Data Quality Control and Assurance

DataONE Community Engagement & Outreach Working Group

Lesson Topics

Definitions

- Quality assurance and Quality control
- Data contamination
- Types of errors

QA/QC best practices

- Before data collection
- During data collection/entry
- After data collection/entry

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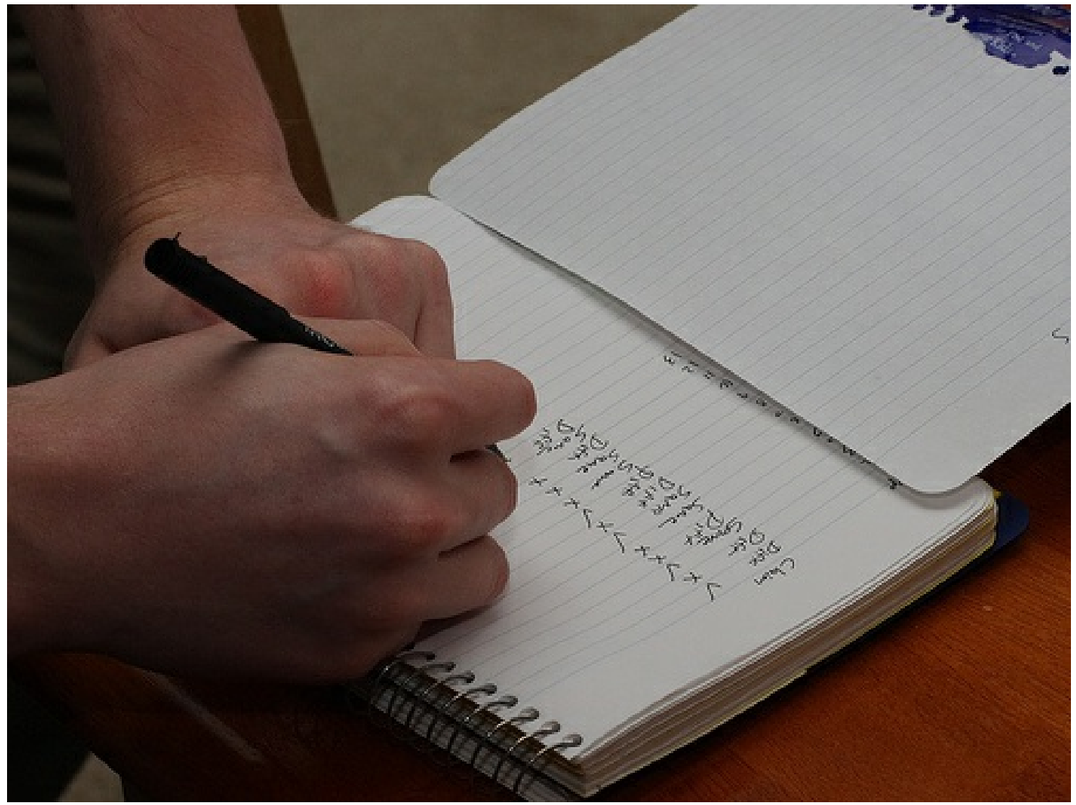
Learning Objectives

After completing this lesson, the participant will be able to:

- Define data quality control and data quality assurance
- Perform quality control and assurance on their data at all stages of the research cycle



