report on Disability 2011 – Chapter 1  
ICF, WHO, 2001

## Components of ICF

- **Body Functions:** Physiological & psychological functions.
- **Body Structures:** Anatomical parts of the body.
- **Impairments:** Problems in body functions or structures.
- **Activity:** Execution of a task or action.
- **Activity Limitation:** Difficulties in executing activities.
- **Participation:** Involvement in life situations.
- **Participation Restrictions:** Problems in involvement.
- **Environmental Factors:** Describe the context in which one lives and conducts their life (**facilitators or barriers**).
- Each component can be expressed in positive & negative terms
- **Personal Factors:** Are not classified into components because of the large social and cultural variance.

World Report on Disability 2011 – Chapter 1  
ICF, WHO, 2001



## cont'd description of ICF...

- Impairments or disabling factors do NOT necessarily mean that the person be regarded as sick or disabled.
- Disability is characterized as the outcome or result of a complex relationship between an individual's health condition, personal factors, and the external factors that represent the circumstances in which one lives.
- Different environments may have a different impact on the same individual with the same health condition.
- Two persons with the same disease can have different levels of functioning.
- Two persons with the same level of functioning do not necessarily have the same health condition.

World Report on Disability 2011 – Chapter 1  
ICF, WHO, 2001



## ICF Organization of Content

### b BODY FUNCTIONS

#### b1 Chapter 1 Mental Functions

##### b110-b139 Global Mental Functions

##### b110 Consciousness functions

b1100 State of consciousness

b1101 Continuity of consciousness



- Each component consists of various domains AND within each domain, there are categories, which are the units of classification.

<http://apps.who.int/classifications/icfbrowser/>  
ICF, WHO, 2001



## Aims of the ICF

- To provide a scientific basis for understanding and studying health and health-related states, health outcomes, and determinants of health.
- To establish a common language for describing health and health-related states in order to improve communication between different users/disciplines.
- To allow for comparison data across countries, health care disciplines, and services.
- To provide a systematic coding scheme for health information systems.

ICF, WHO, 2001



## Health Indicators

*A directly measurable variable that reflects the health status of the population... Can be measured in terms of presence or absence of these factors. (Last, 2007)*

- Examples: mortality rates, incidence rates of diseases, school and work absenteeism, cancer incidence, prescribed medications, causes of deaths, etc.

A Dictionary of Public Health (Last, 2007)

