COMMUNITY HEALTH

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DEFINITIONS

Bias
- ❑ systematic error in making inferences, making and recording observations

Confounding Factors
- ❑ factors associated with both the factor under study and the occurrence of a health outcome (e.g. smoking and alcohol to head and neck cancer)

Co-Intervention
- ❑ an intervention, made in either the intervention group, the control group or both which may contribute to a study's outcome (e.g. anti-hypertensive agents given to participants in a trial measuring morbidity and mortality related to a cholesterol-lowering agent)

Contamination
- ❑ controls are exposed to the factor in question or receive some of the intervention on trial (e.g. placebo group receives a trial drug from a physician not involved in the trial)

Cohort Study
- ❑ follows a group of persons with common characteristics forward over a period of time and determines outcome according to exposure to different factors

Case-Control Study
- ❑ examines a group of people who already have a particular outcome and compares them to a similar group without that outcome
- ❑ can examine risk factors for the outcome and determine if those with the outcome have had significantly more exposure to the factors

Randomized Controlled Trial (RCT)
- ❑ randomization: equal distribution of all characteristics
  - one group receives intervention
  - one group receives placebo
- ❑ single-blind: subjects do not know treatment status
- ❑ double-blind: subject and observer both blind
- ❑ triple-blind: subject, observer, and statistician all blind

Relative Risk
- ❑ ratio of the incidence of a health outcome among a population exposed to a factor vs. a population not exposed (see Figure 3)

Attributable Risk
- ❑ rate of a health outcome attributable to a hypothetical risk factor for that outcome
- ❑ [incidence in exposed population] - [incidence in non-exposed] (see Figure 3)

Odds Ratio
- ❑ estimate of relative risk
- ❑ ratio of odds in favour of exposure to a hypothetical risk factor among cases vs. the odds of exposure among non-cases (see Figure 2)

TYPES OF STUDY DESIGN

Observational
- ecological study
- prevalence study (cross-sectional)
- case-control (retrospective)
- cohort (prospective, incidence, longitudinal)

Experimental
- randomized controlled trial

ECOLOGICAL STUDY
- analyzes an aggregate, not individuals (i.e. geographic areas such as countries or census tracts are used as units of analysis)
- generate hypotheses therefore cannot be used for direct assessment of causal relationships because cannot achieve adequate control of all confounding variables
- provides accurate descriptions of the average exposure or risk of disease for populations but cannot infer about any individuals in the population
- e.g. an ecological study will show that France has a higher rate of red wine consumption and a lower rate of death from cardiovascular causes. One cannot conclude that red wine drinking leads to lower risk of death from CVS disease because the individuals dying from CVS disease were not investigated for their red wine-drinking habits

PREVALENCE STUDY (CROSS-SECTIONAL)
- presence or absence of a specific disease compared with one or several variables within a defined population at a specific point in time

Method
- state the purpose of the study
- select a population (total or sample)
- collect information from each person at one particular time
- tabulate the numbers in the groups
  - presence or absence of disease
  - presence or absence of factor
- make 2 x 2 table and compare the groups

Disease (Effect)

Factor (Cause)	Present	Absent	Total
Present	A	B	A + B
Absent	C	D	C + D
Total	A + C	B + D	A + B + C + D

$\frac{A}{A+B}$ prevalence of disease in the group with the factor (e.g. lung cancer in smokers)

$\frac{C}{C+D}$ prevalence of disease in the group without the factor (e.g. lung cancer in non-smokers)

Figure 1. Prevalence Study

CASE-CONTROL STUDY (RETROSPECTIVE)
- starts now and goes back in time
- specific hypotheses usually tested
- select all the cases of a specific disease during a specific time
  - cases must be representative of spectrum of clinical disease under investigation
- select a number of controls
  - controls should represent general population

- ❑ may select more than one control group for specificity
- ❑ may match controls to patients (e.g. age, gender)
- ❑ determine exposure to factor(s) in cases and controls
- ❑ provides odds ratio (only an estimate of relative risk)
- ❑ disease in population must be rare (less than 10% of population) (see Figure 2 and Table 1)

		Disease (Effect)	
		Present	Absent
Factor (Cause)	Present	A	B
	Absent	C	D
	Total	A + C	B + D

$$\text{odds ratio} = \frac{A \times D}{B \times C} = \text{cross products}$$

Figure 2. Case-Control Study

COHORT STUDY (PROSPECTIVE, INCIDENCE, LONGITUDINAL)

- ❑ start with two groups free of disease and follow forward for a period of time
- ❑ one group has the factor (e.g. smoking); one group does not
- ❑ define one or more outcomes
- ❑ collect information on factors from all persons at the beginning of the study
- ❑ tabulate the numbers of persons who develop the disease
- ❑ provides estimates of
  - incidence
  - relative risk
  - attributable risk
- ❑ can not, by itself, establish causation but can show an association between a factor and an outcome
- ❑ generally provides stronger evidence for causation than case-control study

		Disease (Effect)		
		Present	Absent	Total
Factor (Cause)	Present	A	B	A + B
	Absent	C	D	C + D

$\frac{A}{A+B}$ = incidence rate of disease in smokers

$\frac{C}{C+D}$ = incidence rate of disease in non-smokers

relative risk: $\frac{A}{A+B} \Big/ \frac{C}{C+D}$

attributable risk: $\frac{A}{A+B} - \frac{C}{C+D}$

Figure 3. Cohort Study

Table 1. Comparison of Cohort and Case-Control Studies

	Advantages	Disadvantages
Cohort (prospective study)	1. lack of bias in factor 2. yields incidence rates, relative and attributable risk 3. uncovers natural history 4. can study many diseases	1. possible bias in ascertainment of disease 2. large numbers 3. long follow-up 4. problem of attrition of subjects 5. very costly 6. changes in criteria and methods of treatment over time 7. changes in factor over time 8. locked into the factor(s) measured
Case-Control (retrospective study)	1. small number of subjects 2. relatively quick to do 3. suitable for rare diseases 4. relatively inexpensive 5. can study many factors	1. incomplete information for factor 2. recall bias 3. problems selecting control group or in matching controls 4. only an estimate of relative risk 5. no incidence rates 6. locked into the disease

RANDOMIZED CONTROLLED TRIAL

- ❑ to test the hypothesis that an intervention (treatment or manipulation) makes a difference
- ❑ an experimental group is manipulated while a control group receives a placebo or standard procedure
  - all other conditions are kept the same between the groups
- ❑ the outcome is measured and the groups are compared
- ❑ provides strongest evidence for causation

Problems

- ❑ ethical issues
- ❑ randomization
- ❑ blind techniques
- ❑ defining the reference population
- ❑ length of follow-up

Clinical Trials

- ❑ to test a treatment
- ❑ carried out on patients with disease

Points in the Design of Controlled Trials

- ❑ obtain informed consent
- ❑ divide patients into treatment group and control group
  - randomization preferable (e.g. random number based)
- ❑ treatment protocol must be the same so that any effect can be attributed to intervention
- ❑ follow-up should be carefully done
  - drop-outs, moved away, non-compliance
- ❑ measurement of effects
  - subjective (e.g. pain)
  - objective (e.g. blood sugar)
  - bias (e.g. doctor or patient)
- ❑ statistical evaluation
  - how likely is the difference observed to be due to chance/sampling error alone?
  - relative vs. absolute risk reduction

MEASUREMENTS OF THE EFFECTIVENESS OF INTERVENTIONS

Compliance

- ❑ the degree to which a patient adheres to a treatment plan

Notes

Effectiveness, Efficacy, Efficiency
- ❑ three measurements indicating the relative value (beneficial effects greater than harmful effects) of an intervention in three situations
  - effectiveness: the value of an intervention to all those offered the intervention (its real world impact)
  - efficacy: the value of the intervention to all those who accept the advice and comply with it (its ideal maximum impact)
  - efficiency: the cost-effectiveness of the intervention (considers the optimal use of resources e.g. monetary, personnel, equipment, etc...)

Critical Appraisal
- ❑ questions to critically assess an article on therapy
- ❑ was assignment of patients to treatments really randomized?
  - was similarity between groups documented?
- ❑ were all clinically relevant outcomes reported?
  - mortality as well as morbidity?
  - death from all causes?
  - quality of life: was outcome assessment "blind"?
- ❑ were the study patients recognizably similar to your own?
  - eligibility criteria
- ❑ were both clinical and statistical significance considered?
  - if statistically significant, was the difference clinically important?
  - if not statistically significant, was the study big enough to show a clinically important difference if it should occur?
- ❑ is the therapeutic maneuver feasible in your practice?
  - available? affordable? sensible?
  - were contamination and co-intervention avoided?
  - was it blind?
  - was compliance measured?
- ❑ were all the patients who entered the study accounted for at its conclusion?

CAUSATION

Criteria for Judging Causal Relationship
- ❑ experimental evidence
- ❑ strength of association: high relative risk
- ❑ biological gradient: dose-response curve
- ❑ consistency with other data e.g. different populations or study designs
- ❑ temporal relationship
- ❑ biologically plausible
- ❑ specificity of association
- ❑ analogy: other associations model this relationship
- ❑ coherence with theory and knowledge

MEASUREMENTS

DEFINITIONS

Population
- ❑ a collection of living individuals

Sample
- ❑ a selection of elements from a population or universe of observations
- ❑ types
  - random (all equally likely to be selected)
  - systematic (e.g. every second patient in queue)
  - stratified (separately representative of more than one stratum/subgroup)
  - cluster (grouped in space/time to reduce costs)
  - convenience (non-random)

Sampling Bias
- ❑ select a sample that does not truly represent the population
  - sampling procedure should be chosen to prevent bias

Sample Size
- ❑ sample size contributes to the credibility of "positive" studies and power of "negative" studies
- ❑ increasing the sample size decreases the probability of making type I and type II errors

Statistical Hypotheses
- ❑ null
  - hypothesis of no difference between a test group and a control group (i.e. there is no association between the disease and the risk factor in the population)
- ❑ alternative
  - hypothesis that there is some difference (i.e. there is some association between the disease and the risk factor in the population)

Type I Error (Alpha Error)
- ❑ the probability that a null hypothesis is considered false when it is actually true (i.e. declaring an effect to be present when it is not)
- ❑ this probability is represented by the p value or α, the probability the difference is due to chance alone

Type II Error (Beta Error)
- ❑ the probability of accepting a null hypothesis as true when it is actually false (i.e. declaring a difference/effect to be absent when it is present)
- ❑ the probability that a difference truly exists
- ❑ reflects the power (1-ß) of a study

		Actual Situation	
		No Effect	Effect
Results of Statistical Analysis	No Effect	no error	type II (ß) error
	Effect	type I (α) error	no error

