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### Logistics

12/7 office hours 12-1PM

12/12 office hours 12-1PM

Look over:

* HW assignments
* Midterm exams
* Discussion slides

N-Z Hodson 210 9AM-12PM 12/13

1 double sided 3x5 index card

50MC, 3-4 guest lecture questions

### Extra Tips

* Make sure to check whether a question is asking for survival or death
* For cumulative incidence, check for loss to followup

### Module 1 - Descriptive

#### History of epi

* John Snow (cholera)
* Semmelweis (handwashing after autopsy)
* Jenner (smallpox vaccine)
* Graunt (life table)
* Lind (scurvy, controlled trial)
* Typhoid Mary [Q]

#### Definition of epi

* study of distribution and determinants of health-related states or events in specified populations and the application of this knowledge to the control of health problems

#### Core functions

* Assessment, policy development, assurance
* Prevention - Primary, Secondary, Tertiary [Q]

#### Morbidity and mortality

* Prevalence - burden of disease = [Q]
* Incidence - risk of disease
  + Cumulative = new cases/total pop at risk [Q]
  + Incidence rate = new cases/total pop-time at risk [Q]
  + Assumes complete followup
* Using prevalence versus incidence [Q]
* Mortality rate
  + All-cause = [Q]
  + Cause-specific = [Q]
* Case fatality rate - severity of disease = [Q]
* Proportionate mortality - proportion of deaths due to disease = [Q]
* Age-adjusted mortality rate (direct adjustment) = [Q]
* Standardized mortality ratio (indirect adjustment) = [Q] [Q]
* Observed survival
  + Life table [Q]
  + Kaplan-Meier method [Q]
  + Life table versus Kaplan-Meier [Q]

#### Outbreak investigations and disease surveillance

* Endemic versus epidemic versus pandemic [Q]
* Herd immunity - resistance of a group of people to a disease based on proportion of people immune to disease, applies to person-to-person transmission [Q]
* Types of outbreaks [Q]
  + Common source
    - Point source - food outbreak
    - Continuous - broken fountain
    - Intermittent - common flu
  + Propagated - HFM
  + Mixed
  + Using epi curve
* Attack rate
* Identifying probable cause of outbreak [Q]
* Incubation period, via cross-tabulation [Q]
* Types of surveillance
  + Sentinel - pick certain sites
  + Syndromic - between symptoms and diagnosis
  + Passive - mandatory reported diseases
  + Active
  + Identify type [Q]
* Sources of data - medical records, emergency departments, 911 calls, or nonclinical data from schools, labs, surveys, etc.

#### Measures of validity and reliability

* Validity - expresses degree to which a specified measurement measures what it purports to measure, sensitive and specificity are fixed characteristics of the test, predictive values depend on the prevalence of the disease, often for new tools [Q]
  + Sensitivity = P(test positive | disease)
  + Specificity = P(test negative | no disease) [Q]
  + Net sensitivity simultaneous = inclusion exclusion
  + Net specificity simultaneous = product rule
  + Net sensitivity sequential = product rule
  + Net specificity = inclusion exclusion
  + Simultaneous and sequential testing - simultaneous captures positive for either, so high sensitivity, sequential captures test negative for either, so high specificity [Q]
  + PPV = P(disease | positive test), increases with prevalence
  + NPV = P(no disease | negative test) [Q]
  + NNH
  + NNT [Q]
  + ITT [Q]
* Reliability - degree to which the results can be replicated for a specified measurement procedure, aka repeatability, precision, comparing one tool to itself
  + intra and inter observer agreement
  + Kappa statistic - won’t have to calculate, only interpret [Q]

### Module 2 - Study Designs

#### Types of populations

* Target
* Source
* Study
* [Q]

#### Validity in study design

* Internal validity - need to consider methodological problems, bias, confounding, random error, must be established before generalizing to external bias
* External validity

#### Types of study design

* Clinical Trial
* Cohort
* Case control
* Cross-sectional
* Ecologic
* Identify type

### Module 3 - Analysis and Inference

#### Measures

* Calculate and interpret each measure
* Use in appropriate study design

#### Ratios

* Relative risk (trial, cohort)
* Prevalence ratio (cross-sectional)
* Odds ratio (case control)
  + Matched and unmatched
* RR is roughly OR when disease is rare

#### Differences

* Risk difference
* Prevalence difference
* Attributable risk

#### Necessary versus sufficient

* Necessary - disease won’t develop w/out exposure
* Sufficient - exposure guarantees disease

#### Epidemiological guidelines for suggesting causation

* Temporality (only one that is necessary)
* Strength of association
* Dose-response gradient
* Consistency/replication
* Coherence (biological plausibility)
* Experiment (cessation of exposure)
* Analogy
* Consideration of alternate explanations
* Specificity of association

#### Chance

* p value, sample size, precision of confidence interval determined by sample size, type I, II errors

#### Bias

* systematic/non-random error in design, conduct or analysis of study
* Selection bias - difference in characteristics between those who take part in a study versus those that do not
* Information bias - flaw in data collection or measurement that results in different quality/accuracy between comparison groups
* Identify type

#### Confounding

* Associated with exposure
* Cause of outcome
* Not in the causal pathway
* Control in study design
  + Restriction on confounding variable
  + Matching in a case-control study
  + Randomization in a clinical trial
* Control in the data analysis
  + Stratification
  + Adjustment

#### Effect modification

* Make a list of potential confounders and effect modifiers
* Calculate crude measure of association for exposure and outcome of interest, calculate measures for stratified

### Module 4 - Applications of Epi