2015 EVENT SUPERVISOR GUIDE – DISEASE DETECTIVES (B/C)

EVENT INFORMATION

DESCRIPTION – Disease Detectives allows students to use their investigative skills in the study of disease, injury, health, and disability in populations or groups of people with a focus on the **Population Growth Causes of Public Health Problems for 2015**.

There is a three topic rotation for Disease Detectives: Environmental Quality, Population Growth, and Food Borne Illness – each on a two year rotation

2015 Emphasis – Some Population Growth Causes of Health Problems

- Water Quality, Water Pollution, Water Demands
- Sanitation Needs
- Growth of Slums and Household Environment
- Environmental Degradation
- Air Pollution
- Infectious Disease Outbreaks
- Rapid Spread of Disease via Public Transportation and Air Travel
- Food Quality and Food Contamination
- Lack of food in poor nations vs. unhealthy fast food and drinks in technological societies
- Availability of health care for the poor and the aged
- People moving into uninhabited areas = new pathogens
- as Lyme Disease and Ebola

Some Environmental Causes of Public Health Problems:

- Air pollution , Smoking, Inducers of Asthma
- Flooding health problems, Drought problems
- Extreme heat, UV exposure
- Lead contamination, Pesticides, Chemical Spills
- Water pollutants, Heavy metals
- Ventilation pollutants
- Noise induced hearing loss
- Waste and toxic substance
- Food contamination

Some Causes of Food Borne Illness

- Bacteria
- Viruses
- Parasites
- Protozoa
- Natural toxins
- Other pathogenic agents (as Prions)

RULES – Rules are available from your Tournament Director.

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- **2015** should appear at the bottom by the page number.
- BE SURE TO CHECK THE RULES for Event Parameters and suggested topics.
- At **www.soinc.org** see the **Event Information** and **Event Supervisor** sections
- Rules clarifications are available at www.soinc.org under event information.

FORMAT – Disease Detectives may be exam based, station based, or a combination of both
It is most often an inquiry-based written exam with 2-3 outbreak scenarios.
Division C will do some statistical analysis-not more than 10% of competition

EVENT NEEDS

ROOM TYPE – Classroom when run as an inquiry based exam or a room with tables if run as stations.

HELPERS – 2 or 3 helpers are needed to proctor and grade in addition to the event supervisor. If possible it is beneficial to have volunteers who are assigned to grading and others assigned to ranking. This is especially true if the event is run in 2 or more sessions. This ensures that the grading process is continuous and rushed.

EQUIPMENT – Any materials needed for the competition.

- One exam per team
- Grading keys for helpers
- One answer sheet per team
- Basic office supplies (pens, pencils, stapler, staple removers, etc.)

TIME NEEDED FOR SETUP

- If possible go by the event room prior (~1 hour) to the exam to properly arrange the room.
- When run as an inquiry-based exam, all teams can compete at once if a large enough room is available.
- You just need time to check in and distribute the exam and answer sheets.
- This event usually takes a long time to grade so it is a good idea to run it early in the day.
- Using an answer sheet helps to organize answers for students and makes grading quicker.

PREPARATION FOR COMPETITION

TIME-LINE FOR PLANNING - You will need to know the number of teams competing.

- Teams consist of two students so plan accordingly. Be sure you have enough time to prepare the questions, answer keys, and answer sheets.
- Writing a good exam takes time. If possible begin the writing process as soon as possible.
- Possible sources of outbreak scenarios are
  - Morbidity and Mortality Weekly Report
  - Emerging Infectious Diseases
  - Journal of Infectious Diseases
  - Journal of the American Medical Association
  - New England Journal of Medicine

ORGANIZING CONTENT – Be sure to cover the topics presented in the rules and give appropriate emphasis to each area.

WRITING QUESTIONS

- Format and material of the Division B and C event is similar except that the level of reasoning and math skills should be consistent with the grade level.
- Differences between the two levels should be reflected in both the type of questions asked and the scoring rubrics. Testing the process is most important – students are taught to relate the 10 step
  procedure to the scientific method.
- Competitions may be written using actual data from an outbreak or it may be a hypothetical outbreak with hypothetical data.
- Fill in or multiple choice questions are easier to grade.
- Free response questions should have a rubric to assist in scoring.
- The Science Olympiad website www.soinc.org has event information with training materials for students, and internet links which may assist you in writing questions.
  The CDC has information on their website www.cdc.gov/excite as well as previous exams.
- The philosophy of Science Olympiad is that the competition be inquiry- based to emphasize process skills and mental challenges using suggested content.
- Balance the content so that it reflects the content described in the rules. Students are expecting to see all of the topics listed in the rules to be reflected in the competition.
- Develop questions which are easy to grade.
- Multiple choice, matching, fill-in-the blank questions are preferable. They are quicker to grade and allows volunteers completely unfamiliar with the event to assist in grading.