Figure 4. Types of Error

Power (1 - ß)
- ❑ the probability of rejecting a null hypothesis when it is in fact false (i.e. the probability of finding a specified difference to be statistically significant at a given α-error level [p value])
- ❑ power increases with sample size

Statistical Significance
- ❑ determination by a statistical test that there is evidence against the null hypothesis (i.e. that the control group and the test group differences are unlikely due to chance alone)
- ❑ the level of significance depends on the values chosen for α error
- ❑ usually $\alpha < 0.05$ and ß < 0.20 (i.e. studies rarely aim for power > 80%)

Clinical Significance
- ❑ statistical significance is necessary but not sufficient for clinical significance, which reflects the meaningfulness of the difference (e.g. a statistically significant 1 mmHg BP reduction is not clinically significant)
- ❑ depends on factors such as cost and side effects in addition to statistical significance

Confidence Interval (CI)
- ❑ a range of values reflecting the statistical precision of an estimate (e.g. a 95% CI has a 95% chance of including the true value)

Data
- ❑ information about a sample or population
  - discrete (e.g. number of strokes experienced)
  - continuous (e.g. serum cholesterol, hemoglobin, age)
  - categorical (e.g. gender, marital status)

Accuracy
- how closely a measurement approaches the true value

Reliability
- how consistent a measurement is when performed by different observers under the same conditions or the same observer under different conditions

Validity
- describes the accuracy and reliability of a test (i.e. the extent to which a measurement approaches what it is designed to measure)

COMMON STATISTICAL TESTS

Z-Test (known as t-test for samples of fewer than 30 each)
- tests difference between two sample means for continuous data

Chi-square Test(χ^2)
- tests difference between proportions or tests for association between categories (e.g. if one sample of 20 patients is 30% hypertensive and another comparison group of 25 patients is 40% normotensive, how likely is the difference in percentage due to chance alone? This likelihood is the p value)
- very versatile test

Analysis of Variance (ANOVA)
- an extension of the Z/t-test which compares mean values from three or more groups simultaneously on one or more factors
- one-way ANOVA - compares 3 or more groups on one factor
- two-way ANOVA - compares 3 or more groups on two or more factors

Regression
- linear regression
  - a technique to describe the relationship between two variables when both variables are continuous
  - where one variable might be used to predict the other or to explain changes in the other
  - assumes a straight line is a reasonable fit for this relationship
  - allows you to estimate slope of the line and closeness of fit
- logistic regression
  - requires discrete outcomes (e.g. disease/disease free)
  - produces an adjusted odds ratio for individual variables

DISTRIBUTIONS
- to describe statistical distributions of observations

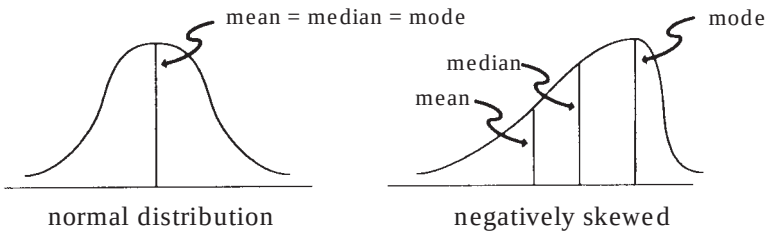


Figure 5. Distribution Curves

- normal (Gaussian) or non-normal (e.g. skewed, bimodal)
- measures of central tendency
  - mean (average): sum of all variables divided by total number of variables
  - median: value at the 50th percentile
    - in a skewed distribution, median better reflects central tendency than mean
  - mode: most frequently observed value in a series

- ❑ measures of variability
  - range: the largest minus the smallest observation
  - variance: a measure of spread of data (in the distribution curve) from the mean
  - standard deviation: the positive square root of variance
- ❑ given the mean and standard deviation for a distribution curve, a description of the entire distribution of data is obtained
- ❑ characteristics of the normal distribution
  - mean = median = mode
  - 67% of observations fall within one standard deviation of the mean
  - 95% of observations fall within two standard deviations of the mean

MEASUREMENTS OF HEALTH AND DISEASE IN A POPULATION

Definitions:

$$\text{rate} = \frac{\text{number of times an event has occurred during a specified time}}{\text{number of persons at risk of that event during the same interval}} \times \text{factor}$$

NB: the numerator is a portion of the denominator

$$\text{ratio} = \frac{\text{number of times event A has occurred during the specified time}}{\text{number of times event B has occurred during the same interval}} \times \text{factor}$$

NB: the numerator is not a portion of the denominator

Figure 6. Calculation of Vital Statistics

Incidence

- ❑ number of new cases of a disease in a population per unit time
- ❑ to determine incidence, it is necessary to follow prospectively a defined group of people and determine the rate at which new cases of disease appear; certain basic requirements must be met
  - specification of denominator (should be population at risk, not those already affected or not at risk)
  - period of observation (incidence rates must always be stated in terms of a definite period of time)

Prevalence

- ❑ total number of cases in a population at a given time
- ❑ two kinds of prevalence
  - point prevalence (most common): attempts to measure frequency of all disease at one point in time
  - period prevalence: measure constructed from prevalence at a point in time, plus new cases, and recurrences during a succeeding time period

Incidence and Prevalence Compared

- ❑ knowledge of time of onset is not required in prevalence study
- ❑ denominators in prevalence rates always include the entire related population since the numerator also contains old as well as new cases
- ❑ incidence is a direct measure of risk of getting a disease
- ❑ prevalence favours inclusion of chronic over acute cases (therefore presents a biased picture of disease)
- ❑ prevalence studies are cross-sectional and can not be used for causal inferences
- ❑ prevalence figures are useful for determining the extent of a disease problem (and therefore valuable for rational planning of facilities and services)

$$\text{incidence} = \frac{\text{number of new cases of disease in a time interval}}{\text{total population at risk}} \times \text{per unit population (e.g. 100 000)}$$

$$\text{prevalence} = \frac{\text{number of existing cases of disease at a point in time}}{\text{total population}} \times \text{per unit population (e.g. 100 000)}$$

Figure 7. Incidence and Prevalence Compared

Standardization
- ❑ adjustment of the crude rate of a health-related event to a rate comparable to a "standard" population
- ❑ adjustment can be made on the basis of age groups, sex or other characteristics of a population
- ❑ standardization prevents the drawing of misleading conclusions which could be made by comparing crude rates from two dissimilar populations (e.g. as our population has aged since 1950, crude death rates between decades are not comparable)

PREVENTION AND CONTROL OF DISEASE AND INJURY

NATURAL HISTORY OF DISEASE
- ❑ framework to understand different approaches to prevention and control of disease
- ❑ stage of susceptibility
  - disease has not developed but risk factors are present which favour its occurrence (e.g. hypertension)
  - risk factors may be immutable or susceptible to change (e.g. age, sex, race, family history vs. smoking, drinking)
- ❑ stage of pre-symptomatic disease
  - no manifest disease, but pathogenic changes have started to occur (e.g. carotid artery stenosis with positive Doppler)
- ❑ stage of clinical disease
  - recognizable signs or symptoms of disease (e.g. TIAs)
- ❑ stage of disability
  - any temporary or long-term reduction of a person's activity as a result of an acute or chronic condition (e.g. stroke with hemiplegia)

Epidemiology
- ❑ study of the distribution and determinants of diseases and injuries in populations and factors that influence this distribution

Health
- ❑ state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity
- ❑ includes ability to lead a socially and economically productive life

LEVELS OF PREVENTION
- ❑ measures that interrupt or slow the progression of disease
- ❑ primary prevention (e.g. health promotion, immunization)
  - prevention of disease by altering susceptibility or reducing exposure for susceptible individuals
- ❑ secondary prevention (e.g. screening)
  - applied early in disease
  - refers to early detection and prompt treatment of disease
- ❑ tertiary prevention (e.g. rehabilitation)
  - alleviation of disability resulting from disease and attempts to restore effective functioning

SCREENING AND FOLLOW-UP

Types of Screening

- ❑ mass screening (e.g. PKU and TSH in newborns)
- ❑ selective screening: screen in a specific subgroup of the population
- ❑ multiphasic: the use of many measurements and investigations to look for many disease entities (e.g. periodic health exam)

Criteria for Screening Tests

- ❑ important health problem
- ❑ accepted and effective treatment available
- ❑ facilities for diagnosis and treatment available
- ❑ recognized latent or early symptomatic stage
- ❑ suitable test or examination available
- ❑ test should be acceptable to the population
- ❑ natural history of the disease is understood and can be changed by intervention
- ❑ agreed policy on who to treat
- ❑ cost of case-finding vs. medical care
- ❑ case-finding should be a continuous process
- ❑ legal aspects must be considered
- ❑ proposed early treatment should be useful and not harmful to the patient (e.g. outcomes better than later stage treatment)

TEST VALIDATION

Sensitivity

- ❑ the ability of the test to identify correctly those who have the disease (e.g. PID = positive in disease)
- ❑ when a test has low sensitivity, there will be more false negatives
- ❑ SNOUT: with a highly Sensitive test, a Negative result helps rule OUT disease

Specificity

- ❑ the ability of a test to identify correctly those who do not have the disease (e.g. NIH = negative in health)
- ❑ when the test has poor specificity (e.g. when the sensitivity is set at 100%), there will be more false positives
- ❑ SPIN: with a highly Specific test, a Positive result helps rule IN disease

Pre-Test Likelihood

- ❑ probability that a person in the population tested has a disease [prevalence = (TP + FN) / (TP + FN + FP + TN)]

Post-Test Likelihood of a Positive Test

- ❑ probability that a person with a positive result on any test actually has the disease (i.e. positive predictive value)

		Disease +	Disease –	Total
Test	+	TP	FP	TP + FP
	–	FN	TN	FN + TN
	Total	TP + FN	TN + FP	

T = true; F = false; N = negative; P = positive

$$\text{sensitivity} = \frac{TP}{TP + FN}$$ ability to correctly detect those who are diseased

$$\text{specificity} = \frac{TN}{TN + FP}$$ ability to correctly detect those who are not diseased

$$\text{positive predictive value (PPV)} = \frac{TP}{TP + FP}$$ likelihood that a positive test is truly positive

$$\text{negative predictive value (NPV)} = \frac{TN}{TN + FN}$$ likelihood that a negative test is truly negative

Figure 8. Interpretation of Screening Results

- ❑ PPV tends to be higher when disease is more prevalent whereas NPV tends to be lower when disease is more prevalent

STRATEGIES FOR CONTROL OF DISEASE

- ❑ tripod of disease: host, agent, environment
- ❑ intervention can be aimed at any or all of these
  - host
    - immunization
    - chemoprophylaxis (e.g. chloroquine for malaria)
    - personal hygiene
  - agents
    - protective clothing
    - modified diet
    - lifestyle
  - environment
    - physical environment (e.g. housing, clothing, etc...)
    - modification of environment (e.g. sewage, clean water, etc...)

