

Unit 15: Designing Experiments

SUMMARY OF VIDEO

Statistics helps us figure out the story hidden in a mound of data. Using statistics we can describe distributions, search for patterns, or tease out relationships. However, the reliability of our conclusions depends on the quality of the data collected.

One method of producing data is from an observational study. For the first story, we follow a team of marine scientists investigating how human populations affect coral reef ecosystems. They set up an observational study at four atolls in the remote Line Islands, each having a different history of human habitation. Kingman Reef has never had a human population; Palmyra was home to a military base during World War II but is no longer inhabited; Tabuaeran has a growing population of around 2,500; and Christmas Island has a population over 5,000. The research team recorded the size and quantity of predator fish, collected samples from each ecosystem, and took photographs of the coral. The scientists did not try to influence reef health – they simply observed it. They observed healthier ecosystems in areas with fewer humans. However, the problem with observational studies is they can't prove anything about cause and effect. So, while the scientists observed less healthy ecosystems in areas with human population, they could not state that humans caused the damage to the coral reefs.

In order to establish causal relationships, researchers rely on experimental studies. An experiment imposes some treatment on its subjects to see how they respond. The second story focuses on a study of how certain dietary supplements affected the pain of osteoarthritis. Here researchers set up a double-blind randomized comparative experiment. Participants were randomly assigned to one of five treatment groups: Glucosamine, Chondroitin, combination of Glucosamine and Chondroitin, Celecoxib, and placebo. The latter two groups were control groups. The Celecoxib group received a standard prescription medication and the placebo group received a dummy pill. The response variable was the reported decrease in knee pain. When researchers calculated the mean reduction in pain after six months for each treatment group, it turned out that they all had fairly similar outcomes. So, the dietary supplements were no worse or better than the prescription medication, or even the placebo.

The osteoarthritis study was a well-designed experiment – researchers randomly assigned their subjects to treatments, the treatments included control groups, and the number of subjects was large. Next, we visit Dr. Confound as he collects data for his study on mood-altering medication. The video clip with Dr. Confound focuses on two hypothetical patients –

his last two for his experiment, subjects 7 and 8. The patients get treated differently based on their initial mood – the one in a terrible mood is allowed to sit while the one in a good mood must stand. The doctor decides which medication to give each participant and he interacts with participants – adjusting one participant's response and sympathizing with another's. So this is a lesson in what not to do!