**Urban Sustainability Learning Module**

In this module we will be examining Vital Signs data to understand the relationship between sustainability and a range of factors including cleanliness and environment, crime and safety, business and economics, social and political, housing, health, and education. You will then answer the three questions in the assignment section.

**Introduction**

Sustainability is a term with many different conceptions, and when applied to urban planning it takes on even more meaning. This ambiguity in its definition can make it difficult to concisely evaluate what makes a city sustainable. For this exercise, we will define sustainability as the ability for a city to grow demographically, economically, and socially. This growth is often tied to environmental concerns such as energy and resource consumption. The multiple aspects of urban sustainability can make it seem difficult to understand what exactly makes a city sustainable. That is okay, because there is no one particular variable that will creates sustainability, rather it is an interdependent mix of variables working together. In fact, one of the more common metaphors for urban sustainability is that of a biological organism, where the many different parts (organs) work together as a whole.

We are going to look at one specific outcome of sustainability: population growth and decline from 2000-2010. Once again, this is a simplistic definition of sustainability. A more complex examination would include things such as economic growth and environmental concerns. In addition, population could very well be a variable in sustainability in addition to being an outcome. But for our purposes, we will use it as an outcome or sign of sustainability.

In the course of this exercise, you will explore some of the different variables that relate to urban sustainability.

**Step 1**

Look over the different categories of sustainability indicators given below. For each category discuss why it is important for population growth.

Cleanliness and Environment

* Rate of Dirty Streets and Alleys Reports
* Rate of Clogged Storm Drains
* Percent of Area Covered by Trees
* Number of Community Managed Open Spaces
* Walk Score

Crime and Safety

* Violent Crime Rate
* Property Crime Rate
* Domestic Violence Calls Rate
* Gun Homicide Rate
* Narcotic Calls Rate

Business and Economics

* Median Income
* Percent of Family Households Living Below the Poverty Line
* Unemployment Rate
* Total Number of Businesses
* Banks and Bank Branches Rate
* Neighborhood Businesses Rate
* Percent of Employed Population with Travel Time to Work over 45 Minutes

Social and Political

* Racial Diversity Index
* Percent of Registered Voters
* Percent of Population who Voted in 2012 General Election
* Population with Library Cards Rate

Housing

* Percent of Housing Units that are Owner-Occupied
* Percent of Residential Properties that are Vacant or Abandoned
* Percent of Residential Properties with Housing Violations (Excluding Vacants)
* Affordability Index – Rent

Health

* Percent of Babies Born with a Satisfactory Birth Weight
* Percent of Children (aged 0 – 6) with Elevated Blood Lead Levels
* Life Expectancy
* Infant Mortality
* Fast Food Outlet Density Rate
* Average Healthy Food Availability Index

Education

* Percent of 8th Grade Students Passing MSA Math
* Percent of 8th Grade Students Passing MSA Reading
* High School Completion Rate
* Percent of Population (25 years and over) with Less than High School Diploma or GED
* Percent of Population (25 years an over) with a Bachelor’s Degree or Above

**Step 2**

Open the Urban Sustainability Excel workbook, and go to the worksheet titled “Chart”. Find the drop down list of all the indicators, located in the top left of the worksheet. From here you can select indicators that will be measured against population growth. These indicators have been standardized by using the number of standard deviations from the mean (see note below for more information about how this data was formatted).

**Step 3**

Next, you should select each indicator and examine the chart for each of them. Examine multiple Community Statistical Areas (CSA) to see if there are relationships between certain indicators and population growth.

**Assignment**

1. Which indicators seem to have the highest correlation between population growth or decline? Write a couple sentences for each category given in step one about the indicator that had the closest correlation to population growth or decline.
2. Why do you think this indicator corresponded so well with population growth or decline?
3. Are there any categories that do not have an indicator that corresponds well with population change? Why do you think this is?

**Notes on Data Formatting**

Due to the fact that there are different forms of values (numbers, percent, and rate per 1,000 residents) for the indicators in this exercise, the values were standardized for comparison. This was done by using the number of [standard deviations](http://en.wikipedia.org/wiki/Standard_deviation) from the mean for each value. For example, comparing the median household income ($69105.14 for Fells Point) to the percent of population change (5.5% for Fells Point) would result in an incomprehensible chart. To create comparable values, the standard deviation was first derived for each indicator. For example, the standard deviation of median household income is $19048.43 from the mean of $40,100 for Baltimore City, while the standard deviation of percent of population change is 10.3% from the mean of -4.4%.

The next step was to compute the value for number of standard deviations. The formula for this was (Value – Mean) / Standard Deviation = Number of Standard Deviations. For example, to get the number of standard deviations for the median household income for Fells Point, the formula was (69105.14 – 40,100) / 19048.43 = 1.52. This means that $69105.14 is 1.52 times greater than the mean for Baltimore City. The same formula was used for population change. Once again using the Fells Point example, the formula was (5.5% - -4.4%) / 10.3% = 0.96. Because most values do not fall outside three standard deviations from the mean, this way of standardizing results in values that are comparable irrespective of if their raw values are numbers, percentages, or rates.

The third and final step to creating comparable data across all the different values was to assign negative values to the number of standard deviations indicators that have negative impacts on sustainability. For example, a positive value for median income is positive for sustainability. However, a positive value for crime rates is negative for sustainability, and so if it is not modified it remains incomparable to other indicators. Therefore, the number of standard deviations for indicators that have negative impacts on sustainability were multiplied by -1 to assign them negative values. The indicators that underwent this last step were: Rate of Dirty Streets and Alleys Reports, Rate of Clogged Storm Drain Reports, Violent Crime Rate, Property Crime Rate, Domestic Violence Calls Rate, Gun-Related Homicide Rates, Narcotic Calls for Service Rates, Percent of Family Households Living Below the Poverty Line, Unemployment Percent, Percent of Employed Population with Travel Time to Work 45 Minutes and Over, Percent of Residential Properties that are Vacant, Percent of Residential Properties with Housing Violations, Percent of Children (aged 0 – 6) with Elevated Blood Lead Levels, Infant Mortality, Fast Food Outlet Density Rate, and Percent of Population (25 years and over) with Less than a High School Diploma or GED. These are indicators where if the value is above the mean, it is detrimental to population change, and so once again they were assigned a negative value in order to compare them to population change.

The last piece of data hygiene was to limit the number of Community Statistical Areas due to the number (55) being too large to realistically view in the Analysis Tool chart. Therefore, thirty CSAs were randomly chosen to be included in the analysis. Once again, this was done to simplify the data for ease of data visualization.