Surveillance

- ❑ regular collection, summarization, and analysis of data on newly-diagnosed cases of a disease
- ❑ purpose is identifying high risk groups in the population and new patterns that may require urgent action (e.g. epidemics)
- ❑ also important in reduction and elimination of disease

Case-Finding

- ❑ effort made in investigating the outbreak of a disease to find other, possibly unsuspected, cases to offer treatment, and to better assess the outbreak
- ❑ can contact physicians, public health nurses, hospitals, and other resource personnel who may have seen such cases
- ❑ many communicable and potentially serious diseases are reportable

Table 2. Reportable Diseases to your Local Medical Officer of Health (Ontario Ministry of Health, 1995)

AIDS	Group B *Streptococcus* infection, neonatal	Pertussis
Amebiasis	Hib disease, invasive	Poliomyelitis, acute
Anthrax	Hemorrhagic Fevers	Plague
Botulism	Hepatitis A, B, C, D	Psittacosis/ornithosis
Brucellosis	Herpes, neonatal	Q Fever
Campylobacter enteritis	Influenza	Rabies
Chanchroid	Lassa Fever	Rubella, congenital
Chickenpox	Legionellosis	Salmonellosis
Chlamydia Trachomatis infections	Leprosy	Shigellosis
Cholera	Listeriosis	Syphilis
CMV, congenital	Lyme Disease	Tetanus
Diphtheria	Malaria	Trichinosis
Encephalitis	Measles	Tuberculosis
Food Poisoning, all causes	Meningitis, acute bacterial or viral	Tularemia
Gastroenteritis, institutional outbreaks	Meningococcal diagnosis, invasive	Typhoid Fever
Giardiasis, except asymptomatic cases	Mumps	Verotoxin:E. *coli*
Gonorrhea	Ophthalmia neonatorum	Yellow Fever
Group A *Streptococcus* infection, invasive	Paratyphoid Fever	Yersinosis

Contact Tracing

- ❏ effort made to trace and offer treatment to all those who could have been infected (i.e. all contacts of an index case)

PREVENTION IN THE CLINICAL SETTING

Periodic Health Examination

- ❏ group of tasks designed either to reduce the risk of subsequent disease or to identify disease in its early asymptomatic state (see Family Medicine Notes)

DEMOGRAPHY AND HEALTH STATUS IN CANADA

DATA SOURCES

- ❏ census
- ❏ Statistics Canada
- ❏ disease registries
- ❏ medical examiners (e.g. autopsy results)
- ❏ health surveys (e.g. Canada Health Survey)
- ❏ birth and death certificates
- ❏ hospital and medical services data
- ❏ Workers' Compensation data

DEMOGRAPHIC CHARACTERISTICS OF A POPULATION

Age-Sex Structure of a Population

- ❏ best demonstrated with "population pyramid"
- ❏ population broken down by sex into a number of age groups
- ❏ proportions of whole population are calculated and the results expressed as vertical histogram

Rectangularization of Mortality

- ❏ ideally all people would live a full life span, giving a rectangular plot of percentage survival vs. age
- ❏ in worst case, all would die at birth
- ❏ the actual situation is somewhere in between with rectangularization of curve with improving health care/living conditions

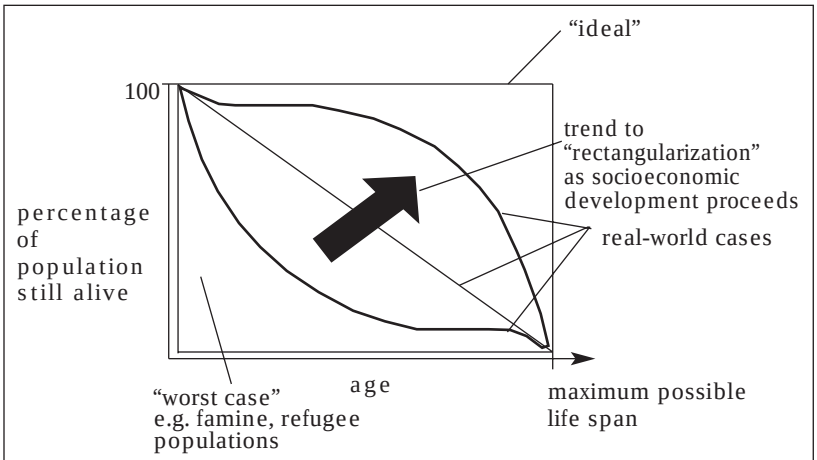


Figure 9. Rectangularization of Mortality

Morbidity
- ❑ all health outcomes other than death (e.g. injury, disease and disability)

Compression of Morbidity
- ❑ related to rectangularization of mortality curve
- ❑ not only do people live longer but they remain healthier longer
- ❑ theoretical; not yet demonstrated empirically; opposite may be true

Fertility (see Figure 10)

(all rates refer to the number of events occurring in a specified population during a specified period of time)

		CANADA 1995
crude birth rate: live births / total mid-year population	x 1 000 =	12.8
stillbirth rate: stillbirths (> 20 weeks in Canada) / total births (live births + still births)	x 1 000 =	3.5
perinatal mortality rate: stillbirths + infant deaths (< 7 days old) / total live births + stillbirths	x 1 000 =	6.9
neonatal mortality rate: deaths of infants < 28 days old / total live births	x 1 000 =	4.2
infant mortality rate: deaths of infants < 1 year old / total live births	x 1 000 =	6.1
maternal mortality rate: maternal deaths due to pregnancy or child bearing / total live births	x 100 000 =	4.5
crude death rate: total death / mid-year population	x 1 000 =	7.1
case fatality rate: deaths from specified disease / total persons with that disease	x 100	e.g. virtually 100% for rabies

Figure 10. Representative Vital Statistics Report

Implications for Health Care System
- ❑ Canadian population undergoing rectangularization of mortality
- ❑ increased numbers of elderly with multiple health problems
- ❑ most chronic diseases are exponentially more frequent as age increases
- ❑ continually increasing burden for health care system
- ❑ trend towards
  - preventive measures and health promotion
  - health service organizations, health maintenance organizations and similar schemes
  - attempts to legislatively limit amount of total billings (e.g. Manitoba, Ontario, etc...)

HEALTH INDICES AND HEALTH STATUS

Direct Measures (see Figure 10 and Table 3)

Table 3. Leading Causes of Death Categorized by Sex in Canada, 1994

	Total		ASMR (Age Standardized Mortality Rate)*		
Causes of Death	Number	%	Male	Female	Total
Cancer	57,324	27.7	239.0	153.9	188.3
Diseases of the heart	56,960	27.5	245.0	137.8	184.2
Stroke	15,306	7.4	54.3	45.2	49.1
COPD, respiratory disease	8,920	4.3	46.4	18.3	28.9
Accidents	8,687	4.2	40.9	18.1	29.1
Pneumonia and influenza	7,302	3.5	30.6	18.8	23.3
Diabetes mellitus	5,165	2.5	20.0	14.4	16.8
Suicide	3,749	1.8	20.6	5.2	12.7
Renal disease	2,480	1.2	10.6	6.4	8.0
Liver cirrhosis	2,208	1.1	10.7	4.4	7.3
AIDS	1,628	0.8	9.9	0.9	5.5
Other causes	37,348	18.0	142.9	105.0	121.9
All causes	207,077	100.0	870.8	528.5	675.0

* per 100 000 population of 1994
Source: Health Reports 1995, Vol. 7, No. 1, Statistics Canada, Cat. No. 82-003.

- ❑ life expectancy (Canadian statistics for 1996)
  - women: 81.3 years
  - men: 75.7 years
  - Canadian average: 78.6 years
- ❑ potential-years-of-life-lost (PYLL)
  - calculated by adding up number of years lost in those dying before reaching 75 (assumed life expectancy)
  - accidents are the largest cause of PYLL in Canada
- ❑ other measures
  - disability days
  - activities of daily living
  - prevalence of disability

Indirect Measures
- ❑ percentage of low birth-weight neonates
- ❑ percentage of communities with potable water (e.g. in sub-Saharan Africa)
- ❑ risk factor distribution (e.g. prevalence of smoking)

Correlates
- ❑ health care utilization data
- ❑ gross national product
- ❑ socioeconomic status of the individual

EPIDEMIOLOGY OF INFECTIOUS DISEASE

Notes

DEFINITIONS

(see Infectious Diseases Notes)

Outbreak
- ❑ occurrence of new cases of a disease clearly in excess of the baseline frequency of the disease in a defined community over a given time period

Epidemic
- ❑ occurrence, in a community or region, of a group of illnesses of a similar nature in excess of normal expectancy

Endemic
- ❑ habitual presence of a disease or agent within a geographic area based on the usual prevalence of a given disease within such an area

Pandemic
- ❑ an epidemic which is worldwide in distribution

Host
- ❑ person/animal that affords subsistence to an infectious agent under natural conditions

Carrier
- ❑ person/animal that harbors a specific infectious agent in the absence of discernible clinical disease and serves as a potential source of infection

Fomite
- ❑ contaminated substance (not necessarily a reservoir) serving as an intermediate means of transport for an infectious agent

Reservoir
- ❑ anything (living or inert) in which an infectious agent lives and multiplies in such a manner that it can be transmitted to a susceptible host

Vector
- ❑ invertebrate animal capable of transmitting an infectious agent to vertebrates

Virulence
- ❑ ability of an infectious agent to cause severe or fatal infections

IMMUNITY

- ❑ active
  - altered organism or its product induces a host to produce antibodies (e.g. natural measles infection or live vaccine)
- ❑ passive
  - protective antibodies produced by another host which are introduced into susceptible persons (e.g. natural transplacental IgG from mother to infant)
- ❑ inherent
  - endogenous production of antibody
- ❑ herd
  - expression used to describe immunity of a group or community
  - resistance of a group to an infectious agent based on the immunity of many individuals in the group
  - implies transmission interruption when < 100% of group is immune due to separation of few susceptibles

TRANSMISSION OF INFECTION

- ❑ direct contact (e.g. impetigo via skin, gonorrhea via sexual contact)
- ❑ indirect
  - vehicle-borne: organisms are spread via inanimate objects (e.g. salmonella food poisoning)
  - vector-borne: transmission via simple carriage of agents by animals or by biological method (agents multiply inside insect vectors e.g. malaria)
  - airborne (e.g. measles)
- ❑ spectrum of severity of disease

	a	b	c	d	e
agent	inapparent	mild	moderate	severe	fatal
susceptible host	subclinical (incubation)	—>	clinical disease	—>	death

