Disease Detectives Division B/C

2023 Centerville Coaches' Academy

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Part 1: Event Overview

Event Introduction

- Disease Detectives is classified as a ‘core knowledge’ event
- Event Parameters:
  - Team of up to 2 students
  - One double-sided 8.5” by 11” reference sheet
  - Two stand-alone non-programmable, non-graphing calculators
  - Approximately 50 minutes
- Addresses three big topics related to disease, injury, health, and disability in populations or groups of people:
  - Background & Surveillance
  - Outbreak Investigation
  - Patterns, Control, and Prevention

Students

- Good researchers and organizers
- Learn by reading
- Good note takers.
- Learners, not doers.
- Attention for detail
- Can discuss STIs without breaking into giggles or being offended
- Understand the relationships between ratios, fractions, decimals, and percentages.
- Enjoy a bit of history
- Are comfortable with graphs.
- Are good with word problems
- Can understand technical definitions

Event Strategy

- Focus on evaluation and interpretation when presented facts
- Students may be expected to:
  - Define concepts/terms
  - Interpret data (statistics, graphs/charts, etc.)
  - Perform calculations (e.g. relative risk)
  - Generate hypotheses, explain reasoning, draw conclusions
- Knowing disease factoids can be helpful but is not the focus
- Stress
  - Definitions
  - identifying examples (outbreak steps may be given as examples and not the CDC titles)
  - basic calculations (those 4x4 grids!)
  - Case examples
  - Reading questions carefully

Three Big Topics

1. **Background & Surveillance**
2. **Outbreak Investigation**
3. **Patterns, Control, and Prevention**

All are approximately equal in points

Topic 1: Background & Surveillance

- Health and disease
  - Approaches – Individual vs. population, clinical vs. public health
    - Natural history and spectrum of disease
  - Aspects – mental, physical, etc.
  - Causes – infectious, non-infectious
- Epidemiology
  - History of epidemiology
  - Role of epidemiology in public health
- Surveillance
  - Role of public health surveillance
  - Methodologies for surveillance
- **Definitions**

Topic 2: Outbreak Investigation

- Epidemiology
  - Core concepts – **epidemiological triad**, chain of transmission
  - Studying disease – **study designs**, calculations
- Outbreak investigation
  - **Methodology for outbreak investigation (steps…)**
  - Formulating case definitions (second triad), collecting data
  - Hypothesis generation
  - Evaluating hypotheses and *verifying cause of outbreaks*
  - **Interpreting and evaluating data**
  - **Herd Immunity (new this year!)**
- *Evaluating studies/measures (Division C only)*
  - *Identify and address biases, errors, confounders, limitations in study design/data*
  - *Additional statistics/methods: confidence intervals, stratification, adjusted rates, etc.*
  - *Suggest control & prevention measures (nationals only)*

Topic 3: Patterns, Control, and Prevention

- Patterns
  - Interpreting data to identify patterns – charts, tables, graphs
  - **Calculations** – disease risk, incidence rate, etc.
- Control and prevention
  - Strategies for control/prevention, levels of prevention
- *Prevention (Division C only)*
  - *Based on analyses, propose prevention strategies*
  - *Identify strengths/weaknesses, evaluate effectiveness of prevention strategies using data (nationals only)*

Part 2: Coaching Tips, Resources, and Sample Questions

Coaching Tips

1. Talk to your students!
   - This is an excellent event to use a Socratic method teaching style.
   - This is an event that is nearly impossible for them to learn by just reading and doing.
   - Spend the time talking to your students.
2. Encourage an organized study of important concepts
   - *Example:* What are the study types? What are the advantages/disadvantages of each study type?
   - *Example:* What are important statistics in epidemiology? How do you calculate an odds ratio?
3. Have students prepare a reference sheet
   - They write out concepts in a way that makes sense to them. For the reference sheet, be efficient with space: remove mastered factoids, include quick guides/diagrams/formulas
4. Practice finding information in the note sheet.

Coaching Tips (Continued)

4. Apply concepts learned through practice tests
   - *Example:* What study design would be best suited for studying rabies and why?
   - *Example:* Using the provided statistics for smoking status and heart attacks, calculate the odds ratio. Interpret your calculated result.
   - Stress the importance of showing your work.
5. Review progress, identify topics for review, reassess, repeat!
   - Remember, the focus is evaluation and interpretation, <u>not regurgitation</u>
6. Use local and/or timely examples.

