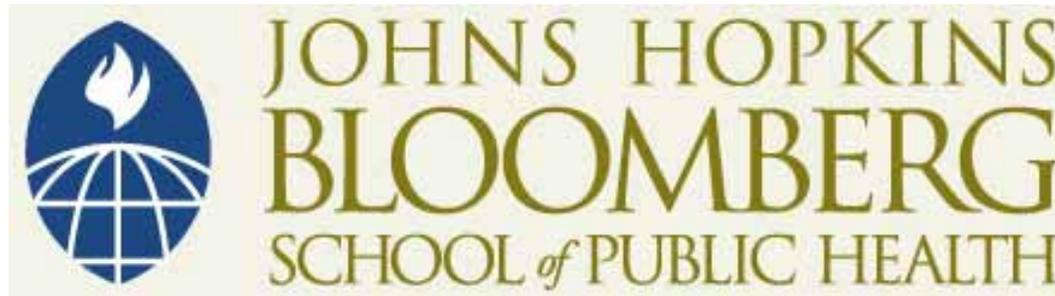


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**En 570.498 & IH 221.629**

**Engineering Aspects of Public Health Crises**

**Quiz 1**

You have 30 minutes to answer the following questions. For questions 1-10, please circle the correct answer. Please limit your answers for questions 11-15 to 50 words or fewer.

1. Clean water is the most important environmental intervention to provide during a cholera or a typhoid outbreak because:

- a) these are very serious diseases with a high case fatality rate.
- b) it is believed that if the outbreak can run long enough the specific strain can evolve to become more food-borne
- c) these pathogens are particularly waterborne compared to other enteric bacteria.
- d) c&b
- e) a&b

2. A population has a cholera attack rate of 2% (meaning 2% of the population was hospitalized over the course of the outbreak). There has not been any cholera in the population for many years. It is likely that everyone was infected if:

- a) about half the cases never went to the hospital and were undetected.
- b) ....no. Only 2% have been ill so about 98% can still get sick.
- c) ....no if about it. 2% is as high an attack rate as is ever seen thus everyone must have been infected.
- d) most of the cases (meaning ~70 or 80%) never went to the hospital and were undetected.
- e) the water supply was the source of the outbreak because everyone is exposed to water.

3. In general the world over, clean water has more influence on common diarrheal diseases than more water or latrines do because:

- a) most enteric pathogens are transmitted primarily by water.
- b) the above statement (question #1) is not true.
- c) children do not use latrines.
- d) there is no education needed to optimize the benefits of clean water while there are behaviors that need to be employed to get benefits from more water or latrines.

4. The competing theories put forward by Shuval and Briscoe create diverging predictions about the benefits of environmental interventions in the poorest countries because:

- a) Briscoe's model is based on pathogen transmission while Shuval's model is based on economics.
- b) Shuval has no consideration of residual fallacy.
- c) .... the question is misleading because the two models basically predict the same results in the poorest and least sanitary countries.
- d) ) in the poorest conditions, the water conditions tend to be far worse than the sanitation conditions.
- e) a & b.

5. Several examples from class and examples provided in the articles by Esrey, Briscoe and Shuval describe situations where latrines or improved water supplies could not be shown to produce reduction in rates of diarrheal disease. Most of these examples involved very wealthy settings. Even in such settings, these environmental improvements may be a worthy investment because:

- a) water supplies and latrine construction can be a sustainable way to keep people employed.
- b) there are dignity and image issues that require societies always be improving their water quality standards .
- c) this is not true! The wealthiest people are so far below the levels where diseases can be seen, that once endemic transmission is broken, even relaxing standards and services will not result in any disease.
- d) this is not true! The settings where most benefits have not been seen is the poorest and least sanitary settings, not the wealthiest and most sanitary.
- e) None of the above.

6. You are experiencing an explosive outbreak of bloody diarrhea. You send 10 samples to a laboratory in the capital on ice and with a standard carrying media for enteric bacteria. Two sample comes back positive for shigella *dysenteriae*, and two come back reporting that there were amoebic cysts in the stool samples. This means that:

- a) you probably have an outbreak of amoebic dysentery.
- b) you probably have an outbreak of shigella *dysenteriae*.
- c) you probably have an outbreak of both illnesses.
- d) most people have something else so you do not know that you have yet.
- e) you cannot even guess whether you have an outbreak of shigella *dysenteriae* or amoebic dysentery.

7. The article you read by Clasen et al. entitled, " Household water management: refining the dominant paradigm " was important because it demonstrated that:

- a) the Esrey review was wrong.
- b) the reductions in diarrhea that have occurred between 1972 and 2004 correspond with a general increase in income and a general improvement in living conditions and have little to do with water.

c) the issue of the relative importance of clean water (as compared to more water for example) is perhaps correct but more complex than laid out by Esrey and depends on the pathogen, the populations immunity, and many other factors.

d) none of the above.

8. The key conclusions from the case-study about dysentery in Lisungwe include:

a) latrines can be dangerous if they are not kept clean.

b) latrines do more harm than good even when kept clean.

c) case-control studies which look at sick people may not give you a proper society-wide perspective. When considering the individual risks and society-wide benefits in this case, latrines were still protective.

d) a & b

e) a & c

9. The key conclusions from the case study about a water shortage in Ngara include:

a) latrines are always a cost-effective investment even when compared to measles immunization.

b) The benefits of more water quantity are not always seen but can be probabilistic with regard to major waterborne outbreaks.

c) while somewhat arbitrary, the 15 l/p/d standard can help aid workers prevent water shortage conditions from deteriorating. This is because disease rates can often be reduced by providing more than 15 l/p/d, and dipping below that point allows people to sound the alarm even if there is no health crisis.

d) none of the above

e) b & c

10. In both the Esrey review and the first class, the relative importance of handwashing compared to cleaner water or more water was discussed. This is probably the case because:

a) ...this is not true. Handwashing and personal hygiene were reported in the Esrey review to have less influence on diarrhea than clean water and more water.

b) ...this is not true. Handwashing had less influence than clean water because handwashing primarily removes your own pathogens so that it has little influence on disease transmission.

c) handwashing is only done intermittently and thus cannot have much influence.

d) none of the above.

11. Historically, researchers 100 years ago in the US and Europe saw providing clean water as the main way to stop enteric disease-related deaths. The main reasons that this logic does not apply in the tropics today include (give 2 reasons):

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12. In Kakuma camp in northern Kenya there have been almost 2 latrines per household built in the past 5 years. Latrines should last 5 years given the size of the pit and the average families "production." But, there is only about 1 latrine per 3.5 families at present. Please provide at least two explanations for this. How would you test what was happening?

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13. 5000 m<sup>3</sup> of water is available per day for population of 300,000 people. Is this an adequate quantity of water according to the UNHCR?

14. Thus far in the course, it has been stated repeatedly that providing people with large quantities of water is generally preferable to providing people with smaller quantities of high-quality water. Under what circumstances would this not be true?

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15. The feces of children is particularly dangerous to society because (2 reasons at least):

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