Capillus tabasco

POST-WORKSHOP RESOURCES

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THE CHOOSE-YOUR-OWN-VIRUS-EPIDEMIC-CONTROL-ADVENTURE-GAME

In the *Capillus Tabasco* choose-your-own-adventure-game, your choices determined how quickly and effectively a public health agency was able to trace the cause, and control the spread, of a bizarre new virus that turned people's hair pink.

The game asked you to consider principles of:

- The scientific method
- Epidemiological reporting regimes
- Experiment design
- Public health management and communication

THE BIG REVEAL: THE FACTS BEHIND THE GAME

These are the facts of the scenario we devised when planning the game. Did you uncover all of these in your play?

- The source of the infection is a particular algae found in water. Humans are infected when they inadvertently ingest the water when swimming, washing or drinking.
- The algae also attracts flamingos, as it's a food source for them.
- The infection is primarily being spread across the continent by the migration of flamingos with algae stuck to their feet.
- The infection is spread from human to human quite slowly, through close contact: sharing water sources, drinking glasses, a bathroom. It may also be spread by hair-to-hair contact, such as sharing a cap or a pillow.
- Humans can be infected asymptomatically. An infected person's hair will only turn pink if they have a diet high in acid. Pink hair is the only symptom.

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SELECTED HISTORY OF EPIDEMIOLOGY

Circa 400 B.C.	Hippocrates attempted to explain disease occurrence from a rational rather than a supernatural viewpoint.
1740's	James Lind designed the first experiment to use a concurrently treated control group while studying scurvy.
1790's	Edward Jenner developed the small pox vaccine using clinical trials using cowpox
1800	Farr, considered the father of modern vital statistics and surveillance, developed many of the basic practices used today in vital statistics and disease classification.
1849 - 54	John Snow the "father of field epidemiology." formed and tested hypothesis on the origin of cholera in London - one of the first studies in analytic epidemiology
1910's	Flu pandemic
1940's	Fluoride supplements added to public water supplies in randomized community trials
1950	Epidemiological studies link cigarette smoking and lung cancer, demonstrating the power of case control study design
1954	Field trial of the Salk polio vaccine - the largest formal human experiment
1980's	Chronic disease, injury and occupational epidemiology; HIV epidemic
2000's	Genetic and molecular epidemiology; health disparities; racialism; HIPAA in the USA; West Nile Virus
2003	SARS, quarantines and public health law; and world-wide epidemiology; BSE in Canada
2004 – 2009	SARS recurrence; BSE in USA; flu epidemic; H1N1 pandemic
2020	Covid-19

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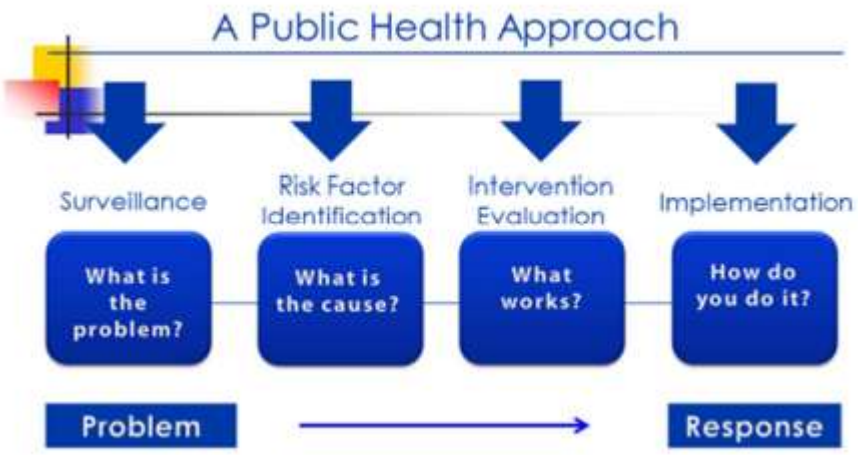
PUBLIC HEALTH AND EPIDEMIOLOGY



Purposes of Epidemiology

- Determine the agent, host, and environmental factors that affect health
- Determine the relative importance of causes of illness, disability, and death
- Identify those segments of the population that have the greatest risk from specific causes of ill health
- Evaluate the effectiveness of health programs and services in improving population health

Steps in Solving Health Problems

Step 1- Collect Data – Surveillance, determine Time/Place/Person triad
Step 2- Assessment- Inference
Step 3- Hypothesis testing – Determine how and why
Step 4- Action-Intervention