Coach Resources

- Science Olympiad National Website – training handouts, practice tests etc.
  - https://www.soinc.org/disease-detectives-b
  - https://www.soinc.org/disease-detectives-c
- Science Olympiad Student Center
  - Disease Detectives Wiki: https://scioly.org/wiki/index.php/Disease_Detectives
  - Question Marathons: https://scioly.org/forums
  - Test Exchange: https://scioly.org/tests
- Need PowerPoints? (The notebooks have great test-like questions and examples too) - https://www.epiedmovement.org/eebeLessons.html
- An excellent list of resources - http://www.epidemiolog.net/
- ActivEPI - https://web1.sph.emory.edu/activepi/index.html
- Teaching units (lots of outbreak scenarios) - http://yes-competition.org/yes/teaching-units/discipline.html
- Need to write a scenario? MMWR - https://www.cdc.gov/mmwr/

Print Resources

- Centers for Disease Control and Prevention
  - *Principles of Epidemiology in Public Health Practice* (3rd Edition) (includes tests and quizzes) https://stacks.cdc.gov/view/cdc/6914
- World Health Organization
  - *Basic Epidemiology* (2nd Edition) (includes end of chapter assessments) https://apps.who.int/iris/handle/10665/43541

Video Resources

- CDC NERD Academy - includes Activity Guides and sample outbreak activities - https://www.cdc.gov/scienceambassador/nerdacademy/index.html
- How to coach using NERD - https://www.youtube.com/watch?v=6JQa7HmJfAk&list=PL1t-RzwecjdOi0jyo2k-itASsUTef_er-&index=11
- ActivEPI - https://web1.sph.emory.edu/activepi/index.html

Interactive Resources

- Welcome to Epiville - https://epiville.ccnmtl.columbia.edu/
- MedMyst (requires some IT know-how to run now that Flash is dead.) - https://webadventures.games/stu/Games/MedMyst/
- Coursera course (requires a log in) - https://www.coursera.org/learn/epidemiology?action=enroll
- Outbreak At Watersedge - http://www.mclph.umn.edu/watersedge/
- Boston University - https://sphweb.bumc.bu.edu/otlt/MPH-Modules/Menu/index.html

Levels of Knowledge & Question Types

Sample Questions: Remember

- Epidemiologic triads can be used to generate hypotheses and assist in collecting important data about an outbreak. Which of the following are valid epidemiological triads? Select TWO. *(Source: 2023 MIT Invitational)*
  - Person, place, time
  - Agent, host, environment
  - Person, agent, environment
  - Vector, host, environment
  - Place, time, agent
- Define an observational study and an experimental study. *(Source: 2022 UT Austin Invitational)*

Sample Questions: Understand

- What is the difference between hyperendemic and holoendemic diseases? *(Source: 2022 UT Austin Invitational)*
- Local village health volunteers were recruited to assist with the identification of study participants: children between 1 and 5 years of age whose parents have lived in Cinangka for at least 3 years and are willing for their children to participate in the study. Socio-economic factors were assessed through interviews with parents while nutritional data was collected by measuring height and weight and comparing children's BMI with the average of their age. Additionally, blood sampling was performed to measure hemoglobin levels (Hb) (g/dL) and blood lead levels (BLL) (µg/dL). What kind of study is this? *(Source: 2023 MIT Invitational)*

Sample Questions: Apply

- 153 people are tested for mononucleosis. There are 36 positive results. Of these 36 positive results, there are 25 true positive results. Of the 117 negative results, there are 109 true negatives. Calculate the following statistics. Write your answers as percentages rounded to one decimal place. *(Source: 2022 UT Austin Invitational)*
- Calculate the strength of association between eating cucumbers and contracting Salmonella. *(Source: 2021 BirdSO Invitational)*

Sample Questions: Analyze

- What is a possible source of the different antibiotic resistance in the outbreak strains? *(Source: 2021 BirdSO Invitational)*
- What is the major flaw in the design of this study? *(Source: 2021 BirdSO Invitational)*
- Which one of Koch's postulates does this violate? *(Source: 2023 MIT Invitational)*

Sample Questions: Evaluate

- “Assume cost is not an object. Suggest four policies to aid in this goal of eliminating visceral leishmaniasis and explain their utility.” *(Source: 2023 Columbia University Invitational)*
- “Despite the disadvantages, what are two possible reasons why this type of map is preferred in this study?” *(Source: 2021 BirdSO Invitational)*

Sample Questions: Create

- You conduct a case series. List six useful questions you would ask each patient. *(Source: 2023 Columbia University Invitational)*
- Pick one of the two surveillance systems you chose above, and design a surveillance system based on that chosen type for Cambridge's Public Health Department. *(Source: 2022 MIT Invitational)*
- The data above shows the predicted benefits when COVID-19 booster uptake in the United States is raised from 57% to 80%. List four strategies that local governments can use to encourage more individuals to get their booster shot. *(Source: 2022 MIT Invitational)*