DISEASE DETECTIVES

Read the General Rules in the manuals and on www.soinc.org as they apply to every event.

1. **DESCRIPTION:** Students will use their investigative skills in the scientific study of disease, injury, health, and disability in populations or groups of people **with** a focus on the **effects** of **population growth on** public health **outcomes.**

   A TEAM OF UP TO: 2 **APPROXIMATE TIME:** 50 minutes.

2. **EVENT PARAMETERS:** Non-programmable calculators are permitted, but no reference materials may be used during the competition.

3. **THE COMPETITION:**
   a. This event combines a basic understanding of biological and physical agents that cause disease with an ability to analyze, interpret, evaluate and draw conclusions from simple data **and communicate results to peers.** Students should be able to distinguish between infectious and non-infectious health burdens.
   b. A broad definition of health will be used for this competition - potential topics include health as well as illness - mental, physical, infectious, chronic, environmental, societal, genetic, injuries and health behaviors.
   c. This event will include questions based on:
      i. Data collection
      ii. Creating graphic displays of data
      iii. Interpreting trends and patterns of epidemiologic data
      iv. Communicating results
   d. Students will be presented with one or more descriptions of public health problems such as an outbreak of food poisoning, a cluster of cases of West Nile encephalitis or state data on bicycle injuries.
   e. Based on these descriptions, they will be expected to do the following:
      i. Generate hypotheses and recognize various fundamental study designs.
      ii. Evaluate the data by calculating and comparing simple rates and proportions.
      iii. Identify patterns, trends and possible modes of transmission, sources or risk factors.
      iv. Recognize factors such as study design or biases that influence results (especially for Division C - less for Division B).
      v. Propose interventions based on promoting positive health behaviors, eliminating or reducing **risks or environmental exposures,** or disrupting clearly identifiable chains of transmission.
      vi. Translate results or findings into a public health or prevention message for identified populations at risk.
   f. They will also be expected to:
      i. Define basic epidemiological and public health terms (e.g., outbreak, epidemic, pandemic, surveillance, risk, vector, fomite, zoonosis, etc.).
      ii. Recognize various categories of disease-causing agents and give examples of illnesses caused by each.
      iii. Recognize and understand differences between the major groups of infectious agents (e.g., viruses, bacteria, protistans, fungi and animals).
      iv. Recognize examples of various epidemiologic and public health phenomena such as types of outbreaks and modes of transmission.
   g. Calculations and mathematical manipulations should be consistent with middle school math skills and should be part of the competition. Data may be contrived or modified to make it more appropriate for this age group as long as it does not radically alter results or interpretation.
   h. Process skills may include hypothesis, observations, inferences, predictions, variable analysis, data analysis, calculations, and conclusions.
   i. **The level of questioning for Division B and Division C competitions should reflect the age-appropriateness for each group.**
   j. The event format may be exam-based, station-based or a combination of both.

DISEASE DETECTIVES (CONT.)

4. **SCORING:**
   a. Points will be assigned to the various questions and problems. Both the nature of the questions and scoring rubric should emphasize an understanding that is broad and basic rather than detailed and advanced.
   b. Depending on the problem, scoring may be based on a combination of answers, including graphs/charts, explanations, analysis, calculations, and closed-ended responses to specific questions.
   c. Points should be awarded for both quality and accuracy of answers, the quality of supporting reasoning, and the use of proper scientific methods.
   d. Highest number of points will determine the winner. Selected questions may be used as tiebreakers.

5. **Sample Problems**: Students will read a series of reports or summaries of reports adapted from newspapers, scientific publications or Internet sites dealing with outbreaks or other public health problems in a community or population. They will then answer a series of questions related to the epidemiology of the problem and potential intervention or prevention activities.
   a. When given a line listing of symptoms, onsets and outcomes in a group of persons associated with an outbreak, students will be able to calculate frequency distributions for symptoms and the average incubation periods (when given exposure time).
   b. When given a description of a public health problem (outbreak or case-cluster), students will be able to determine the most likely category of agent involved in the problem and either come up with likely agents or describe a series of steps that would lead to an identification of the agent.
   c. When given examples of epidemic curves, students will be able to identify those from point source outbreaks, continuing source outbreaks and person-to-person transmission.
   d. When given examples of reservoirs, vectors or exposure sources for particular diseases, students will be able to propose a group of reasonable prevention and control strategies.
   e. When given a description of the distribution of a disease in terms of person, place, and time, students will be able to generate hypotheses about what lifestyle or environmental factor(s) might be causing the disease.
   f. When given an example of a possible relationship between a lifestyle or environmental exposure and a certain disease, students should be able to describe possible explanations for finding the relationship. The student should be able to describe the most likely explanation(s) for the relationship.
   g. When given an example of a known relationship between a lifestyle or environmental exposure and a certain disease, students should be able to describe a variety of possible prevention and control strategies and the strengths and limitations of each.
   h. When given an example of a prevention / control strategy, students should be able to describe the best study design for determining the effectiveness of the strategy. Students should be able to describe why the study design is better than others. Students should be able to describe the evidence from which they would infer the success or failure of the strategy.

Resources: The following websites and their links contain material that may be useful to event supervisors, coaches and competitors.

www.cdc.gov/excite - Centers for Disease Control Office of Science Education - includes primer of epidemiology, problem sets and examples.

www.montclair.edu/detectives - Montclair State University site with a curriculum for teaching epidemiology at the middle school level.

http://www.collegeboard.com/yes - Young Epidemiology Scholars program - in addition to information on competition, this site contains a number of teaching modules that can be used in training. Although targeted at a high school audience, this material may be useful for training competitors at the middle school level.

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