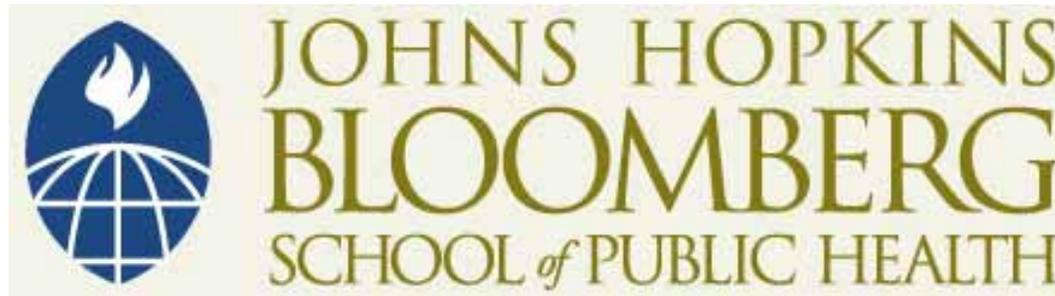


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Engineering Aspects of Public Health Crises
Quiz 2

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 a number or a few words.

1. In the case study about typhoid in Dushanbe, there were hundreds of samples taken from the distribution system. Many of them contained coliforms but none of them contained salmonella *typhi*. This is probably because:
 - a) even during an outbreak, very few people are actually shedding salmonella *typhi*. Therefore, only a small percent of cross-contamination events are introducing the pathogen into the drinking water. Thus, it is common in outbreaks for few environmental samples to reveal the pathogen.
 - b) where natural waters exist that have been contaminated with feces, coliform levels are usually orders of magnitude higher than pathogen levels, and thus finding coliforms and not *S. typhi* is not surprising.
 - c) with cross-contamination driven outbreaks, the contamination events tend to happen out at the extremities of the distribution system, and are difficult to detect by water sampling unless sampling occurs at the household taps.
 - d) all of the above.

2. To prevent cross-contamination, the main thing which should be done by the water treatment plant and system operators is to:
 - a) increase the water pressure in the distribution system.
 - b) increase the chlorine residual in the distribution system.
 - c) adjust the pH so that contamination events are detectable.
 - d) make sure that bacteria and viruses are adequately filtered out at the water to the plant.
 - e) a & b only.
 - f) none of the above.

3. Typhoid fever can cause the following symptom(s):
 - a) elevated fever for several days.
 - b) constipation.
 - c) diarrhea.
 - d) all of the above.

4. In the article about water containers in Malawi by Roberts et al. the modeling to predict water cleanliness produced no statistically significant factors other than bucket type. This implies that:
 - a) this is not true. Many things like change of clothes for children and a dirty latrine floor were predictive of the coliform levels in water.
 - b) the households added enough chlorine.
 - c) latrines are more important than soap.

- d) None of the above.
- e) a, b & c.

5. Household surveys to estimate latrine coverage are problematic:

- a) when people are constipated.
- b) in settings where sanitation availability is very high.
- c) on days when it rains.
- d) none of the above.

6. In settings where you do not know where the population is, estimating water consumption through spatially-based surveys conducted in a radial pattern away from the water source has the following advantages:

- a) it can be very fast.
- b) the sample is likely to be crudely weighted so that some of the sample is close to the water supply and some of the sample is far away from the water supply in proportion to the population's relative proximity to the water supply.
- c) if there is a queue at the water supply all day long, this method will enable you to estimate the population using this water supply.
- d) all of the above.

7. Water consumption surveys are useful because:

- a) Water standards can easily slip without people noticing.
- b) Often water providers can improve their performance if they realize they have a shortage problem.
- c) Water availability, when expressed as liters per person per day, is less subjective than many other measures (e.g. security or coordination) and therefore comparing areas to direct scarce resources can promote equitable distribution of services.
- d) all of the above.

8. When conducting a survey to estimate sanitation coverage, it is important to:

- a) ask families how many other households share their latrine in a tone of voice that implies the interviewer expects them to share facilities.
- b) only give families credit for part of the latrine if they share it.
- c) visually confirm what is being reported by looking at the latrine and seeing if the location and number of latrines is consistent with the interviewee's report.
- d) a, b & c.
- e) none of the above.

9. During outbreaks of hepatitis E and cholera, chlorinating the water supply is the most important preventive measure because:

- a) these are serious illnesses.
- b) the taste of chlorine will remind the population that they are experiencing an outbreak. This has been shown repeatedly to be an effective tool for increasing people's retention of educational messages.

- c) these two diseases are perhaps the most waterborne of all in enteric pathogens and therefore providing safe water is often the most important thing that can be done to stop the outbreak.
- d) all of the above.
- e) the question above is incorrect, cholera is only occasionally waterborne and Hep. E is not at all (and have never been described as such in this course or the readings), indicating that chlorination of the water supply will do little to influence these diseases.

10. When estimating water consumption or other things that vary across space, advantages of doing a random systematic survey over a simple random sample survey include the following:

- a) Usually, you end up with a more precise estimate of your outcome.
- b) Usually, statistical software will give you the right confidence intervals for a simple random survey.
- c) It is generally faster.
- d) When you come to the end, if you have covered the entire population area, you can calculate the population.
- e) a & c only.
- f) a, c & d only.

11. A person goes to a well and records the time at which people begin filling, and finish filling buckets. They collect the following data:

Time	Quantity
8:55	person starts
8:58	20 L
9:01	20 L
9:03	10L
9:04	10
9:06	15L
9:09	20L
9:11	20L
9:15	20L

If this well is in use for 13 hours a day, and there is a queue all day long, approximately how much water is collected from this well each day?

You are out in the middle of the desert in a town which has been inundated in recent weeks with IDP's from fighting 50 km. away. The people are in makeshift tents or staying with pre-existing households. People say that there is an acute water shortage and there is a long line for water all day long. You conduct a spatial radial sample from the only well (and only water supply) in town and get the following results:

Distance	People slept	Liters yesterday	Latrines
50 m N	15	180	1
100 m N	13	120	.3
150 m N	6	40	.5
200 m N	17	120	1
250 m N	16	160	0
350 m N	29	150	1
400 m N	12	90	.5
450 m N	16	120	1
50 m S	19	160	.3
100 m S	2	20	.3
150 m S	9	120	1
200 m S	14	120	.25
250 m S	9	80	0
300 m S	18	130	0.5
350 m S	4	20	0
450 m S	20	100	.25
Total	219	1730	7.9

The rate of water withdrawal is 2000 liters per hour and the well is reportedly in constant use 24 hours a day.

12. How much water are people getting (in liters per person per day)?

13. How many people are there per latrine?

14. How many people are served by this spring?

15. At the present production and withdrawal capacity, how many people could get the UNHCR recommended 15 l/p/d from this spring?