

# 838 Application Project- HCE with United Nations Development data.

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## 1 Introduction

For this project, I looked at data from the United Nations Development Programme. <sup>1</sup> I explored this data with the Hierarchical Clustering Explorer <sup>2</sup>. I will present figures that suggest 1) a large GDP is a sufficient, but not necessary condition for high life expectancy, 2) It is a reasonable abstraction to think about demographics of age and urbanity by classifying countries into 4 categories, and 3) The United States is unique in having astronomical health care expenditures, and quite low levels of trade.

## 2 Data Sets

As a first exploration, I looked at only the two variables of Gross Domestic Product per capita, and Life Expectancy at birth. Figure 1 shows the results. An interesting thing to note is that at low GDP, and increase in GDP per capita is correlated with an increase in life expectancy, but at higher incomes, this correlation tapers off to nothing. HCE produced several clusters for this data. One such cluster, consisting on the more wealthy Western European nations, the United States, Canada and Japan, all had very high GDP and relatively high life expectancies. Another cluster consisted of countries which had slightly lower GDP and/or life expectancy: Korea, Greece, Israel, Portugal, New Zealand, etc. One cluster, with very low GDP and life expectancy included most African Countries. Several other clusters consisted of countries with low GDP per capita, but relatively high life expectancies.

The outliers in this first plot seemed to be South Africa, and Cuba. South Africa, despite a relatively high GDP per capita, has a low life expectancy. Cuba, meanwhile, despite very low GDP per capita, maintains a life expectancy rivaling the richest countries in the world.

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<sup>1</sup>This data set is accessible from [hdr.undp.org/statistics/data/advanced.cfm](http://hdr.undp.org/statistics/data/advanced.cfm) and has a wealth of information about all aspects of development for most of the countries in the world.

<sup>2</sup>Available at <http://www.cs.umd.edu/hcil/hce/>

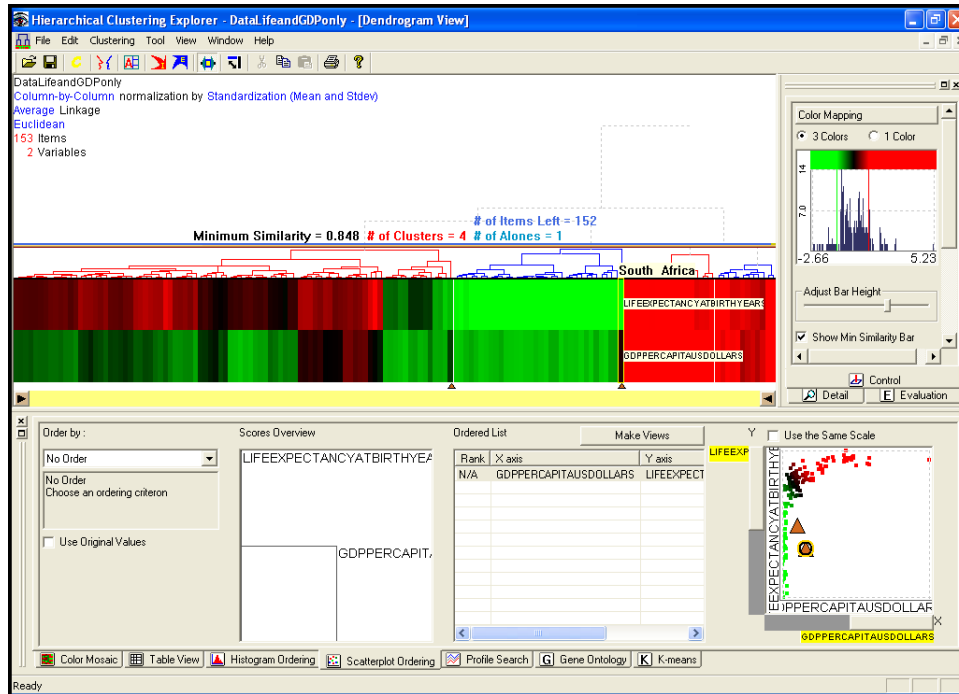


Figure 1: Life Expectancy in years, and GDP per capita

The next data I looked at were the percentage of the population living in an Urban environment, the percent that were over 64 years old, and the percent that were under 15 years old. This data had the predictable correlation between the age variables- countries with many old people had few young people, and vice-versa. However, these two variables had a surprising outlier: Kuwait has a very low percentage of old people, yet it also had a low percentage of young people. Regardless, there was a somewhat less obvious correlation- all countries with very non-urban populations, have few citizens above the age of 64. Similarly, more urban countries tend to have a more aged population. Presumably this is due to the connection between urbanity and income, medical care, etc.

This data had some insight to be drawn from the clustering. There were four clusters at the threshold shown: old, urban countries, clusters for young, non-urban countries, mixed countries, and countries that despite being highly urban, are unhappily unable to sustain an older population. Figure 2 shows a shot from this data.