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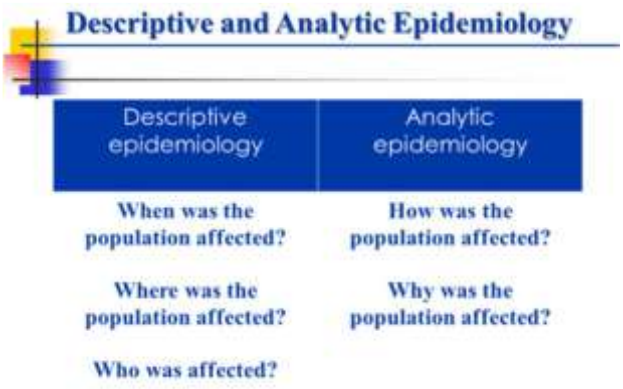
DESCRIPTIVE AND ANALYTIC EPIDEMIOLOGY

Descriptive Epidemiology involves identifying to the time, place, and the person involved in the onset of the healthrelated event.

Analytical Epidemiology is mainly concerned with finding the causes of the health-related event and to identify the interventions of the health problem.



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EPIDEMIOLOGICAL TERMS

Endemic	disease or condition present among a population at all times
Outbreak	(localized epidemic) – more cases of a particular disease than expected in a given area or among a specialized group of people over a particular period of time.
Epidemic	Large numbers of people over a wide geographic area affected.
Pandemic	An epidemic occurring over a very wide area (several countries or continents) and usually affecting a large proportion of the population.
Cluster	An aggregation of cases over a particular period esp. cancer & birth defects closely grouped in time and space regardless of whether the number is more than the expected number. (often the expected number of cases is not known.)
Sporadic	A disease that occurs infrequently and irregularly
Risk	The probability that an individual will be affected by, or die from, an illness or injury within a stated time or age span.
Rate	Number of cases occurring during a specific period; always dependent on the size of the population during that period.
Ratio	Value obtained by dividing one quantity by another – a ratio often compares two rates.
Proportion	The comparison of a part to the whole as the number of cases divided by the tota lpopulation – does not have a time dimension, It can be expressed as a decimal, a fraction, or a percentage.

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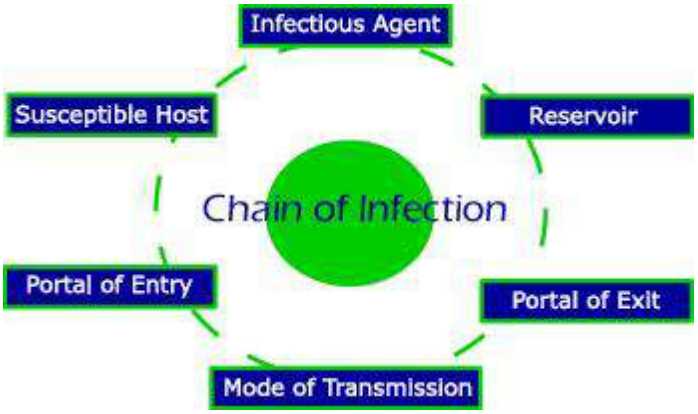
THE CHAIN OF INFECTION



Agent	A microbial organism with the ability to cause disease
Reservoir	A place where agents can thrive and reproduce
Portal of exit	A place of exit providing a way for an agent to leave the reservoir
Mode of transmission	Method of transfer by which the organism moves or is carried from one place to another
Portal of Entry	An opening allowing the microorganism to enter the host
Susceptible host	A person who cannot resist an microorganism invading the body, multiplying and resulting in infection

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TYPES OF PUBLIC HEALTH SURVEILLANCE

Passive Surveillance

Example: a physician sees a patient, diagnoses measles, and then initiates a case report by contacting the local health department and providing the details as required for a case of measles. the local health department relies on the physician to report the case.

Active Surveillance

Example: if a health department receives a case report for measles, a serious vaccine-preventable disease, active surveillance will be triggered. Public health practitioners will actively search for other cases, using a standard case definition: calling doctors' offices for any cases, following up to find additional cases among those exposed, checking laboratories.

Sentinel Surveillance

Example: a network of large hospitals might be used to collect high-quality data on various Diseases and their causative organisms, such as invasive bacterial disease caused by Haemophilus influenzae type b, meningococcus or pneumococcus.

Syndromic Surveillence

Example: Using a normal influenza outbreak as an example, once the outbreak begins to affect the population, some people may call in sick for work/school, others may visit their drug store and purchase medicine over the counter, others will visit their doctor's office and other's may have symptoms severe enough that they call the emergency telephone number or go to an emergency department.

