Surveillance Defined

Surveillance is the ongoing systematic collection, analysis and interpretation of outcome-specific data for use in the planning, implementation and evaluation of public health practice. Surveillance can have a negative connotation, but we can use it to:

- Identify patients and their contacts for treatment and intervention
- Detect epidemics, health problems, changes in health behavior
- Estimate magnitude and scope of health problems
- Measure changes in infectious and environmental agents
- Assess effectiveness of programs
- Develop hypotheses and stimulate research

The authority of surveillance lies almost entirely at the state level. The CDC only responds when diseases have interstate implications or they are invited by a state.

Modes of Surveillance

Active Surveillance

- Health agencies reach out to health care providers
- More complete reporting
- Active case finding

Passive Surveillance

- Diseases are reported by health care providers
- Simple and inexpensive
- Incomplete and variable data quality

Sentinel Surveillance

- Reporting of health events by health professionals who are selected to represent a geographic area or specific reporting group
- Can be active or passive

Syndromic Surveillance

- Focuses on one or more symptoms rather than a physician-diagnosed or laboratory-confirmed disease

Surveillance Systems Attributes

- Usefulness - Does this system accomplish its objectives?
- Data quality - How reliable is the available data? How complete is it?
- Timelines - How quickly is information received?
- Simplicity - How easy is the system?

Data Sources and Reportable Disease

Electronic health records, birth and death registries and surveys are all examples of data sources for public health data. The CDC publishes a summary of reportable disease activity each week in the MMWR.

In MA, disease are reported through an electronic system called MAVEN.

After a drug is approved, passive surveillance is performed to detect adverse events. Health professionals or consumers can report suspected adverse events through MedWatch on the FDA site.

National Center for Health Statistics (NCHS) administers national health surveys and oversees vital statistics and archive of national data.

Demographic and Health Surveys (DHS) are a tool which can be used in resource poor settings and performed regularly.

Emerging Infection Program (EIP) was established in 1995 by the CDC. It is a network of 10 state health departments and their collaborators. Some of their work includes Active Bacterial Core Surveillance (ABCs), FoodNet, and impact of infectious diseases.

Public Health Action

- Describe the burden of or potential for disease
- Monitor trends and patterns in disease, risk factors, and agents
- Detect sudden changes in disease occurrence and distribution
- Provide data for programs policies and priorities
- Evaluate prevention and control efforts

Sampling

Terminology

Observation Unit: Object on which measurement is taken
Sampling Unit: A unit that can be selected for a sample
Target Population: The completely group we want to study and make statements about

Census: Survey designed to sample the entire population
Sample: Finite sample of target population
Sampling Frame: List, map, etc. that shows all units from which a sample can come
Parameter/Statistic: Any numerical value that describes a population
Estimator: Any statistic that approximates a parameter

Variance: How precise is the estimator? What are sources of uncertainty
Bias: How close is the statistic to the parameter

Sources of Bias

Convenience sample: Select units that are the easiest to get
Judgment sample: Purposely selecting a "representative" sample
Misspecify the target population
Undercoverage: Fail to include all the target populations
Overcoverage: Include population units in the sampling frame that are not included in the target population
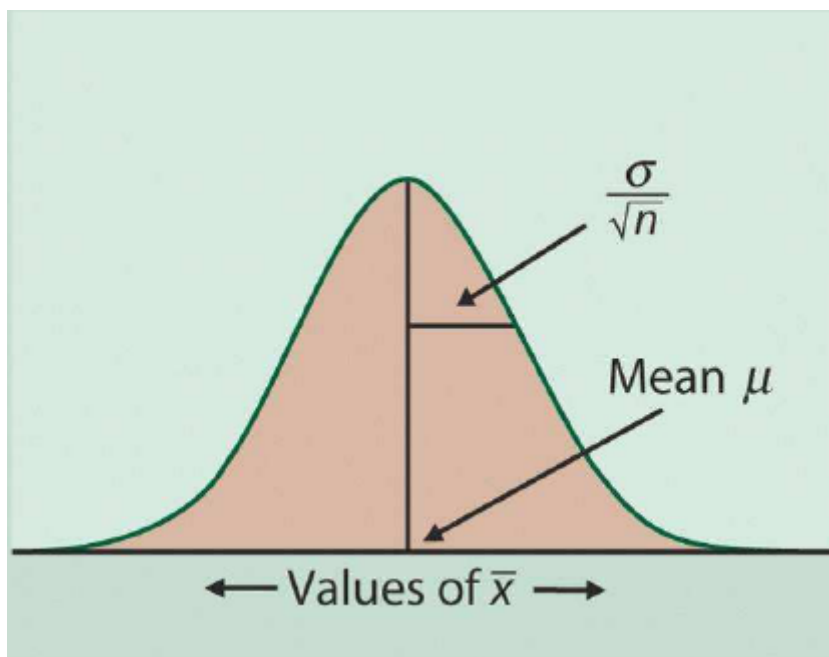**Nonresponse:** Failing to get responses from all who were chosen to be in the sample
Sample consists entirely of volunteers
Measurement error: Sensitive questions people will lie on, recall bias when people forget, question wording or order

Central Limit Theorem

A very important idea in sampling is when we select a large, **random** sample measuring an estimator it will eventually meet the true population value, and we can use a normal distribution. It also tells us how "wide" the histogram is, or how much our sample mean could vary from the true mean.