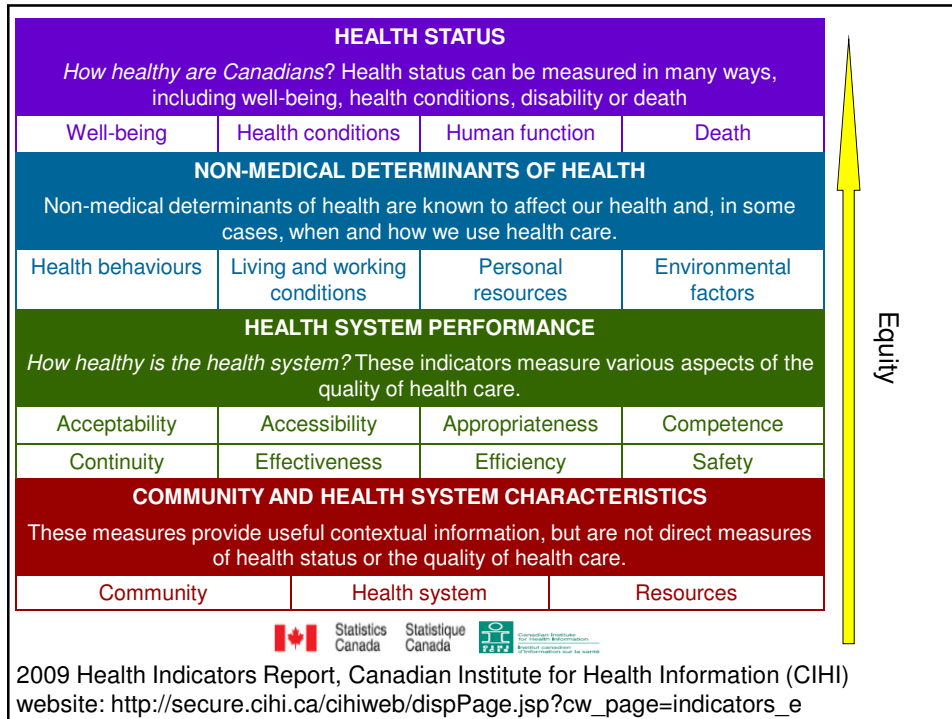


## Health Indicators

- **Why?** To know the levels, trends, and distributions of health; to understand the determinants of these aspects of health; and to allocate resources effectively to improve health
- **Who?** Provincial Ministers and Deputy Ministers of Health; general public; managers of health care delivery institutions; physicians, nurses and other health care providers; community agencies

A Dictionary of Public Health (Last, 2007)





## Health Status Indicators

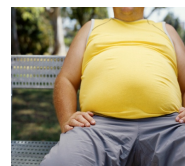
- **Perceived health:** Proportion of household population aged 12 years and older who reported perceiving their own health status as being either excellent or very good.
- **Arthritis or rheumatism:** Proportion of household population aged 12 years and older who reported being diagnosed with arthritis or rheumatism by a health professional.



- **Asthma:** Proportion of household population aged 12 years and older who reported being diagnosed with asthma by a health professional.

## Cont'd Health Status Indicators

- **High blood pressure:** Proportion of household population age 12 and older who reported being diagnosed by a health professional as having high blood pressure.
- **Body mass index:** Proportion of household population age 18 and older with a body mass index (BMI) of  $> 30 \text{ kg/m}^2$  (=obese).
- **Diabetes:** Proportion of household population age 12 and older who reported being diagnosed by a health professional as having diabetes.



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## Non-medical Determinants of Health

- **Low income rate:** Proportion of population in economic families and persons aged 15 years and older not in economic families with incomes below the Statistics Canada low income before tax cut-off (LICO-BT).
- **Unemployment rate:** Proportion of the labour force aged 15 years and older who did not have a job during the reference period.
- **Youth unemployment rate:** Number of unemployed persons aged 15 to 24 years expressed as a percentage of the labour force in this age group.



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## Cont'd Non-medical Determinants of Health

- **Life stress:** Proportion of household population aged 15 years and older who described their level of life stress as quite a lot.
- **Leisure-time physical activity:** Proportion of household population aged 12 years and older reporting active or moderately active level of physical activity, based on questions about the frequency, duration and intensity of their participation in leisure-time physical activity over the past three months.
- **Sense of community belonging:** Proportion of household population aged 12 years and older reporting their sense of belonging to their local community as very strong or somewhat strong.

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## Cont'd Non-medical Determinants of Health

- **Fruit and vegetable consumption:** Proportion of household population aged 12 years and older who reported consuming fruits and vegetables five or more times per day, on average.
- **Current smoker:** Proportion of household population aged 12 years and older who reported being a current smoker on either a daily or occasional basis.
- **Heavy drinking:** Proportion of household population aged 12 years and older who reported being a current drinker and having five or more drinks on one occasion, 12 or more times a year.

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## Health System Performance

- **Caesarean section:** Proportion of women delivering babies in acute care hospitals by Caesarean section.



