Department of Environmental Sciences
Huxley College of the Environment
Western Washington University

ESCI 340 BIOSTATISTICAL ANALYSIS

Project 1: Traffic Loads on Bellingham/WWU Streets

Traffic impacts rank among the chief concerns of planners in rapidly growing regions in the U.S., and traffic congestion and safety risk often are the most common frustrations of people living or working in such areas. Growth-induced traffic has become an increasing concern in Bellingham and at WWU. Traffic issues within WWU and between WWU and adjacent neighborhoods now impose strong constraints the university's plans for future development. WWU is addressing traffic issues with several approaches, including investment in Transportation Demand Management (TDM). TDM strives to reduce traffic, increase safety, and improve transportation efficiency by helping people access the university using alternatives to driving alone.

Successful TDM applications require knowledge about commuter behavior. In particular, efforts to draw people out of their cars depend on knowledge about why people choose to drive, and what factors would induce them to use alternative modes of transportation. In this project, you will evaluate weather as a factor that may influence transportation decisions.

Research Question

Do weather and road conditions affect traffic loads on streets in the vicinity of WWU?

Hypotheses

1 On days when ice and snow increase driving hazard or difficulty, more people choose alternatives to driving (e.g., buses, walking) than on days without roads covered with snow and ice.

2 On days when ice and snow increase driving hazard or difficulty, drivers preferentially choose to drive on major roads, where snow removal or maintenance has made driving is easier or safer. Relative to days without snow or ice, drivers tend to avoid driving on secondary roads, where slick conditions make driving more difficult or dangerous.

Note that this study is observational, rather than experimental. You will collect data from roads that differ from each other in many factors beyond your control. You will attribute differences in your samples to differences in some of the factors, but you will not determine whether or how those factors actually caused the observed differences. In particular, effects on driving behavior due to differences in road conditions may be confounded with differences in day of the week, events at WWU or in town, and shopping needs suppressed by recent weather.

Field Methods

Find one or two partners. This project is best conducted during a primary commute period, such as the hours between 0800 and 0900 or 1600 and 1700. We will select a common observation period and assign observation locations during class.

1 Walk to your designated intersection. Take care to choose an observation point protected from errant vehicles.

2 Designate one person as the recorder and the other one or two as observers. By definition, your intersection contains two streets. In groups with two observers, each observer will watch for vehicles traveling on one of the streets. Single observers will have to note traffic on both streets in the intersection.

3 Describe conditions of the road surface on each street in your intersection. From your description, it should be clear whether all or part of a road is covered with slick ice, packed snow, soft or dirty snow, patchy snow, slush, water, or dry pavement. Because intersections often receive extra snow maintenance, be sure to record road conditions at least 50 meters away from the intersection.

4 Note the time. Begin recording vehicles traveling on each road. Because we are interested in behavior of people who could choose alternative modes of transportation, restrict your observations to private passenger vehicles (cars, SUVs, pickup trucks). Do not count "working" vehicles: buses, emergency vehicles, commercial trucks, etc.

5 Stop recording after ten minutes. At this point, the observer(s) should review for accuracy the data taken by the recorder.

6 After a ten minute wait from the end of your first observation period, repeat step 4 for a second ten minute observation period. Repeat step 5, and enjoy the rest of your day.

7 Repeat steps 1-6 at the same time of day, on a day when all roads are clear of snow and ice.

Data Analysis

1 Determine the number of vehicles during each ten-minute observation period on each street of your intersection. For each street, calculate the mean of vehicle load over the two observation periods. Repeat for data recorded on the second day. Share your calculated values with other class groups.

2 Prepare a table showing traffic loads for all streets observed. Your table should distinguish between values recorded from primary vs. secondary streets and snowy vs. clear road conditions.

3 Plot histograms of traffic load (number of streets vs. number of vehicles) for primary and secondary streets, and for snowy vs. clear road conditions.

4 Describe the shapes of the two histograms from (3). Do they appear similar to any of the distributions discussed in class? How?

5 Calculate the mean values for traffic load on primary and secondary streets on the snowy/icy day. Repeat for samples from the snow-free day.

6 Calculate variances, standard deviations, and standard errors of traffic load on primary and secondary roads. Repeat for samples from the snow-free day.

7 Use values calculated in steps 5 and 6 to evaluate the two hypotheses stated on the preceding page. Note any assumptions you make in your evaluation. Do those assumptions appear reasonable? Why or why not?