Introduction to Epidemiology

in the Community

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Definitions

Epidemiology

- is "the study of the distribution and determinants of diseases and injuries in human populations." Mausner & Kramer, 1985

Endemic Diseases

- a disease that occurs regularly in a population

Epidemic

- an unexpectedly large number of cases of disease in a particular population

Recent Epidemics in the United States

Disease	Cases/Prev. yrs	Period	# of Cases
St. Louis encephalitis	5-72	1975	1,815
Legionnaires'	Unknown	1976	235
AIDS	Unknown	1981-1999	733,374
Lyme Disease	Unknown	1990-1999	121,000

DefinitionsNumbers and Rates

Epidemiologist

- one who practices epidemiology

Epizootiologist

- one who studies disease outbreaks in animals

Pandemic

- an outbreak of disease over a wide geographical area such as a continent
- influenza pandemic of 1918-1919 killed 25 million people worldwide

3 Important Kinds of Rates

$$\text{Natality (birth) rate} = \frac{\text{\# of live births to residents in an area in a calendar year}}{\text{Population in the area in the same year}}$$

$$\text{Morbidity (disease) rate} = \frac{\text{\# of cases of residents with illness in an area in a calendar year}}{\text{Population in the area in the same year}}$$

$$\text{Mortality (fatality) rate} = \frac{\text{\# of deaths to residents in an area in a calendar year}}{\text{Population in the area in the same year}}$$

3 Important Types of Rates

$$\text{Incidence rate} = \frac{\text{\# of new cases of a disease in a certain time period}}{\text{Population at risk in same time period}}$$

$$\text{Prevalence rate} = \frac{\text{\# of new and old cases of a disease in a certain time period}}{\text{Population at risk in same time period}}$$

$$\text{Attack rate} = \frac{\text{\# of new cases in a narrowly defined population during a specific time period}}{\text{Population at risk in same time period}}$$

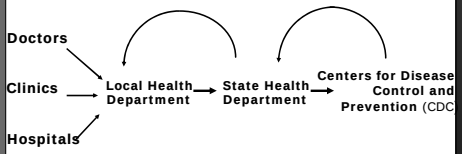
Crude & Specific Rates

Crude death rate = $\frac{\text{Number of deaths (all causes)}}{\text{Estimated midyear population}}$

Age-specific death rate = $\frac{\text{Number of deaths (35-44)}}{\text{Estimated midyear population (35-44)}}$

Cause-specific death rate = $\frac{\text{Number of deaths (specific cause)}}{\text{Estimated midyear population}}$

Reporting Births, Deaths, & Diseases



Sources of Standardized Data

- U.S. Census
  - conducted every 10 years, enumeration of population
- Statistical Abstract of the U.S.
  - statistics on social, political, & economic organization
- Vital Statistics
  - statistical summaries of records of major life events

Sources of Standardized Data

- Morbidity & Mortality Weekly Reports (MMWR)
  - lists cases of notifiable diseases in the U.S.
- National Health Surveys
  - health interviews of people
  - clinical tests, measurement, and physical examinations
  - survey of places where people receive medical care
    - NHIS NHANES BRFSS YBRS NHCS

Standardized Measurements of Health Status

- Mortality Statistics
- Life Expectancy
- Years of Potential Life Lost
- Disability-Adjusted Life years
- Disability-Adjusted Life ExpectancyEpidemiological Study MeasuresEpidemiological StudiesEpidemiological StudiesEpidemiological Studies

Types of Diseases	Examples
Acute Diseases	
Communicable	Common cold, pneumonia, mumps, measles, pertussis, typhoid fever, cholera
Noncommunicable	Appendicitis, poisoning, trauma
Chronic Diseases	
Communicable	Tuberculosis, AIDS, Lyme disease, syphilis, rheumatic fever
Noncommunicable	Diabetes, coronary heart disease, osteoarthritis, cirrhosis of the liver

Causative Agents for Diseases & Injuries Communicable Disease Model

Biological Agents	Chemical Agents	Physical Agents
Viruses	Pesticides	Heat
Rickettsiae	Food additives	Light
Bacteria	Pharmacologics	Radiation
Fungi	Industrial chemicals	Noise
Protozoa	Air pollutants	Vibration
Metazoa	Cigarette smoke	Speeding objects

Chain of Infection

A model to conceptualize the transmission of a communicable disease from its source to a susceptible host

Chain of Infection

Pathogen

- is the disease causing agent

Chain of Infection

Pathogen | Reservoir

- **is the habitat in which an infectious agent normally lives & grows**
- **Human: symptomatic or asymptomatic**
- **Animal: called zoonoses**
- **Environmental: plants, soil, and water**

Chain of Infection

Pathogen | Reservoir | Portal of exit

- **is the path by which an agent leaves the source host**

Chain of Infection

Pathogen | Reservoir | Portal of exit | Trans-mission

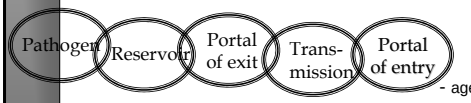
- how pathogens are passed

Modes of Transmission

Direct
- **Direct contact**
- **Droplet spread**

Indirect
- **Airborne**
- **Vehicleborne**
- **Vectorborne**

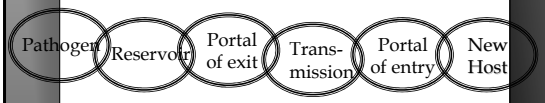
Chain of Infection



- agent enters susceptible host

Respiratory
Oral
Skin
Intravenous
Gastrointestinal

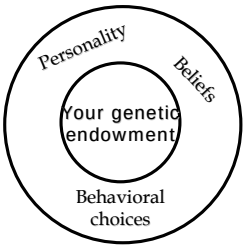
Chain of Infection



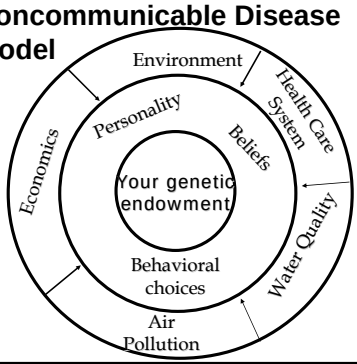
- Final link is a susceptible host

Noncommunicable Disease Model

Noncommunicable Disease Model



Noncommunicable Disease Model



Prioritizing Prevention & Control Efforts

- Leading Causes of Death
- Years of Potential Life Lost
- Economic Cost to Society

Prevention, Intervention, Control, and Eradication of Diseases

- Prevention
  - primary
  - secondary
  - tertiary
- Intervention
  - which is defined as taking of action during an event
- Control
  - general term used in the containment of disease
- Eradication
  - total elimination of the disease

Levels of Prevention

- Primary Prevention
  - is the forestalling of the onset of illness or injury during the pre-pathogenesis period (before the disease process begins)
- Secondary Prevention
  - is the early diagnosis and prompt treatment of diseases before the disease becomes advanced and disability becomes severe
- Tertiary Prevention
  - is to retrain, reeducate, and rehabilitate the patient who has already incurred disability