- **Acute myocardial infarction readmission:** The risk-adjusted rate of unplanned readmission following discharge for acute myocardial infarction (AMI) or heart attack.
- **Hysterectomy readmission:** The risk-adjusted rate of unplanned readmission following discharge for hysterectomy

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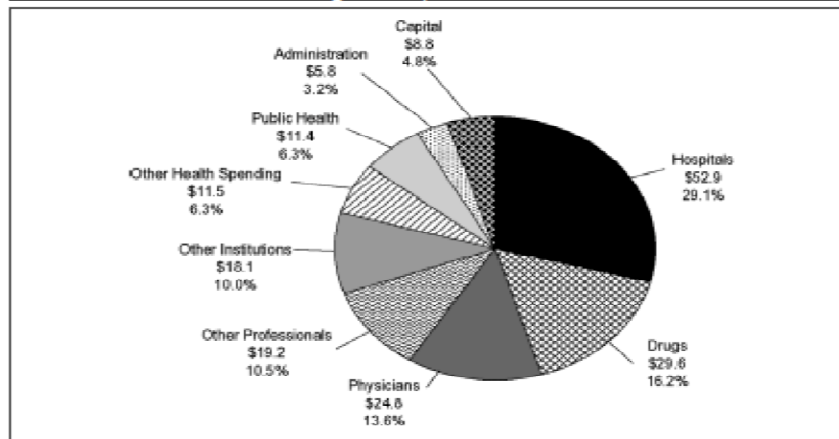
## Community and Health System Characteristics

- **Physicians:** Number of physicians per 100,000 population.
- **Number of health professionals:** Number of health professionals (selected) per 100,000 population.
- **Total health expenditure:** Total health expenditure includes any type of expenditure for which the primary objective is to improve or prevent the deterioration of health status.
- **Total health expenditure by use of funds:** Percentage distribution of total health expenditure by health-spending category (e.g., administration, hospitals, drugs, physicians, public health, etc).

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**Figure 12: Total Health Expenditure by Use of Funds, Canada, 2009 (Billions of Dollars and Percentage Share)**



**Note**

See tables C.1.1 and C.1.2 and Section 8.1 for definitions.

**Source**

National Health Expenditure Database, Canadian Institute for Health Information.

Canadian Institute for Health Information  
[www.secure.cihi.ca/cihiweb/products/nhex\\_trends\\_report\\_2011\\_en.pdf](http://www.secure.cihi.ca/cihiweb/products/nhex_trends_report_2011_en.pdf)



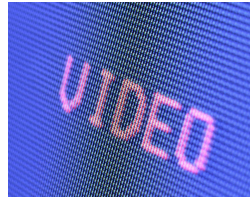
## Health Indicators

- Specific indicators measured and reported for specific purposes
  - e.g., hospital reports may want to measure number and types of admissions and surgical mortality rates, etc
- Other specific uses:
  - e.g., advocacy, accountability, system management, quality improvement, research, evaluations of interventions, improving professional training, etc

Measuring Population Health (Etches et al., 2006)



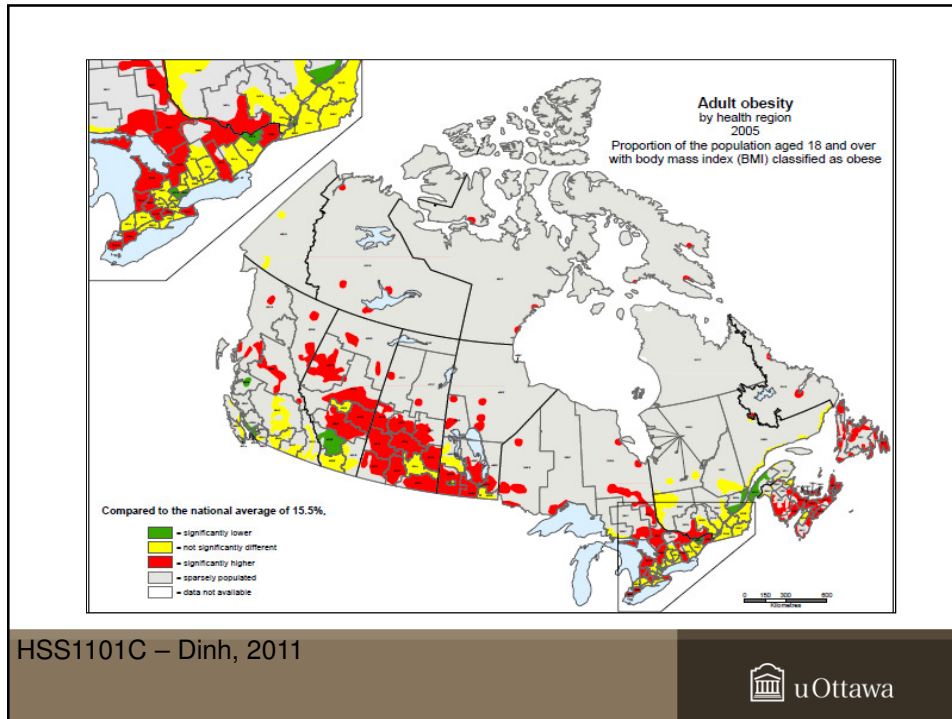
## Video: Health Indicators – Use for Practice



