



WSMC High School Competition
Cities, Suburbs or the Brush: How Does Population
Density Affect Quality of Life, or Does it?
2010 Team Project

Life is different when it's crowded. Is it better or worse? Can you make that determination? What are some of the factors to be considered? How can you use mathematics to explore and perhaps begin to answer some of these questions?

For this investigation you will examine the ways in which some basic demographic measures such as median income, level of educational attainment, and racial distribution are associated with population density.

The Web site, Zip Skinny (<http://zipskinny.com/>), serves up demographic information using U.S. Census data from the year 2000, the last time the national census was completed. It allows you to enter a zip code and retrieve information regarding the educational attainment, marital status, stability of home ownership, household income, occupation, unemployment level, racial and age distribution of the people living within the boundaries of that zip code as well as some general information such as the land area, water area, number of housing units and, most particularly for this investigation, the population density. Another Web-based utility that will be useful in this investigation is the "USPS Zip Code Boundary Map" (<http://www.usnaviguide.com/zip.htm>). This utility allows you to see maps of zip codes all across the country. Using these two Web sites your job will be to use mathematics to investigate whether the quality of life found in crowded areas, those with high population densities, is better or worse than that in less crowded areas.

What do we mean by "quality of life?" You will examine five factors as indicators of quality of life. Three will be defined for you. These three are **income**, **educational attainment**, and **quality of schools** (as represented by the teacher/student ratio). Zip Skinny provides data in each of these three areas. You will have to decide exactly how to quantify the factor using the data. For example, under the heading "Educational Attainment," you will find the percentage of the population that has less than a 9th grade education, the percent that have graduated from high school, the percentage with a bachelors degree, and more. You will have to decide how to use these numbers to characterize the educational attainment of the population in that zip code. You will need to do the same for income. For the third prescribed factor, quality of schools, you must use the student/teacher ratio provided by Zip Skinny. To get this information, specify one zip code and then click on the yellow tab at the top of the page labeled "schools in ...". Many educational agencies may be listed. Try to eliminate from your examination those that are not traditional elementary, middle and high schools. There's no sure way to do this. Do your best.

Remember, we said there would be five factors. Three are specified above. You will invent the other two factors. Each of these factors has to do with quality of life. The data must come from the Zip Skinny Web site and you must be able to explain why you chose to use these factors.

You will examine data regarding these five variables in areas where the population densities fall into the following categories:

- 0-100 people per square mile
- 101 – 1,000 people per square mile
- 1,001 – 5,000 people per square mile
- 5,001 – 10,000 people per square mile
- more than 10,000 people per square mile

Use the USPS Zip Code Boundary Map utility to examine a map of the U.S. and its zip code boundaries. (Try the “Zip Hybrid” option.) Some zip code areas are large and some are small. The large ones generally encompass rural areas while the small ones are found in more densely populated urban areas. You can determine the population density of any U.S. zip code area as well as a wide range of additional demographic data using Zip Skinny. Your job is to use mathematics to investigate the ways in which the five factors vary across these categories.

Here’s what you must do: find at least ten zip codes anywhere in the country that fall into each of the population density categories given above. Collect and analyze data from the Zip Skinny Web site that will enable you to characterize that population density category with regard to each of the five factors. In your report, explain how each factor varies across the population density categories. Your work will be assessed in large part on how well you are able to use mathematics to characterize the ways in which the factors differ across the population density categories. Ultimately you must answer the question: ***How is quality of life affected by population density.***