The last data I looked at were the relations between percentages of imports and exports, and the amount per capita spent on health care. An interesting fact here is that if all countries are to be split into two clusters, there will be one cluster consisting of the United States, and one cluster consisting of the rest

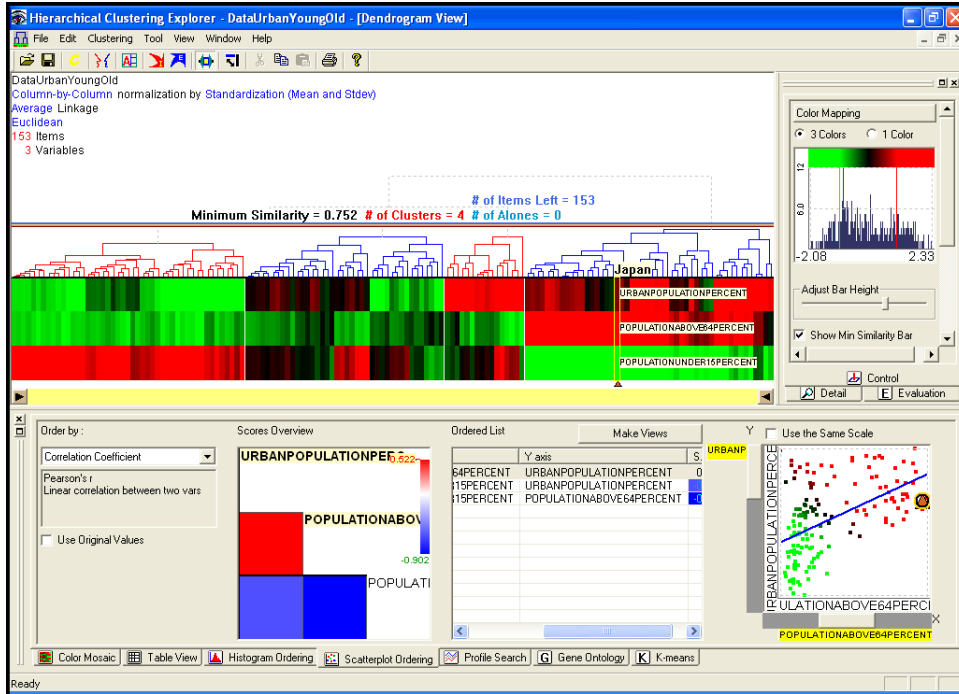


Figure 2: Percentage of population over 64, population under 15, and percentage urban.

of the world! The United States, which spends 4,887USD per capita <sup>3</sup>, also has unusually low imports as a percentage of GDP. <sup>4</sup> Presumably, low trade is due to the United States' ability to produce most goods and services domestically, while high health care costs are due to the conspiracy of high quality of care and bureaucratic inefficiencies.

It can be seen immediately from the graphs that countries with high exports tend to have high imports. However, there is little correlation between these factors and how much the country spends on health care. This data can be seen in Figure 3.

<sup>3</sup>The U.S. followed distantly by Switzerland, which spends a meager 3,322USD per capita.

<sup>4</sup>The US imports and exports to the tune of 14 and 10 percent of GDP, respectively. The Netherlands, for example, has imports of 56 percent and exports of 62 percent.

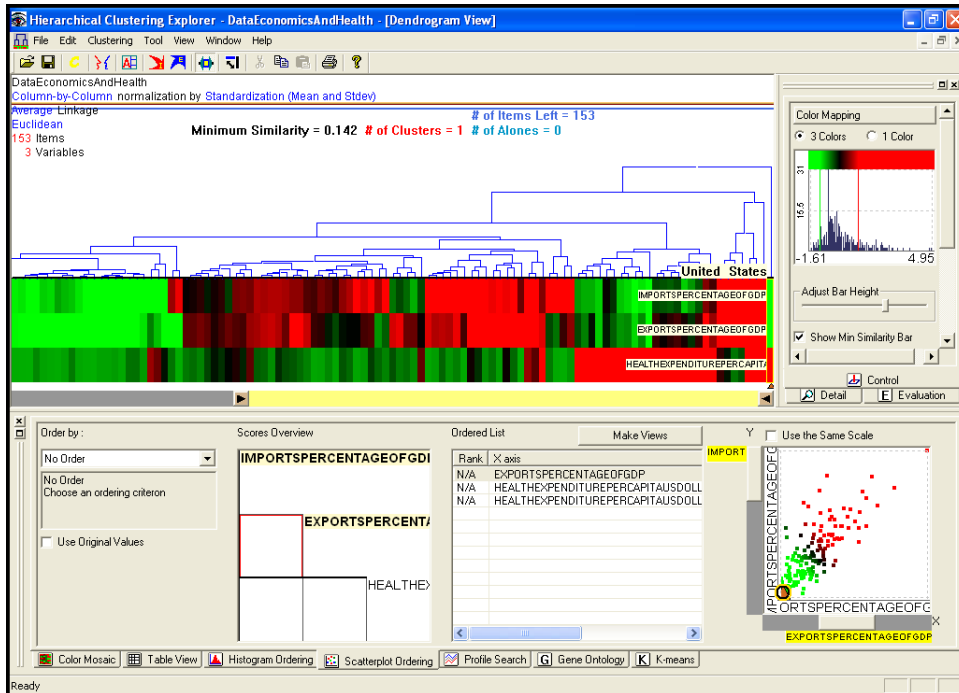


Figure 3: Imports and Exports relative to GDP, and amount spent on health care per capita.