**Summary**

**Topic 1**: **Question & Data.** A study begins by establishing the Research Question and Data that will be used. The research question determines the scope of the study. Data has structure. Objects under study are called “Observation Units (OUs).” OUs have characteristics that describe them. A variable represents the potential values of a specific characteristic. Variables have specific types: Categorical, Ordinal, and Quantitative.

**Topic 2**: **Data has shape.** Variable values have structure, which we call a ‘distribution.’ This distribution can be described by a bar chart with categorical variables, or a dotplot or histogram for ordinal or quantitative variables. Specific charts can be paired with specific variable types.

**Topic3:** **Sample.** To obtain data, we need to obtain a sample to get our OUs, as it is too difficult or impossible to measure the whole population. Sampling must be done systematically. If it is not done correctly, then biases can creep into the study (or waltz in), and the study would be ruined. There are also the dangers of lurking and confounding variables.

From the research questions we have an explanatory variable and response variable.

Sometimes we cannot control the variables or sampling procedure in a study. In that case, it is an Observational study.

**Topic 4:** **Investigate a population. Random Sample.** To obtain a sample that is as unbiased as possible, we randomly sample subjects from a population or population frame. Simple random sampling is a good way to sample. There are some very acceptable protocols for random sampling. Use a protocol. Random Samples have attributes. Accuracy and Precision are two attributes related to sample size. Also note that samples *can* be ‘unlucky.’ Finally, sample size is not affected by population size (if the population is large enough).

**Topic5:** **Experiments: Random Assignment.** If we want to investigate the impact of an explanatory variable over a response variable, we do an experiment. In an experiment we randomly assign OUs to two groups, and subject the groups to different treatments. Problems with experiments can occur. To reduce bias and the effects of confounding variables, random assignment *or control*  of the other variables is essential. *To avoid the effects of lurking variables, we use research or peer review.* To balance the potential placebo effects of treatments, we use blind or double-blind methods.

**Homework**

**Highlights (pink areas)**

**Watch Outs**

**Wrap-Up**

**In Brief & You should be able to**