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OUTBREAK INVESTIGATION AND THE SCIENTIFIC METHOD

Steps in Solving Health Problems

- Step 1-Collect Data – Surveillance, determine Time/Place/Person triad
- Step 2- Assessment- Inference
- Step 3- Hypothesis testing – Determine how and why
- Step 4- Action-Intervention

Compare Scientific Method to these steps:

- Obtain Background Information
- Define the Problem
- Formulate Hypothesis
- Develop a Study to Test the Hypothesis
- Collect Data and Observations
- Evaluate Results
- Determine if Hypothesis is true/modify Hypothesis
- Formulate Conclusions
- Report Results

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EXPERIMENTAL DESIGN IN EPIDEMIOLOGY

Experimental

- Clinical Trials for Individuals
- Community Trials for Communities

Observational

- Cohort Study- the epidemiologist records whether each study participant is exposed or not, and then tracks the participants to see if they develop the disease of interest
- Case Control Study - investigators start by enrolling a group of people with disease (casepatients) and a comparison group without the disease (control) to compare previous exposure between the groups
- Cross Sectional Study - a sample of persons from a population is enrolled and their Exposures and health outcomes are measured simultaneously-it tends to assess the presence (prevalence) of the health outcome at that point of time without regard to duration.
- Ecological Study - a study in which at least one variable, either an exposure or the outcome, is measured at the group (not individual) level. The occurrence of disease is compared between groups that have different levels of an exposure, which affords this study design to have at least one comparison group.

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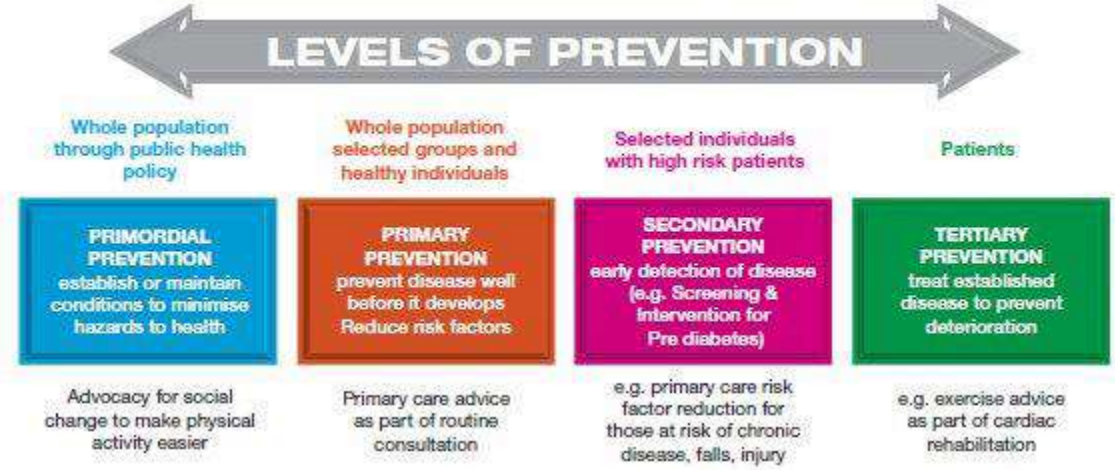
PREVENTING INFECTION



Primary Prevention Approaches

Population-Based Approach:

- Preventive measure widely applied to an entire population (public health approach)
- Strive for small absolute change among many persons
- Must be relatively inexpensive and non-invasive

High-Risk Approach:

- Target group of individual at high risk
- Strive for strong risk factor control
- Often times requires clinical action to identify the high risk group and to motivate risk factor control.

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CONTROLLING INFECTION

Types of Control Strategies – Breaking the Agent/Host/Environment triad

Control Methods regarding the Reservoir of Infection

- Diagnosis and Treatment
- Screening
- Isolation
- Reporting
- Animal reservoirs

Control Methods regarding the Mode of Transmission

- Sanitization, disinfection, sterilization
- Water
- Food
- Other vehicles
- Vector control
- Handwashing

Control Methods regarding the Susceptible Host

- Vaccination
- Chemoprophylaxis – drugs given to exposed and susceptible hosts
- Maintaining a healthy life style
- Limiting exposure to sources of infection
- Personal protective equipment

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ACKNOWLEDGEMENTS AND FURTHER READING

The design of this workshop was greatly inspired by the Center for Disease Control's *Disease Detectives* programme for secondary school students, which is held each year for U.S. students as part of the Science Olympiad.

https://www.soinc.org/disease-detectives-c

In fact, these resources are edited highlights package of those freely available from the Science Olympiad website, at the link above. Teachers interested to build more curriculum units around epidemiology and public health as a demonstration of the practical application of the scientific method, are recommended to explore this link further.

IRL HUB

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November 2020