Demographic Trends in Europe in 1995

GDAA 1000 - Fundamentals of Geospatial Data Analytics

Aila Jalo

22/10/2021

Centre of Geographic Sciences

COGS | nscc

Introduction

The purpose of this assignment was to develop data manipulation and mapping skills while using R. Data manipulation was done on data that was provided by the United Nations. The manipulated data was then used to produce various maps showing different demographic trends in Europe in the year of 1995.

The data was contained in a shape file, and included data collected about twenty-six different variables from one-hundred and eight different countries around the world. In addition to the twenty-six variables, spatial geometry was also included for each of the countries.

In this dataset, there is information about how many people live in cities, the predominant religion, literacy rates, the gross domestic product, economic group, and the predominant climate. There was also information collected about the growth and health of the population such as birth rates and death rates, birth to death ratio, infant mortality, the rate of population increase, life expectancy, calorie intake, number of aids cases, and fertility.

The original shape file was first converted to a simple feature data frame to enable better use of both the spatial and non-spatial features. There are 108 rows which pertained to the unique country entries, and 27 columns of both non-spatial and spatial attributes. The REGION field was converted from characters to factors, for comparing demographic trends between the Eastern and Western European countries within a scatter plot.

Figure 1 is a map of the world where the United Nations had collected demographic data in 1995. The countries included in the original dataset are represented by the green areas on the map. As seen in Figure 1, there are many countries where there was no information collected. The data was collected in 1995, and the United Nations did not have a presence or could not access data in many of the countries in Africa, some in Asia, and a few in South America. These countries also could have been newly formed or going through a turbulent time where there was no stable government to perform a census or any other form of record keeping.