Rates

$$\text{attack rate (usually expressed as percentage)} = \frac{b + c + d + e}{\text{population at risk}}$$

• *term generally used only for infectious diseases*

$$\text{secondary attack rate} = \frac{\#\text{ cases among contacts during incubation period}}{\text{total exposed contacts}}$$

$$\text{case fatality rate} = \frac{e}{b + c + d + e}$$

$$\text{mortality rate} = \frac{e}{\text{population at risk}}$$

$$\text{pathogenicity rate} = \frac{b + c + d + e}{a + b + c + d + e}$$

• *describes the power of the organism to produce clinical disease in those who are infected*

$$\text{virulence} = \frac{d + e}{b + c + d + e}$$

Figure 11. Spectrum of Severity of Disease

IMMUNIZATION

- ❑ a vaccine is a biologically derived substance which elicits an immune response when administered to persons who are well
- ❑ protects against an antigenically similar disease organism or its toxin products
- ❑ 6 major killers of children worldwide that are preventable by vaccines
  - measles
  - whooping cough
  - tetanus
  - polio
  - tuberculosis
  - diphtheria
- ❑ expanded programmes of immunization would vastly improve this situation (e.g. hepatitis B vaccine and second dose of measles vaccine being added on a provincial basis)
- ❑ percentage vaccine efficacy (VE): protective efficacy obtained in a controlled trial (see Figure 12)

$$\%\ VE = \frac{(\text{disease incidence in non-vaccinated group}) - (\text{incidence in vaccinated group})}{\text{incidence in non-vaccinated group}} \times 100$$

Actual program effectiveness = % VE x % coverage x % provider compliance *(e.g. % vaccine viable/unspoiled)* x % patient compliance *(e.g. > 1 dose needed for protection for DPTP)*

Figure 12. Vaccine Efficacy (VE)

OTHER TOPICS

THE DEATH CERTIFICATE

- ❏ every province uses slightly different forms of the death certificate
- ❏ data collected is uniform and is tabulated by Statistics Canada in conformity with guidelines set by the World Health Organization
- ❏ Section 7 of the Coroner's Act sets out circumstances under which a coroner must be notified of a death. Notification to coroner's office is mandatory when
    a. a patient whose death is known or suspected to have been the result of unnatural causes or violence, whether self-inflicted or otherwise
    b. a patient who dies in the operating room or while under an anesthetic
    c. a patient who dies having remained unconscious since admission or who is dead on arrival at the hospital
    d. a patient who dies in hospital, having been admitted following an accident or having an accident in hospital, including fracture cases, and having injuries sustained by reason of a common carrier
    e. a patient who dies in hospital while under arrest or who has been referred from another institution where they have has been a ward or inmate including jail, house of providence, men's or women's home, or mental hospital
    f. a patient who is seriously ill following an abortion when it is feared death is apt to occur; if death does occur in such cases, the coroner must be called again
    g. a patient who dies after some mishap, such as the leaving of a swab or instrument in the body at surgery

TUBERCULOSIS (TB) (see Respirology Notes)

The Tuberculosis Skin Test (Mantoux Test)

- ❏ performed by intradermal injection of 0.1 ml of PPD (purified protein derivative) tuberculin containing 5 TU (tuberculin units)
- ❏ check 48-72 hours later for amount of induration

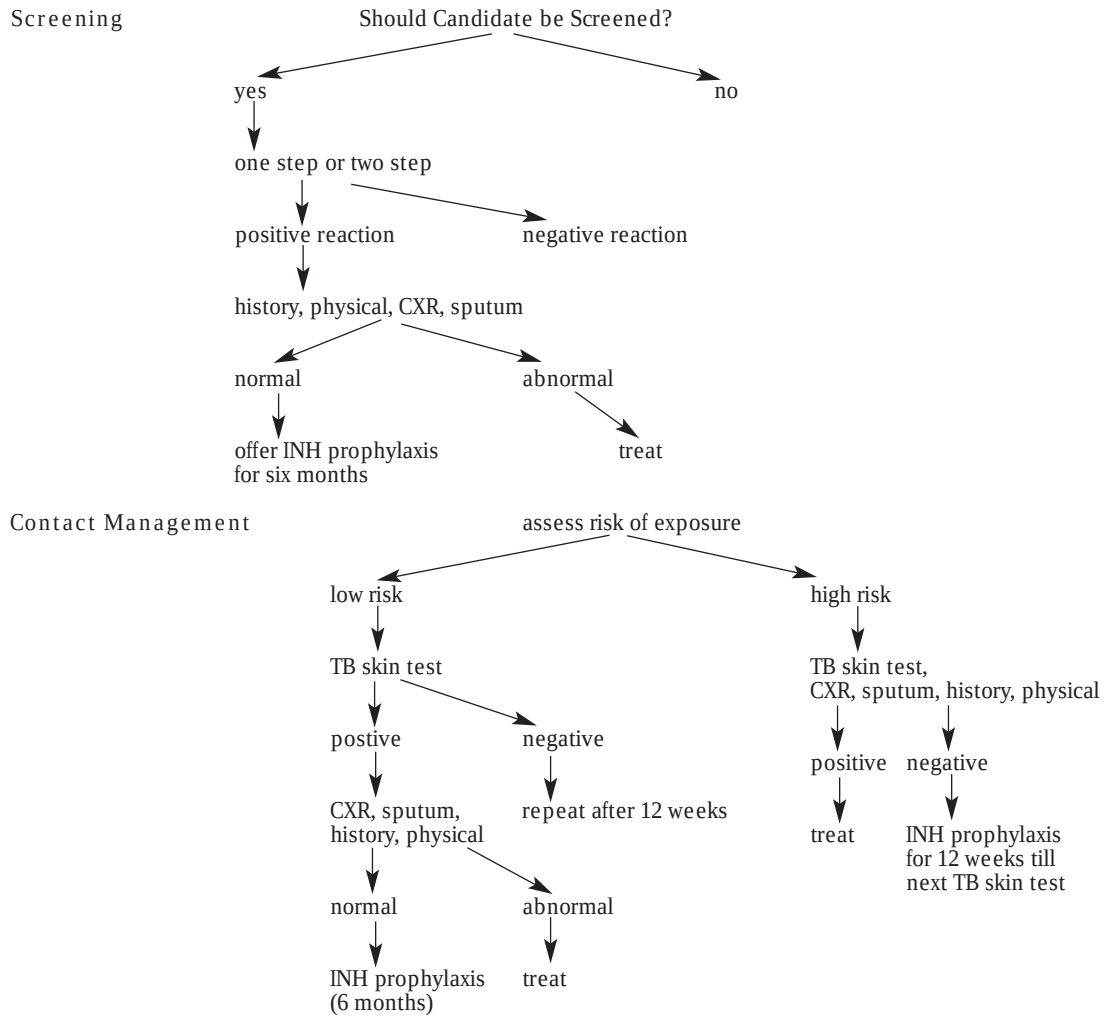
Table 4. Classification of the Tuberculin Reaction		
Induration	Groups in which infection is presumed to be present at the indicated induration	Treatment
Less than 5 mm	Adolescents and children who are close contacts	Treat until 12 weeks after last exposure and then repeat the skin test
Greater than 5 mm	Close contacts	Treat all ages for 6-12 months
	HIV-positive or unknown but at risk for HIV	Treat all ages for 12 months
	Upper lobe fibrosis	Treat all ages for 12 months (if not previously treated for active TB) or 4 months of multidrug regimen
Greater than 10 mm	Silicosis	Treat all ages for 12 months (if not previously treated for active TB) or 4 months of multidrug regimen
	High incidence of disease or high risk to others (from endemic areas, low SES, residents of long-term care facilities) or (employees of health care facilities, schools or child care facilities)	Treat if ages < 35 for 6-12 months
	With risk factor: IV drug users, HIV positive, recent close contact, recent skin test conversion, chest x-ray abnormality	Treat all ages for 6-12 months
	Medical conditions at increased risk of disease if infected (gastrectomy, malnutrition, chronic renal failure, diabetes, high-dose steroids or other immunosuppressives, malignancies)	Treat all ages for 6-12 months
Greater than 15 mm	Low risk	Treat age <35 for 6-12 months

Conversion of TB Skin Test

- ❏ change in TB skin test within 2 years from < 10 mm to > 10 mm or an increase of 6 mm from previous skin test

Booster Phenomenon

- ❏ persons infected with TB many years ago may have waned skin reactivity
- ❏ persons tested many years later may not respond at all or may respond only weakly
- ❏ a second TB skin test within 3 weeks boosts the reaction size in such infected persons but does not sensitize uninfected persons
- ❏ if the initial TB skin test is negative, a second TB skin test is given; if the second TB skin is also negative, the individual has not been previously infected with TB; if the second TB skin test is positive, the individual has been previously infected with TB



CXR: chest x-ray; INH: isoniazid

Figure 13. Guidelines for Tuberculosis Screening and Contact Management

HISTORICAL DEVELOPMENT

KEY LEGISLATION

1867 British North America Act (BNA Act) (renamed Constitution Act, in 1982, and Charter of Rights and Freedoms added)

- ❑ *BNA Act* distributed powers between federal and provincial governments and had few references to health care
- ❑ Federal powers include:
  - taxation
  - census and statistics
  - quarantine and marine hospitals
- ❑ Provincial powers ("exclusive powers of provincial legislatures") include
  - "the Establishment, Maintenance, and Management of Hospitals, Asylums, Charities, and Eleemosynary Institutions in and for the Province, other than Marine Hospitals"
  - municipal government
- ❑ Provincial powers - education

1946 Saskatchewan is first province to establish hospital insurance

1948 National Health Grant Program

- ❑ targeted grants for hospitals, public health, etc...
- ❑ ends in 1970 with establishment of *Medicare*

1957 Hospital Insurance and Diagnostic Services Act (HIDS)

- ❑ federal government agreed to share cost of provincial programs for universal insurance of acute hospital care and in-hospital diagnostic services, as long as national terms and conditions were met
- ❑ replaced by *Canada Health Act (*1984) which has similar provisions
- ❑ covered the most expensive part of the system (i.e. acute care)
- ❑ outpatient and emergency services could be added by separate agreement
- ❑ did not cover mental, tuberculosis, or custodial care hospitals
- ❑ did not cover physician fees
- ❑ universal coverage except for those similarly covered under other public plans (e.g. *Pensions Act*, Workers' Compensation)
- ❑ financing: federal government contributed ~50% of costs using a per capita formula which used both the national cost, and the specific costs in that province
- ❑ provinces paid balance (occasionally using premiums)
- ❑ came into effect July 1, 1958 (5 provinces participating); all provinces have qualifying plans by January 1, 1961

