

ISES Europe Training Series



Domain of Expertise 9 (DoE 9)

Lecture Title: Statistics and Epidemiology

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Lecture Overview

The lecture series offers a fundamental introduction to the statistical and epidemiological concepts used in exposure assessment. It provides an overview of core statistical methods such as descriptive and summary statistics, normality assessment, handling data below detection limits, selection of appropriate exposure values for risk assessment, and the use of software tools. These methods support the exploration of relationships between variables, proper documentation of analytical choices, and the management of uncertainties in exposure assessment. Together, they help learners understand how statistical reasoning supports identifying, characterizing, and interpreting exposure data.

Moreover, the lecture series examines how epidemiology complements exposure science by providing the conceptual tools to measure exposures and health outcomes, understand incidence and prevalence, evaluate risk, and assess causality. This integration supports the broader goal of identifying, understanding, and mitigating environmental exposures that may have adverse health effects.

Learning Objectives

The principal learning objectives for this lecture are that by the end of the session and having reviewed the additional learning resources you will have gained an understanding about the following:

- Gain an understanding of the statistical foundations used in exposure assessment, including descriptive statistics, normality, handling data below LoD/LoQ, and basic statistical testing.
- Learn how to explore relationships between variables, select appropriate exposure values for risk assessment, use software tools responsibly, and handle uncertainties in exposure datasets.
- Learn how exposure science and epidemiology can be integrated to describe exposures, measure risk, evaluate causal relationships, and support the mitigation of environmental health hazards.

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Learning Resources

The following online learning resources will support your learning alongside the lecture slides from this lecture. Please access them via the hyperlinks as resources for students:

Introduction to Statistics

Lane, DM

https://onlinestatbook.com/Online_Statistics_Education.pdf

Experimental Design: Statistical Analysis of Data

University of Central Arkansas

https://uca.edu/psychology/files/2013/08/Ch10-Experimental-Design_Statistical-Analysis-of-Data.pdf

Uncertainty and Data Quality in Exposure Assessment

World Health Organization (WHO) - International Programme on Chemical Safety (IPCS)

<https://www.who.int/publications/i/item/9789241563765>

The Importance of SEG Development

U.S. Environmental Protection Agency (EPA)

https://www.epa.gov/system/files/documents/2024-06/segs_arnold_sahmel.pdf

Introduction to Epidemiology

Centres for Disease Control and Prevention (CDC)

<https://www.cdc.gov/training-publichealth101/php/training/introduction-to-epidemiology.html>

Exposure Assessment in Environmental Epidemiology

National Research Council (US – NRC)

<https://www.ncbi.nlm.nih.gov/books/NBK233635/>