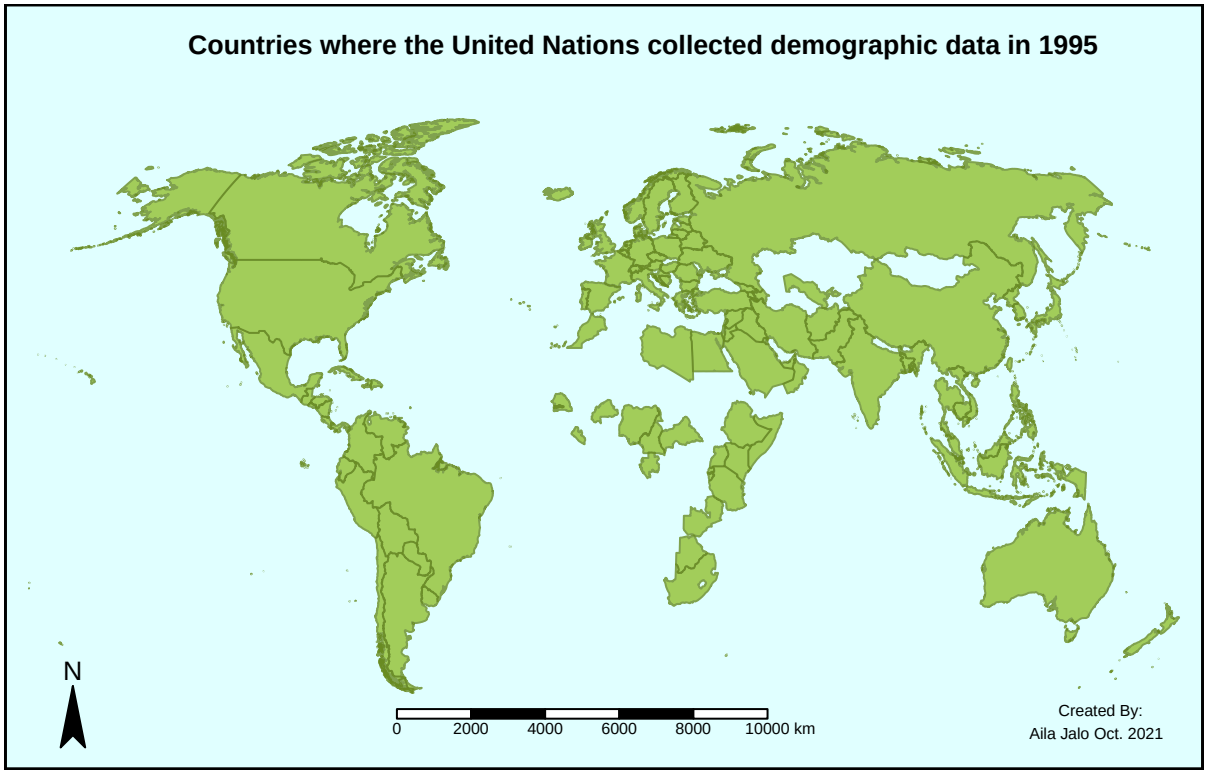

Figure 1: Countries where the United Nations collected demographic data in 1995

Demographic Trends in Europe

To analyse demographic information in Europe, a new data frame was created ("world_europe") and set to only include countries that were in East Europe or the Organization for Economic Co-operation and Development (OECD), and to exclude all countries in Asia, Africa, the Middle East, and the Americas. Russia was also excluded in this assignment to prevent the map extent from getting too large. A new field was created and named POP_DENSITY. The population density was calculated by dividing the population by the area ("POP_CNTRY/SQKM_CNTRY"). The REGION field was then converted to factors, and then renamed to present the factor level [1] as western countries, and the factor level [2] as eastern countries.

Gross Domestic Product (GDP)

Figure 2 shows the gross domestic product (GDP) per capita in the year of 1995. The GDP was lower in eastern Europe than Western Europe. In the west, Switzerland had the highest GDP in Europe in 1995. The majority of the western countries had a GDP between 15,001 and 20,000 Euros. Spain and Ireland both had the next lowest GDP, while Portugal and Greece had the lowest GDP per person.