1962 Saskatchewan first province to establish medical care insurance plan

- ❑ doctors strike over the plan but eventually accept it

1964 Hall Report recommends National Medical Care Plan

1966 Medical Care Act (Medicare)

- ❑ extends cost sharing with provinces to provinical insurance plans for all "medically necessary" physician services. Provinces must meet terms and conditions of *Medicare* (see below)
- ❑ implemented July 1,1968; all provinces have qualifying plans by 1971
- ❑ at provincial discretion, could include other services (e.g. optometry, podiatry) but these were not cost shared
- ❑ precise details of what is covered, how payments made, etc... left to provinces
- ❑ financing: Federal government pays ~50% of costs, province pays balance
- ❑ also replaced by *Canada Health Act* (1984) which has similar provisions

Notes

- Terms and Conditions of *Medicare*
  1. Universality: universal coverage on uniform terms and conditions that provides "reasonable access to insured services"; when HIDS enacted, minimum 95% of population had to be covered within two years
  2. Comprehensiveness: all medically required services provided in hospitals or by doctors must be covered
  3. Portability: benefits must be portable from province to province
  4. Public administration
     Canada Health Act (1984) added a fifth term which was implicit in the earlier laws
  5. Accessibility: reasonable access not impeded directly or indirectly by charges or other mechanisms (i.e. no extra-billing or user fees)

1966 Canada Assistance Plan (CAP)

- Federal cost-sharing for certain social services; unlike health insurance plans, most of the services provided under CAP did not have to be universal, and were means tested
- no longer exists as separate program; funding folded into Canada Health and Social Transfer (CHST)

Disadvantages of Cost Sharing Approach

- encouraged provision by most expensive providers
  - HIDS: covered inpatient but not outpatient care
  - *Medical Care Act* required coverage of physician services, but not those of other providers
- open-ended and unpredictable costs
- federal government incurred costs without receiving credit
- provincial governments had priorities steered by federal programs
- did not encourage reorganization of system

1977 Federal-Provincial Fiscal Arrangements and Established Programs Financing Act (EPF)

- subsequently known as *Federal-Provincial Fiscal Arrangements and Federal Post-Secondary Education* and *Health Contributions Act*
- replaced cost sharing for medical care insurance, hospital insurance and post-secondary education with a new block grant formula which combined
  - "tax room" (i.e. federal tax rate reduced to allow provinces to increase their tax rates without any increase in tax burden to taxpayers)
  - cash payments (per capita amounts, initially indexed to growth in gross national product)
  - plus a few other elements (e.g. equalization, stabilization, revenue guarantee) to further assist poorer provinces
  - special per capita payment for "extended health-care services" (e.g. nursing homes, ambulatory and home care, converted mental hospitals); however no strings attached to this money
- terms and conditions of *Medicare* not changed
- since EPF funds go into general revenues rather than being related to service provision, provinces given greater flexibility in how to organize care
- annual federal government contribution became more predictable
- under budgetary pressure, federal government began to unilaterally change the EPF formula, resulting in a declining proportion of provincial health spending coming from the federal government

1984 Canada Health Act (CHA)

- replaced HIDS and *Medical Care Act*
- continued the requirement that provinces must meet the federal terms and conditions to qualify for full cash grants
- minor changes to the previous terms and conditions
  - explicit penalties for allowing direct charges to patients for insured services
  - ability to designate non-physicians as "health care practitioners" if province wished to do so

- requirement that provinces pay "reasonable" compensation to providers for providing insured health services
- allowed federal government to withhold defined portion of cash payment if terms and conditions not complied with

1986 Bill C-96

❑ reduced annual per capita increase in federal cash payments under EPF to growth in GDP minus 2% (rather than to growth in GDP), meaning that over time, cash portion would likely vanish

1991 Bill C-69 - Government Expenditures Restraint Act

❑ freezes transfer payments for 1990-92 (i.e. per capita payments will not increase at all, whatever the growth in GDP)

1991 Bill C-20

❑ freeze in federal transfer payments extended to 1995, meaning that cash portion continues to decline
❑ political issue arose: how would the federal government enforce national standards once cash transfers disappeared?

1996 Canada Health and Social Transfer (CHST)

❑ replaced federal transfers under CAP and EPF
❑ took effect April 1, 1996
❑ like EPF, is a mix of cash transfers plus tax point transfers
❑ five year funding arrangement
  - for 1998-99 and 1999-2000, CHST entitlements set at $25.1 billion (a reduction from what had been received under EPF and CAP)
  - formula then to grow at 2% less than growth rate of GDP (for 2000-01), 1.5% less than GDP (2001-02) and 1% less than GDP (2002-03)
  - legislated cash floor to ensure that cash component of CHST would total at least 12.5 billion in each of the five years covered by the arrangement

Current Legislative Framework

❑ three key operative pieces of legislation at national level
  - *Constitution Act* - divides powers among levels of government
  - *Canada Health Act* - lays down national terms and conditions
  - *Canada Health and Social Transfer* - sets conditions for fiscal transfers from federal government to provinces
❑ in addition, all provinces have relevant legislation to cover operations of insurance plans, regulate providers, etc...

ORGANIZATION OF HEALTH SERVICES

FEDERAL GOVERNMENT (HEALTH CANADA)

❑ Fiscal role (CHA, etc...)
❑ steering role
❑ leadership/coordination role (e.g. health promotion, technology assessment)
❑ special groups (Natives, military, North)
❑ special issues (e.g. quarantine, food and drug safety, medical devices, research and training, etc...)
❑ note: federal role is under scrutiny, and many of these functions are being abandoned or minimized
❑ for more information on their current organization (which changes over time), check the Health Canada web page

PROVINCIAL GOVERNMENT

❑ has the primary responsibility for health, including
  - education
  - regulating professionals
  - managing the system
  - areas not included under CHA (public health, mental health, etc...)
  - financing hospitals, physicians, etc...
❑ system has public financing but largely private delivery

Notes

LOCAL/REGIONAL BODIES

- ❑ only services as delegated by provincial government
- ❑ certain provinces (e.g. Ontario) have delegated responsibility for public health, managing home care, etc... to local/regional governments
- ❑ some provinces (especially western Canada) took responsibility for building and maintaining hospitals in pre-Medicare years
- ❑ most provinces are experimenting with regional models, which eliminate local boards for individual organizations (hospitals, home care, etc...) and assign responsibility for management, resource allocation, planning, etc... to a regional authority (devolving or decentralizing some authority)
- ❑ provinces vary considerably in how regions are set up, what they are responsible for, and what powers they are given

HOSPITAL ORGANIZATION

- ❑ provincial governments have control over hospitals
- ❑ hospitals must operate within the provisions of provincial regulations (i.e. *Public Hospitals Act* or equivalent)

Board of Trustees

- ❑ voluntary, responsible for governance of hospital under provincial regulations
- ❑ Chief Executive Officer (CEO) responsible to Board for hospital operation
- ❑ in recent years many provinces have been eliminating independent hospital boards and incorporating them within regional boards

Administrative Team

- ❑ responsible to CEO, includes
  - administrative services (admitting, records, etc...)
  - educational programs
  - nursing and medical affairs
  - diagnostic and therapeutic services

Chief of Staff

- ❑ administrative position responsible for standards of care
- ❑ note: quality assurance may be achieved by a number of mechanisms including professional and accrediting organizations, local boards and medical staff, and individual providers (e.g. malpractice, peer review)

VOLUNTARY HEALTH AGENCIES

- ❑ non-profit organizations with boards of volunteers
- ❑ major objectives may include some combination of
  - social action, fund-raising, research, advocacy
  - provision of direct patient services, public education
  - coordination of public and private agencies with similar interests

PUBLIC HEALTH SYSTEM

FUNCTIONS OF PUBLIC HEALTH SYSTEM

- ❑ can include
  - nutrition
  - health education and health promotion
  - communicable disease control
  - public health labs
  - dental health
  - sexually transmitted disease control
  - occupational health
  - environmental sanitation
  - maternal and child health
  - outbreak investigation
- ❑ these activities may, but do not have to be done in a public health unit

Notes

ROLE OF PHYSICIANS IN PUBLIC HEALTH

Role of Practising Physician

- ❑ includes primary, secondary and tertiary prevention
- ❑ notification
  - certain situations must be reported by law (e.g. sexually transmitted diseases, suspected child abuse)

Specialist Roles

- ❑ may include
  - Medical Officer of Health: hired by the government to advise, plan and administer public health programs
  - epidemiologist: study patterns of disease and formulate strategies for prevention and intervention; may or may not be a physician

PAYMENT MECHANISMS FOR INSURED SERVICES

- ❑ institutions (e.g. hospitals)
  - global budgets (prepaid sum given to cover everything); most common approach for hospitals
  - per diem (flat rate per day per patient); common approach for long-term care institutions
  - per case (flat rate per case admitted, often weighted by diagnosis); common approach for US hospitals
  - line by line basis (by individual items of expenditure); older approach to hospital funding
  - population-based (capitation); commonly used for provider organizations in US (e.g. HMOs)
- ❑ individual providers (e.g. physicians)
  - fee-for-service (by service, or by case)
  - fee for time (salary or sessional)
  - note that organizations may be funded by one of the methods noted above (capitation, global budget, per case, etc...) and in turn reimburse individual providers for the care they provide

ALLOCATION OF HEALTH RESOURCES

Data from Canadian Institute for Health Information (CIHI) and Health Canada

- ❑ total Canadian spending, public and private, on health expenditures, 1996: ~ $75.2 billion

Distribution of funds, 1996

	~$ billion (Can.)	(% of total)
• hospitals	25.7	34.2
• other insititutions	7.5	10
• physicians	10.9	14.4
• other professionals	6.6	8.8
• drugs (prescribed and OTC)	10.8	14.4
• other expenditures	8.0	10.7
• public health	3.8	5
• capital	1.9	2.5

Canadian health spending as a percentage of GDP, 1995: ~9.6%

Canadian health human resources, 1997

• total civilian physicians in Canada	55,243
• physicians per 100 000 population	183
• registered nurses employed in nursing	229,813
• nurses per 100 000 population	763

- ❑ most recent data on approved hospitals beds per 1000 population is for 1993-94
  - figure for Canada was 13.6 beds per 1000 population, of which 5.6 were hospital beds
- ❑ these numbers have recently decreased greatly

- ❑ health now comprises about 1/3 of provinical spending in most provinces
  - in general, just under half goes to institutions; between 1/4 and 1/3 to physicians
- ❑ costs have been rising faster than inflation rate
- ❑ in recent years, costs of publicly-funded portions (hospitals, doctors) well controlled; costs of mixed public-private (e.g. drugs) not as well controlled
- ❑ considerable cost shifting going on

Table 5. International Comparisons - Health Expenditures as % of GDP

	1960	1970	1980	1990	1992	1995
Canada	5.5	7.1	7.3	9.2	10.3	9.5
Japan	N/A	4.4	6.4	6.0	6.4	7.2
Sweden	4.7	7.1	9.4	8.6	7.6	7.7
U.K.	3.9	4.5	5.6	6.0	7.0	6.9
U.S.A.	5.2	7.2	9.1	12.7	14.0	14.5

Source: OECD Health Data

Theoretical Definition
- extent to which a given field is based on body of theoretical knowledge
- application of this knowledge in the form of specialized skills and competencies
- commitment to professional code of ethics
- strategic and operational autonomy (what you do and how you do it)

Practical Definition
- specialized knowledge
- self-regulation
- established training program
- certification procedures
- risk to public from unqualified practitioners
- agency relation with client
- providing a service

PROFESSIONAL ORGANIZATIONS

- ❑ three key functions which professional bodies have to take on:

1. Union Function
   - representing interests of their members
   - for physicians, these functions are performed by provincial medical associations
   - includes negotiating agreements with provincial government, advocacy, etc...

