



Overview of Activities

1. Introduction
2. Types of Analysis for Interpreting Data
3. Interpreting Results Presentation and Practice
4. Data Recording Errors
5. Review

Learning Outcomes

At the end of this session participants will be able to:

1. List main types of analysis used to interpret data
2. Interpret DWQT data to make basic conclusions and recommendations
3. Identify common errors in recording DWQT data

Materials & Preparation

- Activity: Introduction
- Handout: Case Study: Determining Test Parameters. See end of lesson (print one page)
- PowerPoint: Interpreting Results
- Activity: Interpreting Results Presentation and Practice
- Handout: Case Study Graph, “What Conclusions Can You Make?” See end of lesson (one page)
- Handout: Case Study: Interpreting Microbiological Test Results. See end of lesson (one of two pages; one copy per group)
- Review trainer’s guides for each case study to help with interpretations
- Activity: Review

Recommended Reading

- Technical Brief: Interpreting and Reporting Drinking Water Quality Test Results

10 minutes

Introduction



1. Explain that participants will determine the correct test parameters for a case study.
2. Show PowerPoint slide with Case Study: Determining Test Parameters (optional).
3. Read Case Study: Determining Test Parameters to the group.

“Agriculture is the main livelihood of communities in North Central Province of Sri Lanka. Cattle rearing and farming are key practices in the area. Shallow wells, ponds and rivers are the major sources of drinking water. A local health clinic has reported that communities often suffer from diarrheal diseases.

“A nongovernmental organization (NGO) wants to introduce household water treatment and safe storage (HWTS) to villages in the region. The NGO organized a meeting and asked that water quality tests be carried out in the project area prior to implementation.

“What is the most important parameter you suggest they test for and why?”

4. Divide participants into pairs. Allow five minutes for pairs to discuss and share their assessment of what to test for based on the data in the case study and what they previously learned about water quality aspects.
5. Ask: “What were the clues that you looked for to determine the parameter to test?”
 - Agricultural runoff may introduce fecal contamination to drinking water sources
 - Most diarrheal disease-causing pathogens come from feces
 - E. coli or thermotolerant coliforms (TTC) are indicators of fecal contamination
 - Recommend microbiological (E. coli) testing for fecal contamination of water sources and/or household drinking water storage
6. Present the learning outcomes or an overview of the lesson.

Trainer tip

Ask for a volunteer to read the case study if language or accent is a barrier to understanding.

10 minutes

Types of Analysis for Interpreting Data



Use PowerPoint: Interpreting Results for this presentation.

1. Use PowerPoint to explain the three main approaches for interpreting results from water quality tests.
 - Comparison Analysis: Results compared with national standards or WHO guidelines
 - Trend Analysis: How a parameter changes with time and location
 - Statistical Analysis: For academic purposes and scientific research

2. Ask: "What is the most common analysis used in projects testing water quality in field conditions?"
 - Comparison analysis, because most projects want to know if the water quality meets local requirements

10 minutes

Interpreting Results Presentation and Practice



1. In the introductory exercise we identified what parameter to test based on available information. We are now going to learn to calculate how effective a technology is at removing a particular contaminant.
2. Use PowerPoint to explain how to calculate % Removal Effectiveness of a treatment technology (optional).
Alternatively explain the calculation using the formula below.

% Removal Effectiveness for Microbiological Test Results:

$$\frac{(\text{Source water colony count} - \text{Filtered (treated) water colony count}) \times 100}{\text{Source water colony count}} = \% \text{ Removal Effectiveness}$$

3. Explain that the formula can be adapted to determine chemical or acceptability removal effectiveness (e.g., iron or turbidity) by substituting colony count results with parameter test results.
4. Use PowerPoint or handout with the graph titled: What Conclusions Can You Make?
5. Ask: "What is the % removal effectiveness for this data?"
 - % removal effectiveness = 99%
6. Ask participants to interpret the results and give a few observations and recommendations.
 - Filters are working well overall: 99% removal effectiveness
 - Transfer (transport) buckets are contaminated and should be cleaned before filling with source water
 - Contamination is introduced in storage; should do post-filtration disinfection
 - Reinforce biosand filter training and community health promotion
7. Divide participants into three groups.
8. Give each group a copy of the handout; Case Study: Interpreting Microbiological Test Results.
9. Assign each group one of the scenarios (Household #1, #2 or #3).
10. Instruct groups to interpret the data and calculate the % removal effectiveness for the household they are assigned.
11. Allow 5-10 minutes for the analysis.

12. Lead a group discussion for each scenario in the case study using the appropriate trainer's guide to assist with the interpretations.

- Ask: "What is the % removal effectiveness of the biosand filter?"
- Ask: "What could observations show you?"
- Ask: "Would the householder be a good candidate as a community wash promoter?"