  For example:
  Okay: List three things that are true of case control studies.
  - Although the question is limited to 3 responses there are more than three possible correct answers. The grader will have to be familiar with case control studies to properly grade all possible responses. This will likely take from a few seconds to several minutes.

  Better: Which of the following statements are true about this case control studies? Circle the letters of all that apply.

  a. Finding adequate numbers of controls can be difficult
  b. Not vulnerable to bias
  c. Exposure is determined by memory or records
  d. Requires little time to conduct
  e. Can study multiple outcomes
  f. Used when the population is not well-defined
  g. All of the above

  The above question has a definite answer (a, c, d, f) and can be graded by anyone. There are also multiple ways to provide partial points which can help avoid the use of tiebreakers.
- Objective Questions require a letter or few words and can be graded quickly
- Free Response or Essay Questions require several words or a paragraph and take longer to grade. They are good questions to use as tie breakers.
- Answers to short answer questions should require no more than one to two sentences and be very specific. Including questions with multiple interpretations and are open to various answers can be very difficult to grade.

For example:

Disease detectives use three pieces of information to characterize an outbreak. What are they?
Answer: person, place and time

There are only three correct answers to this question. No others are acceptable. A grader with no knowledge of epidemiology could grade this question.

- For questions requiring calculations points should be given for both showing their work and the correct answer**.**
- Graphs and tables are good potential source of questions.
- Develop appropriate questions so that **all** ties can be broken.
- Be sure that all teams experience the same testing conditions.

VARING DIFFICULTY FOR SUCCESS OF MANY - To allow most students to be successful, it may be a good idea to vary the difficulty of questions!

ANSWER SHEET ORGANIZATION – Set up the answer sheet so it is easy for students to use and easy for your team to grade. Include team name, team number, student names, as well as a place to record raw score, rank, and points. Be sure you have enough answer sheets for each team. It may be a good idea to put team names and numbers on the answer sheets ahead of time.

ANSWER KEY AND SCORING RUBRICS

- Questions will be assigned point values.
- Students will be ranked from highest to lowest score.
- Ties will be broken by pre-determined tie-breaker questions.
- Have extra answer sheets so your helpers can assist you in grade the competition.
- Be sure each section is graded by the same person.

RUNNING THE EVENT

SET UP TIPS (Exam format)

- Be sure you have a copy of the exam for each team.
- It may be advisable to have a separate answer sheet for each team.
- The answer sheet will provide ease of recording answers and speed up grading.

CHECK IN TIPS– if possible, allow all teams to compete even if one or both members are late. They may need to miss some things but they can do part of the competition.

- Check each team member for wrist bands or approved ID before giving teams their answer sheet.
- Have extra pencils and direct students print their names on sheet.
- Direct student to turn off all non-permitted electronic devices. You may wish to have them put in a designated spot, given to someone outside the room or placed in the student back packs at some to be stored at a designated spot in the room.
- Allow each team to have only what is permitted in the Event Parameters.

TEST FORMAT:

- Hand out test packet just before the event is to begin.
- Give any directions needed.
- Two or three helpers can do the proctoring.
- If the event is run in sessions, begin grading after the first session.
- Helpers can help with grading as long as there is consistency in grading.

DEALING WITH PROBLEM SITUATIONS – have the cell phone numbers of officials

- DISQUALIFICATIONS OF A TEAM SHOULD BE RESTRICTED TO SAFETY ISSUES, CHEATING, OR ABUSIVE AND UNSPORTSMAN-LIKE BEHAVIOR**.**
- Be sure that tournament officials and coaches are notified of any disciplinary action.

CHECK OUT TIPS

- Be sure to get an answer sheet and exam from each team before you allow them to leave the competition.
- Be sure the team number, team names and member names are present and legible.
- Remind students to take all their backpacks and other possessions as cell phones.

SCORING THE EVENT – DO NOT GIVE OUT RESULTS ANY TEAM OR COACH.

CONSISTANCY IN GRADING – have the same person grade the same section for all teams.

CHECKING MATH AND RANKING – Be sure to check the math and ranking for all teams so they are accurate. Scoring worksheets or computer programs may be available to help with ranking.

BREAKING TIES – Break all ties and indicate on the student answer sheets and score sheet how the tie was broken. The **DECIMAL METHOD** is a good way to indicate the winner of ties. Example: If two teams have the raw score tie of 83 for, the winner of the tie gets 83.1 while the other teams gets 83.0. If several ties are broken, you have .1 to .9 to use. This also points out scores where ties were broken.