2. Self-Regulation
   - protecting the public
   - most self-governing professions have provincial college (e.g. College of Physicians and Surgeons of Ontario, College of Nurses)
   - act as licensing agency (each province has unique requirements)
   - physicians also have credentialing bodies (e.g. College of Family Physicians of Canada, Royal College of Physicians and Surgeons of Canada which establish the standard of national uniformity of licensure and set national exams that must be passed along with Medical Counsil of Canada exams as a condition of provincial licensure
   - these organizations are involved with both self-regulation and professional development

3. Professional Development
   - encourage professional growth and development
   - for physicians, this is performed by their professional associations (i.e. provincial medical associations, Canadian Medical Association)

POLITICAL SYSTEM

- ❑ much funding is federal; "fiscal federalism" affects health policy
- ❑ provincial government is the main financier and main regulator
- ❑ political culture imposes constraints

HEALTH CARE SYSTEM

- ❑ system is hospital and physician oriented
- ❑ expensive: often inefficient
- ❑ system is popular therefore hard to modify

Table 6. Health Status and Service Needs of Special Groups

Group	Health Status	Service Needs
Native Canadians	• life expectancy shorter (M=63.8 years, F=71.0 years) • income of Status Indian 2/3 of non-Aboriginal • at risk for: obesity, iron, vitamin and protein deficiency • high incidence of tuberculosis, suicide, substance abuse (alcohol, cigarettes), hepatitis, diabetes • leading causes of death: injury and poisoning, cardiovascular or respiratory disease, neoplasm	• empowerment: control over health, social and educational programs, settle land claims • more Aboriginal health care providers • use of traditional medicine
Elderly	• see Geriatrics Notes	• see Geriatrics Notes
Low Income	• definition: spend > 56.2 % of income on basic needs of accommodation, food, clothing • groups at risk: single mothers, immigrants, Aboriginal • increased mortality age 1-4 (accidents are main cause) • increased risk: low birth weight, infectious disease, dental caries, childhood disability and psychiatric disorders, nutritional and chronic health problems	• additional child benefits to low income families • ongoing funding of accident prevention and health promotion programs
Disabled	• disability = lack of ability to perform activity in manner within range considered normal • decreased education, income • children at risk for malnutrition due to physical disability, cognitive delay, altered requirements • at risk for: sexual abuse, exploitation	• educate public to alter perceptions of disabled • accessible physical, working, educational environments (e.g. ramps) • more trained personnel
Homeless	• include de-institutionalized, runaway teens, victims of domestic violence, elderly, alcoholics, Native Canadians • increased arthritis, rheumatism, emphysema, chronic bronchitis, asthma, epileptic attacks	• outreach programs (e.g. shelters, food banks)

OVERVIEW

- ❑ occupational health involves the recognition, prevention and control of workplace hazards, including
  - chemical agents
  - physical agents
  - biological agents
  - psychological agents
  - mechanical agents

OCCUPATIONAL HISTORY

- ❑ symptoms
- ❑ work description including occupational profile and job-related injuries
- ❑ prior or current exposure to dusts, chemicals, solvents, radiation, or loud noise
- ❑ review of relevant workplace material safety data sheets provided by worker
- ❑ temporal relationship between symptoms and exposure
- ❑ description of other environments
  - home, hobbies, neighbourhood
  - occupation of family members

PREVENTION STRATEGIES

Primary

- ❑ engineering controls
  - elimination, enclosure, or isolation of hazardous work procedures
  - substitution with less hazardous material
  - process control (modify process to reduce exposure)
  - local and general ventilation
- ❑ work practices (e.g. wet sweeping of dusts to prevent sweeping dust into the air)
- ❑ hygiene practices
  - eating away from worksite, washing, non-smoking
- ❑ administrative
  - worker rotation to minimize duration of exposure
- ❑ personal protective equipment
  - protective equipment should NOT be used as the primary method of exposure control unless there is no engineering method available or the period of exposure is brief or infrequent
  - respiratory (e.g. respirators), hearing (e.g. ear muffs or plugs), skin (e.g. gloves)
- ❑ education
  - education of workers about workplace hazards and exposure reduction
  - protocols for emergency situations

Secondary

- ❑ intervention when the physiologic changes that precede illness are recognized or when sub-clinical illness develops
- ❑ may involve medical surveillance and screening

Tertiary

- ❑ intervention to limit the consequences of illness or injury once it has occurred
- ❑ may involve medical treatment, rehabilitation, work restriction, or removal of the worker from further potential exposure

- federal and provincial legislation cover both workplace health and safety and workers' compensation
- most workers are covered by provincial legislation
- federal legislation provides protection to workers in the federal jurisdiction (e.g. communications, radiation, transportation, military, civil servants)

Occupational Health and Safety Act (Ontario Ministry of Labour)

- most workers are covered
- corporate internal responsibility system
- workers have the right
  - to know about possible hazards in the workplace (e.g. chemicals, equipment, or workplace conditions)
  - to participate via corporate Health and Safety Committee
  - to refuse to work if they believe that the work is either unsafe to themselves or to other workers

Workplace Safety and Insurance Act

- provides medical insurance, disability insurance, pensions, and rehabilitation to workers with work-related injuries or illness
- funded from business income through levies on employers (i.e. no government funding)
- no fault insurance - worker has no right to sue the employer for negligence or vice versa
- guaranteed payment to worker from first day of injury or illness if deemed to be work related
- administered by government agency (e.g. Workplace Safety and Insurance Board)

OCCUPATIONAL LUNG DISEASE

PNEUMOCONIOSIS

- lung disease due to deposition of inorganic particulate matter in the lungs

Silica

- exposure
  - major component of rock and sand
  - mining, sandblasting, foundry, tunnel drilling, ceramic and glass manufacture
- symptoms (need average 20 years exposure)
  - usually asymptomatic; dyspnea, cough, sputum
- chest x-ray
  - small rounded nodules in the upper fields
  - +/– eggshell calcifications in hilar nodes
  - if complicated silicosis/severe disease: small nodules may coalesce into larger masses = progressive massive fibrosis
- pulmonary function tests
  - may be normal
  - if progressive massive fibrosis: restrictive pattern and reduced diffusing capacity
- complications
  - increased susceptibility to mycobacterial and fungal infections
- treatment
  - prevention of disease progression and development of complications
  - TB surveillance and reduce occupational exposure to silica

Asbestos

- exposure
  - mining and processing of asbestos
  - manufacture or installation of materials containing asbestos (e.g. brake linings, clutch facings, roofing shingles, and insulation)
- interstitial fibrosis (asbestosis)
  - symptoms
    - progressive dyspnea, dry cough

- physical examination
  - decreased chest expansion, crackles
  - clubbing
- chest x-ray
  - reticular or reticulonodular pattern in lower lung fields
- pulmonary function tests
  - restrictive pattern

❑ pleural disease
- symptoms
  - often asymptomatic; chest pain, dyspnea
- physical examination
  - normal or decreased chest expansion
- chest x-ray
  - diffuse pleural thickening +/– calcification, pleural effusion, plaques (circumscribed areas of pleural thickening)
- pulmonary function tests
  - normal or reduced volumes
  - decreased diffusing capacity with severe disease

❑ treatment of interstitial fibrosis and pleural disease
- prevention, removal from exposure

❑ increased risk of cancer
- bronchogenic carcinoma (synergistic effect with smoking)
- mesothelioma (pleural tumour)
- larynx
- GI

Coal Workers' Pneumoconiosis

❑ exposure
- miners with heavy coal dust burden (> 20 years of exposure)

❑ simple
- asymptomatic
- chest x-ray: rounded opacities (< 10 mm in diameter) in upper lung fields
- pulmonary function tests: normal

❑ complicated = progressive massive fibrosis
- symptoms: dyspnea
- chest x-ray: opacities coalesce
- pulmonary function tests: restrictive pattern
- only small number progress from simple to complicated

❑ treatment
- unlike silicosis, there is no increase in mycobacterial or fungal infections
- reduce exposure to coal dust

OCCUPATIONAL ASTHMA

❑ disorder characterized by variable airway obstruction caused by a specific extrinsic agent in workplace including
- isocyanates (e.g. polyurethane industry)
- anhydrides (e.g. plastics, resins)
- antibiotics (e.g. pharmaceutical industry)
- soldering flux (e.g. resin used in electronics industry)
- animals (e.g. laboratories)

❑ clinical presentation
- wheeze, cough, dyspnea
- immediate (within minutes) or late (4-12 h) response following exposure to the causative agent
- temporal pattern important (worse at or after work, improves on days off or on vacation)
- affects only a portion of exposed population

❑ physical examination
- normal; wheezing may be present

❑ chest x-ray
- normal; if severe may have signs of hyperinflation

❑ pulmonary function tests
- baseline lung function: normal or obstructive pattern
- follow changes over the work week with peak flows
- inhalation challenge test within 24 hours of typical workplace exposure
- experimental exposure to suspected causative agent under controlled conditions

- ❑ treatment
  - control of asthma with appropriate bronchodilator and inhaled steroid therapy
  - avoid further exposure to sensitizer at home and work
  - submit appropriate WSIB information