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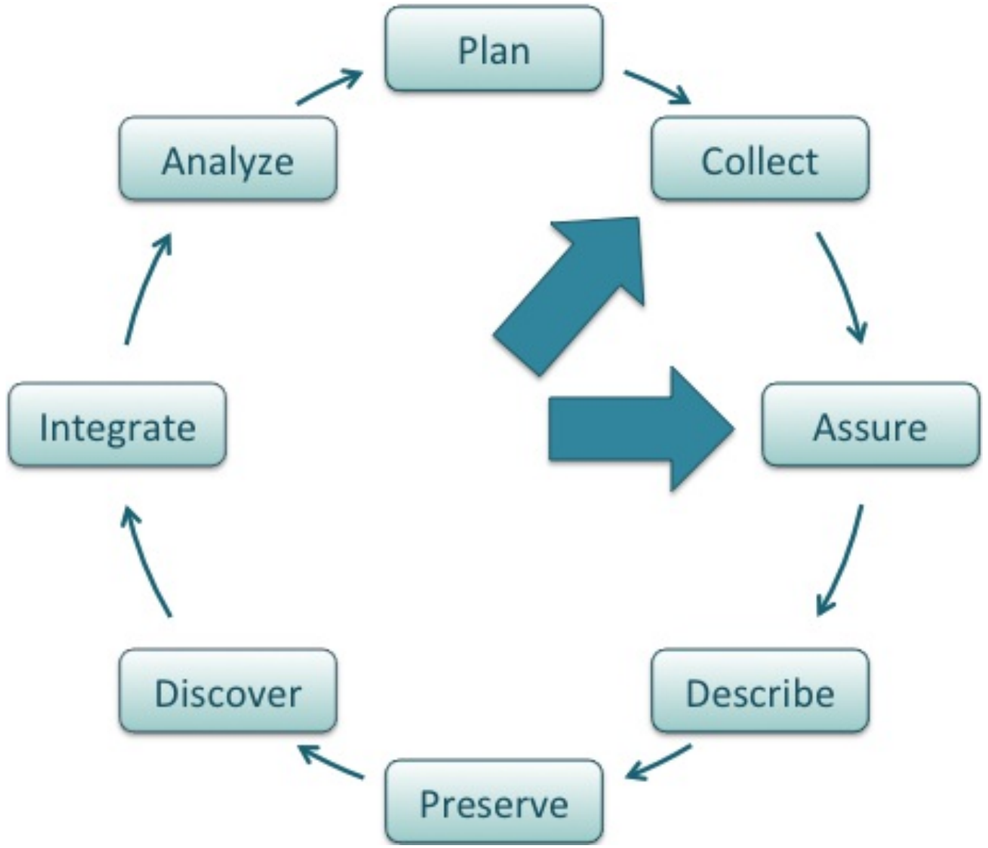
The Data Life Cycle

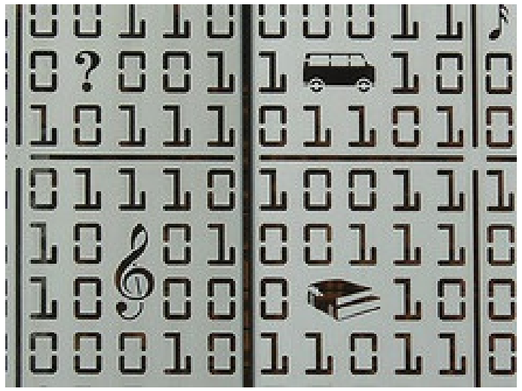


DataONE Life Cycle

Definitions

Data Contamination:

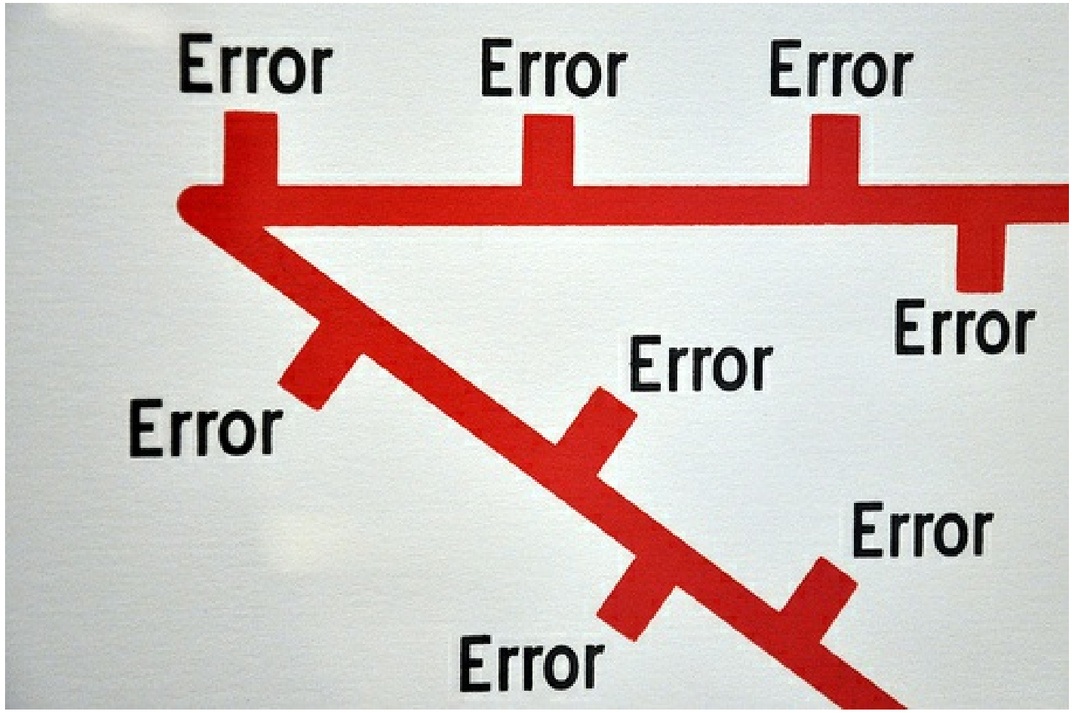
- Process or phenomenon, other than the one of interest, that affects the variable value
- Erroneous values