Trainer tip

See Trainer's Guide to help you interpret results.

10 minutes

Data Recording Errors



1. Invite participants to take out the data recording forms they used when testing their microbiological and chemical water samples.
2. Instruct participants to exchange their data recording forms with another participant. Allow participants a few minutes to review the data records. Ask participants how easy it was for them to read their partner's data records? Were they able to identify any errors or discrepancies?
3. Ask: "We just identified one source of data recording errors. What was it?"
 - Difficulty in interpreting someone else's data because of poor writing for example.
4. Have partners share their findings with each other.
5. Ask: "What are other ways in which data recording errors can happen?"
 - Using wrong units (e.g., ppb instead of ppm)
 - Writing is illegible or unclear
 - Missing or incomplete data on a data recording form
 - Putting the decimal in the wrong place
 - Recording data for the wrong sample
 - Recording the result in the wrong place
6. Ask: "What can be done to minimize data recording errors?"
 - Use a sharp pencil and write clearly
 - Use data recording forms made to suit the needs of the project
 - Train the technicians collecting the data
 - Check data entry in the field and repeat tests if necessary
 - Run duplicate test samples if resources allow
 - Collect and check all data recording forms each day to ensure that the forms are not misplaced or lost
 - Enter data into a table, spreadsheet or database as soon as possible

10 minutes



Review

1. Ask: "What are the steps for data interpretation?"
 - Collect the data
 - Check the data
 - Choose type of analysis (comparison, trend, statistical)
 - Interpret data
 - Report data
2. As a review, write the steps for data interpretation in your workbooks.

Trainer tip

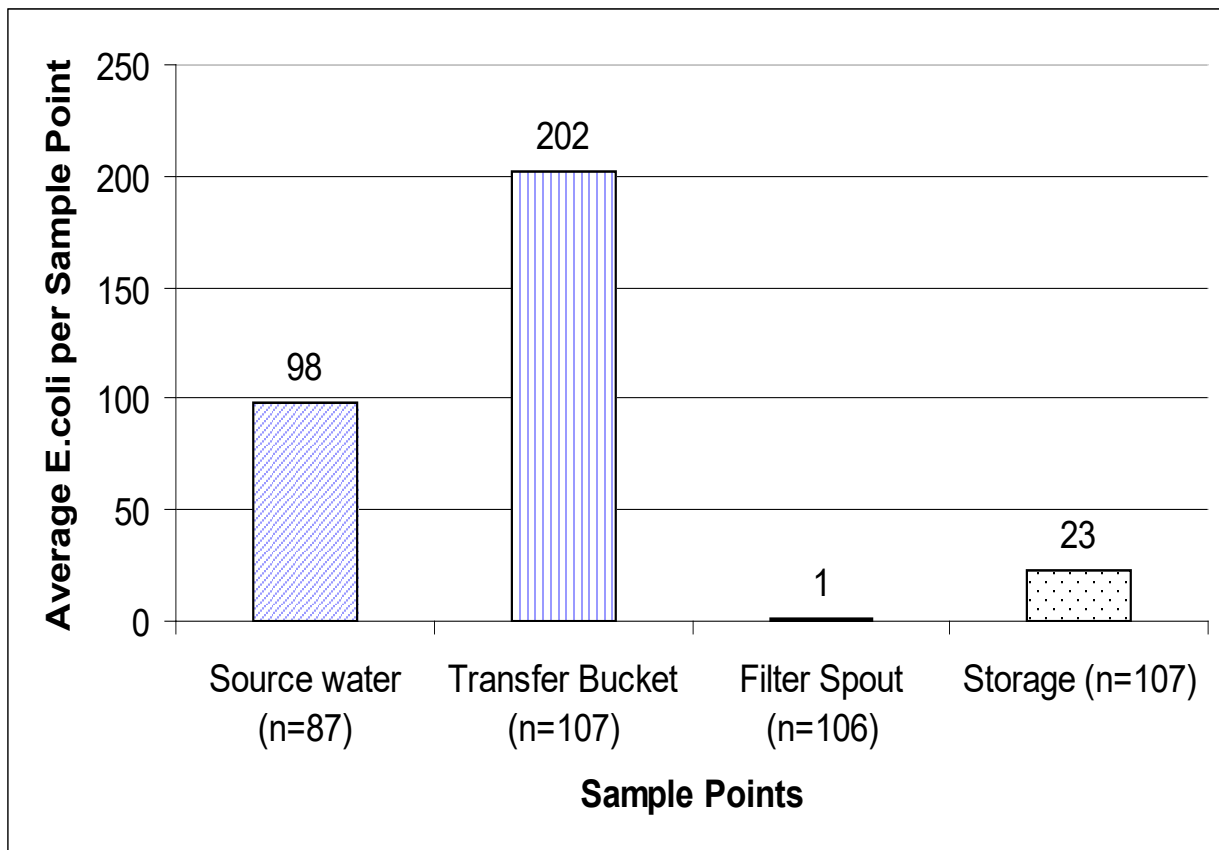
Display the Steps for Data Interpretation using the PowerPoint slide.