- **CIHI Data: Helping Hips Heal Faster (WHRA 2010) (3:05)**  
<http://www.youtube.com/watch?v=fd8nw7GVRCc&lr=1>
- **CIHI Data Helps Put Philosophy into Practice (3:51)**  
[http://www.youtube.com/watch?v=\\_0m6NJyImxA&lr=1](http://www.youtube.com/watch?v=_0m6NJyImxA&lr=1)

## Health Indicators – Types of data

- **Census and Vital Statistics** – births, deaths, income, work, housing, immigration/language, and family/household relations
- **Surveys** – used to collect data on multiple factors from various populations (e.g., Canadian community Health Survey (CCHS))
- **Administrative Data** – collected for reasons other than generating health statistics (e.g., hospital data; OHIP billing; cancer registries)
- **Non-Health Data** – e.g., weather conditions, income, education, social spending, election turnout
- **Map Data** – can visually depict shifts and trends of diseases and other health factors by regions and over time
- **Qualitative Data** – provides contextual information that can generate new knowledge; may include using open-ended questions on surveys uses descriptions, themes and concepts
- **Basket presentation** – presenting multiple health indicators into one report to show potential relationships across indicators



## Health Indicators – Integrating indicators

- **Linked databases** – to establish causal pathways and relationships between multiple factors (e.g., mortality database linked to cancer registries; can link health to non-health datasets as long as there is a common identifier ( e.g. social insurance number)
- **Multilevel analysis** – putting together both individual and community-level information
- **Risk adjustment** – resending data in relation to risk or need (e.g., # physicians by patient income group)
- **Attributable proportions** – percent of health or ill-health attributable to an intervention or determinant of health
- **Modeling** – mathematical equations or algorithms that can look at the effects of multiple factors and their interactions on a particular health outcome; can project into the future
- **Summary measures** – health measurements that take into account more than one type of measurement of health to form some overall measurement of population health

Measuring Population Health (Etches et al., 2006)

## **Ethical Considerations - Health Indicators**

- Privacy and confidentiality
- Placing values on different populations and health states
- Resource allocation
- Transparency and public participation
- Harms versus benefits of measuring and reporting on certain health indicators

Measuring Population Health (Etches et al., 2006)



## **Characteristics of Good Health Indicators**

- Built on consensus
- Based on a conceptual framework
- Feasibility and timeliness
- Valid (accurate), and reliable (consistent) and sustainable
- Comprehensible and comparable
- Flexible for use at different organizational levels
- Include measures of :
  - incidence and prevalence
  - central tendency (e.g., mean, median, etc)
  - distribution
  - stratification of subpopulations

Measuring Population Health (Etches et al., 2006)



## **Health Indicators: Sources of Canadian data**

- **Statistics Canada**
  - Health indicator tables and maps:  
<http://www.statcan.gc.ca/pub/82-221-x/82-221-x2011002-eng.htm>
- **Canadian Institutes for Health Information**
  - Reports: [www.cihi.ca](http://www.cihi.ca)
- **Public Health Agency of Canada**
  - Data cubes for chronic disease:  
<http://cvdinfobase.ca/cubes/intro-e.html>