HYPERSENSITIVITY PNEUMONITIS

- ❑ an inflammatory disease resulting from an immunologic response to an inhaled organic antigen
- ❑ pulmonary disease presents as a syndrome with several forms, depending on the immune response of the host and the nature and duration of exposure
- ❑ thermophilic actinomycetes is a common source of antigen seen in farmer's lung and humidifier lung
- ❑ types
  - acute with constitutional symptoms, lymphocytic infiltration and granulomata in walls of alveoli and small airways
  - chronic with irreversible diffuse interstitial fibrosis
- ❑ symptoms
  - acute
    - fever, myalgia, malaise
    - wheeze, chest tightness, dyspnea 4-8 h after exposure
  - chronic
    - progressive dyspnea, dry cough
    - malaise, weight loss
- ❑ physical examination
  - acute
    - fever
    - increased respiratory and heart rate
    - crackles, wheezes
  - chronic
    - cachexia
    - crackles
- ❑ chest x-ray
  - acute: diffuse consolidation or mottling
  - chronic: reticular pattern
- ❑ pulmonary function tests show restrictive pattern
- ❑ laboratory
  - positive precipitating antibodies to the causative agent
- ❑ treatment
  - prevention
  - remove from exposure
  - steroids

TOXIC GASES

- ❑ exposure to high concentrations of gases may result in diffuse airway and alveolar damage including acute pulmonary edema
- ❑ solubility of the gas is a major determinant of where in the respiratory tract the damage occurs
- ❑ types and sites of exposure
  - high solubility (e.g. ammonia, HCl) affects upper respiratory tract (nose, throat)
  - medium solubility (e.g. SO_2, Cl_2) affects airways
  - low solubility (e.g. nitrogen oxides, ozone) affects lung parenchyma
- ❑ symptoms
  - mucous membrane irritation
  - cough, chest tightness, dyspnea
- ❑ physical examination
  - wheezes, crackles
- ❑ chest x-ray
  - widespread diffuse consolidation or patchy infiltrates
- ❑ pulmonary function tests
  - restrictive or obstructive pattern: depends on site of damage
- ❑ treatment
  - prevention
  - protection of rescuer
  - supportive therapy
  - steroids

CONTACT DERMATITIS

Irritant Contact Dermatitis (ICD)
- ❑ 80% of occupational contact dermatitis

Immediate ICD
- ❑ chemical burn resulting from a single contact with strong alkalis, acids, certain metallic substances, and many organic compounds
- ❑ presentation: erythema, blistering, ulceration
- ❑ treatment
  - medical therapy: compresses to remove irritant and protection from further injury
  - surgical therapy: debridement and skin grafting

Delayed ICD
- ❑ skin damage after multiple contacts with mild irritants such as soaps, detergents, solvents, acids, alkalis, and cutting oils
- ❑ presentation: eczematous eruption, erythema, dryness and cracking; aggravated by low relative humidity, friction, occlusion, and sweating
- ❑ diagnosis through history of exposure and knowledge of the nature of the irritant
- ❑ treatment
  - protection from irritant
  - topical corticosteroid and time off work usually allow the worker to continue at their job

Allergic Contact Dermatitis
- ❑ accounts for 20% of occupational contact dermatitis
- ❑ contact eczema
  - type IV delayed hypersensitivity reaction
  - common causes include chromium, epoxy resin, plants, and rubber components
  - pruritic, erythematous rash at the site of contact 24-72 h after exposure, followed by papule formation and blistering
- ❑ contact urticaria is uncommon
  - type I IgE-mediated immune response
  - etiologic agents include pharmaceuticals, isocyanates, platinum
- ❑ diagnosis by patch testing
- ❑ treatment
  - avoidance of the identified causative agent
  - unlike irritant contact dermatitis, ordinary protective measures usually are ineffective and many workers must change jobs or learn a new trade

OCCUPATIONAL ACNE

Oil Acne and Folliculitis
- ❑ acneiform eruption at sites of contact with oils, fats, tars

Chloracne
- ❑ cutaneous or systemic exposure to halogenated aromatic hydrocarbons (e.g. polychlorinated biphenyls [PCBs])
- ❑ multiple, closed comedones and pale yellow cysts on face, trunk, legs

PRINCIPLES OF PREVENTING OCCUPATIONAL SKIN DISEASE
- ❑ identification of potential irritants and allergens in the workplace (utilization of Material Safety Data Sheets)
- ❑ insistence on personal and environmental hygiene and safe work practices
- ❑ suitable protective clothing
- ❑ contamination of the interior of protective gloves may be a significant problem, therefore re-use should be avoided
- ❑ barrier creams are not effective

NOISE

- ❑ ear senses sound from 20-20 000 Hz
- ❑ ear most sensitive to sounds in the 100-5000 Hz range
- ❑ frequencies for speech: 400-4000 Hz
- ❑ audiograms test the frequencies between 250-8000 Hz
- ❑ higher frequency noise is more damaging than low

Effects of Noise on Hearing

- ❑ Temporary Threshold Shift (TTS)
  - transient hearing loss following short-term high noise exposure
  - characterized by temporary elevation of hearing threshold levels between 3000-6000 Hz
  - TTS recovers following cessation of noise exposure
  - may be accompanied by tinnitus
- ❑ Permanent Threshold Shift (PTS)
  - progressive, permanent sensorineural hearing loss
  - particularly at 4000 Hz (ultimately all frequencies affected)
  - due to daily 8 h exposures at levels in excess of 85 dB over a working lifetime
  - diagnosis requires appropriate history of exposure to noise and characteristic audiogram changes (i.e. dip at 4000 Hz)
  - no medical or surgical treatment; hearing aids of limited benefit
- ❑ Acoustic Trauma
  - acute hearing loss from a sudden noise exposure
  - may be sensorineural or conductive
  - may recover over weeks to months
  - differentiate from PTS by history
- ❑ Tinnitus

Factors Influencing Effects of Noise

- ❑ intensity of sound
- ❑ duration of exposure
- ❑ frequency characteristics
- ❑ susceptibility of the individual to noise

Control: Hearing Conservation Program

- ❑ measurement of the noise levels and evaluation of the hazard
- ❑ reduction of noise and avoidance of new sources
- ❑ worker education
- ❑ provision of appropriate hearing protection
  - use if time-weighted average of noise > than 85 dB for an 8 h workday
  - ear muffs: greatest attenuation at high frequencies
  - ear plugs: usually most acceptable to the workers
- ❑ periodic examination of the worker (audiometry) and work place (sound level meter, noise dosimeters)

HAND ARM VIBRATION SYNDROME

- ❑ work with compressed air tools, grinders, chain saws, drills, and jackhammers
- ❑ characterized by spasms of the digital arteries (Raynaud phenomenon) caused by vibration-induced damage of the peripheral nerve, vascular tissue, subcutaneous tissues, bones and joints of hands and fingers
- ❑ signs and symptoms
  - tingling and numbness of fingers at rest, particularly at night +/– swelling of fingers (especially over knuckles)
  - subsequent blanching and numbness of finger tips
  - localized to the tips of the fingers most exposed to the vibration source with eventual spread to involve all fingers
  - numbness or reduced sensitivity may persist between attacks
  - precipitated by exposure to cold, damp conditions, and strenuous exertion
- ❑ diagnosis
  - occupational history of vibration exposures
  - exclusion of primary Raynaud phenomenon (Raynaud disease)
  - exclusion of other secondary causes of Raynaud's phenomenon (e.g. collagen vascular disease [e.g. SLE], occlusive vascular disease, or prior trauma to fingers and hands)

- ❑ treatment
  - avoidance of exposure
  - ultimately may involve a job transfer
- ❑ prevention
  - identification of hazard by vibration measurement
  - reduction in vibration levels through engineering design
  - use of anti-vibration pads or gloves
  - worker rotation to limit exposure
  - medical surveillance

REPETITIVE STRAIN INJURY

Tenosynovitis, Bursitis, Myositis

- ❑ exposure
  - meat processing plants, construction work, canning industry, data entry/clerical staff, heavy labour
- ❑ related to cumulative trauma which may lead to pain and acute or chronic inflammation of the tendon, muscle, capsule, or nerve
- ❑ eventual scarring and stenosis can entrap tendons, nerves, and vascular tissue

IONIZING RADIATION

- ❑ electromagnetic particles or waves that carry sufficient energy to produce ions in matter
- ❑ most of the radiation we are exposed to is natural background radiation
- ❑ types of ionizing radiation
  - alpha particles (e.g. radon in miners)
  - beta particles (e.g. tritium in nuclear workers)
  - x-rays (e.g. x-ray technicians, dentists, radiologists, industrial radiographers)
  - gamma rays

Units of Measurement (Dose)

- ❑ rad: radiation-absorbed dose
  - measurement of energy deposited in any medium by all types of ionizing radiation
  - one rad = 0.01 Joules/kg (SI units: 1 gray = 100 rad)
- ❑ rem: Roentgen equivalent man (biological dose equivalent)
  - since some ionizing radiation is more effective at ionization than others, a second unit is used to quantify the biological dose equivalent
  - rem = rad x RBE
  - RBE: relative biological efficiency; represents biological potency of one type of radiation relative to another to produce the same biological effect
  - SI units: 1 sievert = 100 rem

Nonstochastic Effects (predictable)

- ❑ outcomes for most individuals exposed to specified levels of ionizing radiation
- ❑ early (hours to weeks after exposure) adverse effects of high dose levels of ionizing radiation
- ❑ three basic syndromes: cerebral, GI, hematopoietic

Table 7. Ionizing Radiation: Nonstochastic Syndromes

	Cerebral	GI	Hematopoietic
dose of whole body rad	extremely high	lower than cerebral	lowest dose
symptoms/ signs	convulsions, ataxia, drowsiness	intractable nausea, vomiting, diarrhea, severe dehydration	nausea and vomiting, anorexia, pancytopenia, spleen/lymph node atrophy
pathology	direct nerve cell death	intestinal villae become denuded	direct killing of radiosensitive cells and inhibition of new cell production
course	always fatal	villi regenerate in 6 days	maximal symptoms between 6-12 hours, GI symptoms subside

Table 8. Ionizing Radiation Dose and Effects	
Dose in Rads	Probable Effect
10-200	usually no deaths
200-350	20% die within 2-6 weeks after exposure
350-550	50% die within 1 month
550-750	up to 100% die
1 000	all die within days

Stochastic Effects (random)
- ❑ outcomes which do not occur in all individuals exposed to ionizing radiation
- ❑ late (months to years after exposure) adverse effects of ionizing radiation
- ❑ effects include malignancy (somatic cell mutation), hereditary effects (germ cell mutation), nonmalignant changes, and developmental effects (fetal exposure)
- ❑ examples of malignancies: leukemia, thyroid, lung, breast