SCORE SHEET – Fill in all information on the score sheet. Indicate how the raw scores are ranked – high score, low score or some other method. Be sure to include raw score, rank and points for each team. Explain how ties are broken.

SCORE COUNSELING

- Have your score sheet completed and signed before going to score counseling
- Arrange student score sheets in rank order for quick checking.
- Turn in answer sheets, a copy of the test and an answer sheet to the Score Counselor

I hope these suggestions are helpful in organizing your tournament. Comments or new ideas are always welcome. Please send them to me at the following address.

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Examples of types of performance indicators that could be used in Division B and C events at various levels of competition.

Competition Level	Division	
	Division B (Middle School)	Division C (High School)
Regional/State	List and recognize examples of different modes of transmission Calculate health-related rates (attack, incidence, prevalence, case fatality) Calculate a simple relative risk and describe what it means Interpret epi curves, temporal patterns and other simple graphic presentations of health data.. List, discuss and recognize examples of disease causing agents (physical and biological) Demonstrate an understanding and ability to use terms such as endemic, epidemic and pandemic; population versus sample, association versus cause. Describe various types of prevention and control strategies (e.g. immunization, behavior change, etc) and situations where they might be used	Recognize differences between study designs and **types of error**. Calculate measures of risk (e.g. relative risk or odds ratio) when given a description of the study design Calculate measures based on data that is not given but that can be readily extracted. Recognize how gaps in information influence the ability to extend conclusions to the general population. **Do Statistical Analysis on Data for both Descriptive and Analytical Epidemiology**
National	Understand how units affect the relative magnitude of a set of rates with different units. Calculate appropriate measures of risk when given the study design Complete tables when given all data needed to complete calculations. Propose a reasonable intervention to a public health problem. Recognize gaps in information	Recognize unmentioned factors that may influence results and **types of error**. Convert between rates with different basic units (e.g. incidence per 10000 persons/year to incidence per 100 persons/week). Propose a means to evaluate the effectiveness of an intervention or control program. **Do Statistical Analysis on Data for both Descriptive and Analytical Epidemiology**

Potential Types of Error in Data Collection (Div C)

- False Relationships
  - **Random Error** - the divergence due to chance alone, of an observation on sample from the true population value, leading to lack of precision in measurement of association
  - **Bias** or **systematic error** in an epidemiologic study that results in an incorrect estimation of the association between exposure and health-related event

- Non-Causal Relationships – "guilt by association"
  - **Confounding** – occurs when the effects of two risk factors are mixed in the occurrence of the health-related event under study - when an extraneous factor is related to both disease and exposure

Random Error:
- Is the result of fluctuations around a true value due to sampling variability
- It can occur with data collection, coding, transfer, or analysis of data
- Affects measurement in a inconsistent manner
- Ways to reduce random error may include – increasing the sample size and reduce the variability in measurements

Systematic Error:
- Occurs when there is a difference between the true value (the population) and the observed value (the sample)
- The error is in the system used for measurement so it occurs in each occasion hence systematic error
- Conclusions drawn on this data will be inaccurate – too great or too little
- Validity of a study depends upon the degree of systematic error – less error equals more validity
  - Internal validity – the amount of error in measurements including those for exposure, disease, and
    the association between these variables.
  - External validity –relates to the process of generalizing the finding of a study to the population from which the study is taken

Types of Bias: Describe problems in how the study is organized
- **Selection bias –** occurs when study subjects are selected for the study as a result of a third unmeasured variable which is association with both the exposure and the outcome. There may be association between diseases or between characteristics and a disease related to the admission to a hospital for those with a disease, without the disease but with symptoms, and those with only the characteristics of the disease.
- **Information bias –** occurs from systematic error in the assessment of a variable. Examples **are information bias, response bias, interviewer bias, recall bias**

Confounding: the co-occurrence or mixing of effects of extraneous factors
- May lead to overestimating or underestimating the true association between exposure and outcome.
- A **confounding variable** would be a variable (pollution) that can cause the disease under study (cancer) and is also associated with the exposure (smoking).

Statistical Concepts for Disease Detectives
Division C

Descriptive Epidemiology

- Mean
- Median
- Mode
- Variance
- Standard deviation
- Standard error
- Confidence intervals of means

Analytic Epidemiology

- Z-test
- T-test
- Paired T-test
- Chi-square
- McNemar test for paired data
- Fischers exact test
- Cochran Mantel-Haenszel summary odds ratio