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Case Study Graph

What Conclusions Can You Make?



Where n = number of samples tested

Trainer's Guide:

- Four sample points: Source Water, Transfer (Transport) Bucket, Filter Spout, Storage Water
- The source water was tested 87 times. One of the filter spout samples was omitted due to error (e.g., sampling error, testing error)
- Filters are working well; overall % removal effectiveness = 99 %
- Transfer (or transport) buckets are contaminated and should be cleaned before filling with source water
- Contamination introduced in storage; recommend regular cleaning and post-filtration disinfection
- Reinforce biosand filter training and community health promotion

Case Study

Handout

Determining Test Parameters

Agriculture is the main livelihood of communities in North Central Province of Sri Lanka. Cattle rearing and farming are key practices in the area. Shallow wells, ponds and rivers are the major sources of drinking water.

A local health clinic has reported that communities often suffer from diarrheal diseases.

A nongovernmental organization (NGO) wants to introduce household water treatment and safe storage (HWTS) to villages in the region.

The NGO organized a meeting and asked that water quality tests be carried out in the project area prior to implementation.

What is the most important parameter you suggest they test for and why?



Trainer's Guide: Determining Test Parameters

- Agricultural runoff may introduce fecal contamination to drinking water sources
- Most pathogens that cause diarrheal disease come from feces
- E. coli or thermotolerant coliforms (TTC) are indicators of fecal contamination
- Recommend microbiological (E. coli) testing for fecal contamination of water sources and/or household drinking water storage

Case Study

Handout

Interpreting Microbiological Test Results

You carried out water quality testing for a project that has installed 60 biosand filters in a peri-urban compound. The following table shows the results of three households that were tested for source, filtered and stored water.

What recommendations would you make to the project manager based on these results?

Name of Organization:	Clean Water in Africa
Location:	Peri-Urban Community
Date of Sampling	Feb 20, 2020
Date of Testing	Feb 20, 2020

Table 1: E. coli test results

Location	Sample Description	<i>E. coli</i> Test Results (CFU/100 ml)	% Removal Effectiveness
Household #1	Hand Dug Shallow Well 1	200	
	Biosand Filter Water 1	90	
	Stored Water 1	131	
Household #2	Hand Dug Shallow Well 2	290	
	Biosand Filter Water 2	9	
	Stored Water 2	100	
Household #3	Hand Dug Shallow Well 3	1100	
	Biosand Filter Water 3	21	
	Stored Water 3	1	

Test results for training purposes only.

Trainer's Guide: Interpreting Microbiological Test Results

- The purpose of this exercise is to show the use of drinking water quality testing (DWQT) for analyzing the safe-water chain and to get an idea of the effectiveness of the biosand filters. It also shows that numbers alone are not sufficient in having a good understanding of the situation and that observations should also be part of DWQT to help explain and interpret the results.
- The results help to identify potential Community Wash Promoter (CWP) candidates and households that need support in treating their water more effectively.
- Source of information: Real data collected from Seeds of Hope International Partnerships, Zambia. If possible, use local data from pre-workshop testing as it makes the exercise significantly more interesting for the participants.

Expected Participant Observations:

House #1:

- Effectiveness of the biosand filter is 55% $[(200-90)/200]$ reduction, which is less than expected. What do the observation notes say about the BSF? (Maybe water level is too high? Installation date?)
- The storage container is dirty as recontamination occurs (increased to 131 CFU/100 mL). What do the notes say about the biosand filter? (Perhaps the same container was used for collection at source and storage?)
- This householder is not likely a good candidate to be a community wash promoter (CWP).

House #2:

- Effectiveness of the biosand filter is 97% $[(290-9)/290]$ reduction, which is excellent, but the stored water is re-contaminated.
- Observation is important, assess if the same container is used for collection and storage (likely).
- This householder is not likely a good candidate to be a community wash promoter.

House #3:

- Effectiveness of the biosand filter is 98% $[(290-9)/290]$ reduction, which is excellent. With a remainder of 21 CFU/100 ml, it would be advisable to disinfect the water after filtration.
- There is further bacteria die-off in the storage container, which could mean there is post-filtration disinfection, the storage container is clean, used properly and kept closed.
- The high fecal contamination level of shallow well 3 requires attention. It is probably subject to surface water or latrine contamination. Improving the well (e.g., lining, apron, cover) and/or hygiene promotion around the well could significantly reduce contamination.
- This householder may be a good candidate as a community wash promoter or biosand filter liaison.