ALARA Principle
- ❑ all ionizing radiation exposures shall be kept "As Low As Reasonably Achievable" (ALARA) with economic and social factors considered

NON-IONIZING RADIATION
- ❑ electromagnetic radiation whose energy is not sufficiently high to ionize matter
    - UV light, infrared light, microwaves, radio waves
- ❑ exposures: outdoor work, welding, glass and steel plants, laser work, telecommunication industry

Thermal Effects
- ❑ photokeratitis, cataracts, sunburn, skin cancer, actinic changes

Non-Thermal Effects
- ❑ headaches, nervous excitability, auditory sensations, hair loss, impotence, menstrual irregularity, eye irritation, diaphoresis and anorexia

CHEMICAL AGENTS

INORGANIC LEAD

Exposure
- ❑ smelting, refining, battery manufacturing, foundries, paint, and glazes

Absorption
- ❑ inhalation, ingestion

Acute effects
- ❑ nausea, vomiting, anorexia, severe abdominal cramping (i.e. lead colic), constipation
- ❑ lead encephalopathy
    - more common in children
    - headache, sleep disturbance, memory deficit, irritability
    - seizures, delirium, coma
- ❑ hemolysis
- ❑ acute renal failure

Chronic effects
- ❑ fatigue
- ❑ microcytic anemia
- ❑ peripheral motor weakness (e.g. wrist drop)
- ❑ chronic renal failure, increase in systolic blood pressure
- ❑ joint pain, gouty arthritis
- ❑ spontaneous abortions, stillbirths, loss of libido

Treatment
- ❑ remove from exposure
- ❑ if severe, chelation with calcium EDTA

Prevention
- ❑ control of exposure
- ❑ surveillance
  - blood lead: normal < 0.7 umol/L, action level > 3.4 umol/L
  - blood protoporphyrin levels

INORGANIC MERCURY

Exposure
- ❑ work involving extraction and recovery of mercury, manufacture of electrical equipment requiring mercury, dentistry

Absorption
- ❑ inhalation, ingestion

Effects
- ❑ skin, mucous membranes
  - acute irritant
  - chronic dermatitis
- ❑ respiratory
  - acute irritant (cough, dyspnea, chemical pneumonitis)
- ❑ GI
  - acute (nausea, vomiting, diarrhea, abdominal pain)
  - chronic (stomatitis)
- ❑ nervous system
  - tremour (resting or intention)
  - personality changes (nervous, irritable)
  - cerebellar ataxia
- ❑ renal
  - tubular damage, nephritic syndrome

Treatment
- ❑ remove from exposure
- ❑ if severe, chelation with dimercaprol or d-penicillamine

Prevention
- ❑ control of exposure
- ❑ surveillance with periodic urine mercury monitoring
  - remove from exposure if > 100 ug/g urinary creatinine

SOLVENTS

Exposure
- ❑ manufacture of chemical products; use of cleaners, thinners, and paints

Examples
- ❑ chlorinated hydrocarbons (e.g. ethylene chloride)
- ❑ aromatic hydrocarbons (e.g. toluene, xylene, benzene)

Absorption
- ❑ inhalation, percutaneous

Effects
- ❑ skin, mucous membranes and respiratory tract
  - irritant, dries skin by dissolving lipids
- ❑ CNS
  - progressive CNS depression with increasing doses in acute exposure
  - weakness, incoordination
  - stupor, encephalopathy, coma, death
- ❑ PNS
  - sensorimotor neuropathies (e.g. carbon disulfide, hexane)

- ❑ hepatic
  - hepatitis, cirrhosis
- ❑ cardiovascular
  - cardiac sensitization: increased susceptibility to arrhythmias and sudden death (e.g. toluene)
- ❑ haematologic
  - aplastic anemia (e.g. benzene) (rare)
- ❑ renal
  - acute and chronic failure

Treatment
- ❑ remove from exposure
- ❑ supportive

Prevention
- ❑ control of exposure
- ❑ surveillance of metabolite levels in the urine

PESTICIDES

Organophosphates
- ❑ cholinesterase inhibitors
- ❑ monitor exposure with baseline values for plasma and red blood cell cholinesterase levels
  - if decreased by 25%, remove from exposure
- ❑ treatment
  - atropine, pralidoxime chloride

OCCUPATIONAL CANCER

- ❑ estimated that from 1-40% of cancers are occupational
- ❑ proportion of certain cancers is higher (i.e. 20% are bladder cancer)

DEFINITIONS

Mutagenesis = induction of genetic mutation
Carcinogenesis = production of cancer
Teratogenesis = production of deformity in developing embryo

CLASSIFICATION

Suspect Carcinogens
- ❑ animal studies have led to the classification of chemicals that cause cancer in mammals as suspect human carcinogens

Known Carcinogens - Types of Cancer and Causative Agents
- ❑ skin
  - arsenic, coal tars, polyaromatic hydrocarbons (PAHs)
  - ionizing radiation (e.g. x-rays), UV radiation
- ❑ lung
  - arsenic, asbestos, chloromethyl ethers, chromium, coke-oven emissions, hydrocarbons, mustard gas, nickel, ionizing radiation (e.g. radon)
- ❑ bladder
  - aromatic amines (e.g. beta-naphthylamine)
  - dyes (e.g. benzidine)
- ❑ nasal
  - chromium, nickel, wood dust
- ❑ blood
  - benzene, ionizing radiation (e.g. x-rays)
- ❑ liver
  - arsenic, vinyl chloride
- ❑ brain
  - vinyl chloride
- ❑ thyroid
  - ionizing radiation (e.g. x-rays)
- ❑ GI
  - asbestos

DIFFICULTIES

- ❑ problems in measuring toxic agents
  - levels difficult to measure in environment and body
  - levels measured may not reflect target organ levels
  - agent may not be toxic but its metabolites might be
- ❑ dose-response relationship difficult to predict at low levels
- ❑ long latency between exposure and carcinogenicity or mutagenicity
- ❑ compounded effects of multiple types of exposures

LEGISLATION

- ❑ federal government
  - sets national policy regarding pollutants that can travel across borders (e.g. acid rain)
- ❑ provincial government
  - responsible for local air control and soil contaminant guidelines
  - monitors industrial emissions and toxic waste disposal
- ❑ municipal government
  - responsible for garbage disposal, food, water, and sanitation

ENVIRONMENTAL HEALTH CONCERNS

Air Pollution/ Acid Rain

- ❑ mainly due to incomplete combustion of fossil fuels
- ❑ in Ontario, association exists between admission to hospital for respiratory illness and levels of pollutants in the air

Ozone Depletion and Ozone Pollution

- ❑ in stratosphere, ozone protects earth from UV radiation
- ❑ at ground level, ozone can be harmful causing airway irritation and reduction in FEV_1

Indoor Air (Sick Building Syndrome)

- ❑ results from indoor pollutants such as cigarette smoke and volatile organic compounds evaporating from furniture and carpeting
- ❑ recirculation of air may also contribute
- ❑ non-specific complaints (nausea, headache, fatigue, mucous membrane irritation)

Water Quality

- ❑ goals: free of pathogenic organisms and harmful chemicals; palatable

Multiple Chemical Sensitivity

- ❑ chronic multisystem disorder
- ❑ affected individuals react adversely and at low exposures to some chemicals, foods and environmental contaminants
- ❑ often no objective clinical findings, but improvement is noted with removal of exposure

HEALTH PROMOTION

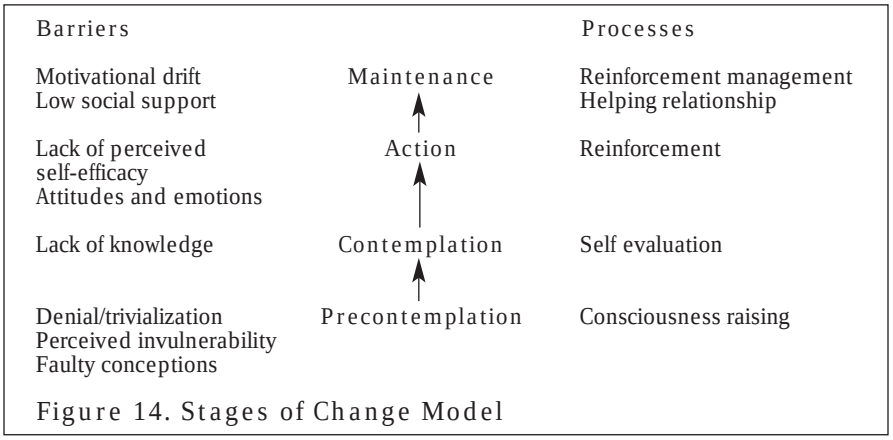


Figure 14. Stages of Change Model

VIOLENCE IN RELATIONSHIPS

Violence Against Women

- ❑ 29% of all Canadian women have experienced violence by current or past partners
- ❑ 1/6 of currently married women reported violence by partner
- ❑ 1/10 of married women have at some point felt their life in danger
- ❑ of 245 women murdered in 1992, 47% (114) were slain by spouse or boyfriend

Patterns of Violence

- ❑ violence tends to be cyclical
- ❑ often the abuser feels remorse immediately after a violent act and promises it will never happen again
- ❑ 3/4 of women who experienced violence by past partners endured repeated assaults (41% on more than 10 occasions)

Essential Tasks of Health Professionals

- ❑ identify (common symptoms include chronic pelvic pain, panic attacks, depression, and substance abuse)
- ❑ evaluation
- ❑ documentation (use patients own words)
- ❑ refer

CHILD ABUSE (see Pediatric Notes)

HEALTH IMPLICATIONS OF SOCIOECONOMIC STATUS

Socioeconomic Status

- ❑ strata of population based on combination of occupation, education, and income
  - 1996: 34.8% of Canadians have less than Grade 9 education
    17.9% of Canadians live below poverty line

Health Implications

- ❑ inverse relationship between socioeconomic status and illness rates (acute and chronic), days restricted activity, psychiatric symptoms, hypertension, obesity, low birth weight, and inability to conceive
- ❑ illiteracy leads to inappropriate medication use, inability to communicate with health care workers and follow instructions

IMPORTANT NOTE FROM EDITORS

Notes

One-sixth of the MCCQE exam is devoted to Community Medicine and all details would be impossible to include in this guide. You are encouraged to refer to Public Health and Preventive Medicine in Canada, C.P. Shah. 4th Edition (1998). Much of these notes are derived from this source.

It is recommended reading by the Medical Council of Canada and deals with basic epidemiological methods, Canada's Health Care System, occupational and environmental health, periodic health exam, impending reforms to health care and other important topics.