Population Demography

Author: Emily G. Weigel, Georgia Institute of Technology

Focus: The students will learn to generate, test, and graphically represent basic hypotheses on data distributions using large datasets.

Overview: This lesson centers around comparing the survivorship of two groups using a life table derived from tombstone information. Students will work through calculating some elements by hand via a worksheet alongside working in R. This swirl lesson goes step-by-step to show students how to do basic data manipulations, graphing, visual inspection of the data, and statistical tests as they work an example dataset with respect to a given hypothesis (whether males and females have the same life history curve). Students are then expected to repeat the coding steps they learned in R to test a hypothesis of their own.

Although this lesson could be adapted for any set of life table information, this lesson uses data collected from the historic Oakland Cemetery in southeast Atlanta (www.oaklandcemetery.com). This 48-acre cemetery opened in 1850 and continues to serve as an active cemetery as plot ownership is passed along family lines or sold back to the cemetery. The cemetery initially served as a public burial ground for the City of Atlanta, and it is home to about 7,000 Confederate and Union soldiers from the Civil War. There are several unique sections of the cemetery, including the original 6 acres, German Jewish grounds and African American grounds (reflecting a policy of racial segregation in 1866). Outside of these areas, burial plots are owned at random with respect to cause of death or ethnicity.

Learning objectives:

1. Complete a prelab reading to familiarize themselves with the goals of the lesson and the background ecological information of life tables
2. Practice calculations and what the numbers in a life-table mean; generate associated hypotheses
3. Practice coding elements necessary to generate datasets and test hypotheses based on the data
4. Apply the coding learned through swirl to their own hypothesis to answer whether two groups in their data have the same survivorship

Lesson sequence:

1. Prelab
2. In-class worksheet (Recording a hypothesis; The rest of the steps may be done alongside the swirl lesson)
3. Swirl lesson
    a. Intro
    b. Random Sampling
    c. Installing Libraries
    d. Grouping Data
    e. Basic Calculations
    f. Graphing
    g. Stats
4. R code generation relative to student hypotheses

Pre-lesson activities: Prelab reading (and quiz) relative to the basic elements of the life table, if students need a refresher. The worksheet may be enough if you have already (and recently) addressed this in your course. The goal is that students familiarize themselves with the goals of the lesson and the background ecological information of life tables *before* coming to lab.

Post-lesson activities: Students are to submit their in-class worksheets and a 1-paragraph summary of their hypothesis and whether it was significant (including test run, df, test statistic, and p-value), as well as a figure addressing their hypothesis that is generated in R and follows the style of the figure generated in the swirl lesson.

Implementation notes: This lesson was designed to be done within a 3-hr laboratory. However, it is subdivided into several subparts to facilitate students stopping and starting, as well as review of critical elements when students begin writing their own code. Encourage students to go slowly and keep a document open in which to paste the code (and any notes) as they work; it will make generating their own R code, plots, and statistics much easier. Additionally, this lesson uses some packages that can occasionally stall the program. If a student gets stuck, restarting R and/or installing the package and opening it before opening swirl generally fixes the problem.