Definitions: Types of Errors

Errors of Commission

- Incorrect or inaccurate data entered
- Examples: malfunctioning instrument, mistyped data Errors of Omission
- Data or metadata not recorded
- Examples: inadequate documentation, human error, anomalies in the field



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Defining QA/QC

- Strategies for preventing errors from entering a dataset
- Activities to ensure quality of data before collection
- Activities that involve monitoring and maintaining the quality of data during the study

QA/QC Before Collection

Define & enforce standards

- Formats
- Codes
- Measurement units
- Metadata Assign responsibility for data quality
- Be sure assigned person is educated in QA/QC

QA/QC During Data Entry

- Double entry
  - Data keyed in by two independent people
  - Check for agreement with computer verification
- Record a reading of the data and transcribe from the recording
- Use text-to-speech program to read data back

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QA/QC During Data Entry

Design data storage well:

- Minimize number of times items that must be entered repeatedly
- Use consistent terminology
- Atomize data: one cell per piece of information Document changes to data
- Avoids duplicate error checking
- Allows undo if necessary

QA/QC After Data Entry

- Make sure data line up in proper columns
- No missing, impossible, or anomalous values
- Perform statistical summaries

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QA/QC After Data Entry

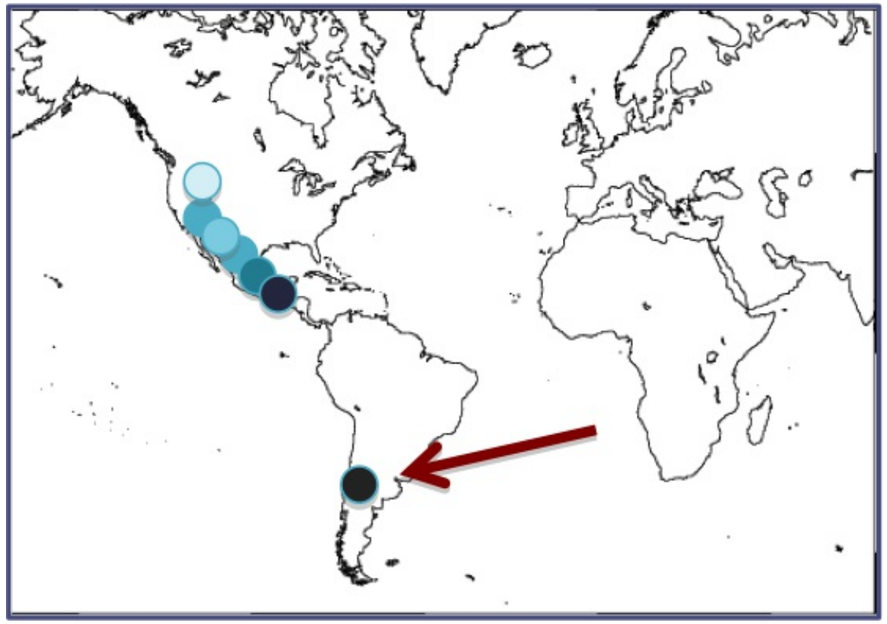
Look for outliers:

- Outliers are extreme values for a variable given the statistical model being used
- The goal is not to eliminate outliers but to identify potential data contamination

QA/QC After Data Entry

Methods to look for outliers

- Graphical
  - Normal probability plots
  - Regression
  - Scatter plots
- Maps
- Subtract values from mean



Summary

- Data contamination is data that results from a factor not examined by the study that results in altered data values
- Data error types: commission or omission
- Quality assurance and quality control are strategies for
  - preventing errors from entering a dataset
  - ensuring data quality for entered data
  - monitoring, and maintaining data quality throughout the project
- Identify and enforce quality assurance and quality control measures throughout the Data Life Cycle

Resources

- D. Edwards, in Ecological Data: Design, Management and Processing, WK Michener and JW Brunt, Eds. (Blackwell, New York, 2000), pp. 70-91. Available at www.ecoinformatics.org/pubs
- R. B. Cook, R. J. Olson, P. Kanciruk, L. A. Hook, Best practices for preparing ecological data sets to share and archive. Bull. Ecol. Soc. Amer. 82, 138-141 (2001).
- A. D. Chapman, “Principles of Data Quality:. Report for the Global Biodiversity Information Facility” (Global Biodiversity Information Facility, Copenhagen, 2004). Available at http://www.gbif.org/communications/resources/print-and-online-resources/download-publications/bookelets/

About

Participate in our GitHub repo: https://dataoneorg.github.io/dataone_lessons/

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