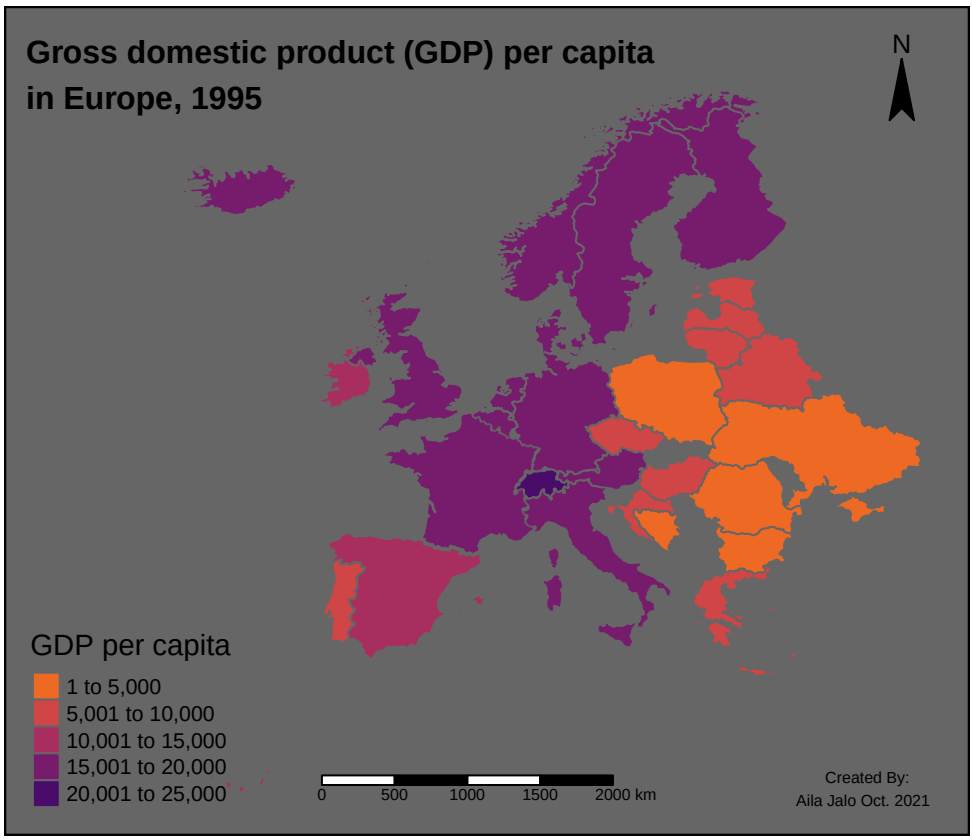

Figure 2: Gross domestic product (GDP) in Europe in 1995

Male Life Expectancy

The average life expectancy of males in Europe is shown in Figure 3. Similar to the trend for the GDP per capita, Eastern Europe had the lowest life expectancy amongst males in 1995. Latvia had the lowest life expectancy of only 63 or 64 years. Western Europe all had a life expectancy greater than 73 years, with males in Finland and Portugal having a life expectancy of 71 to 72 years.

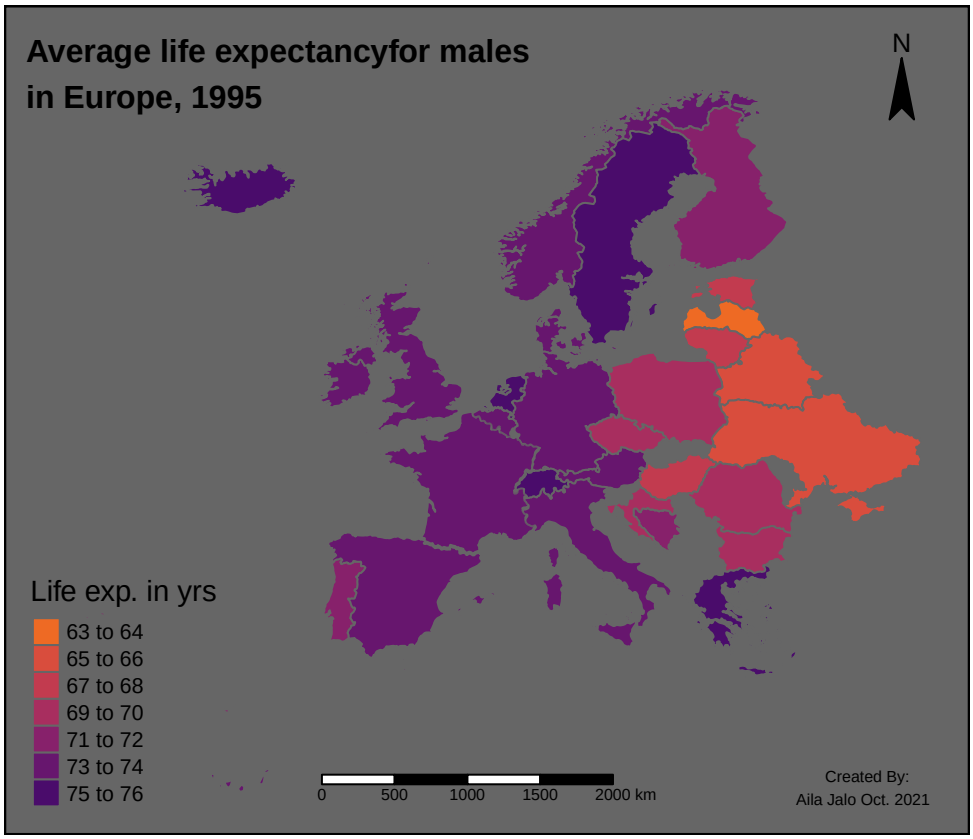

Figure 3: Life expectancy for males in Europe in 1995

Literacy Rate

As seen in Figure 4, there is little discrepancy between Western and Eastern Europe when looking at literacy rates. Czech Republic is the only country in Europe that had a literacy rate of 80% or below. Portugal had 81-85% literacy, and Bosnia and Herzegovina had 86-90% literacy. Bulgaria, Greece, and Spain had literacy rates in between 91% and 95%, and the rest of Europe all had 96% or more of the population that could read.

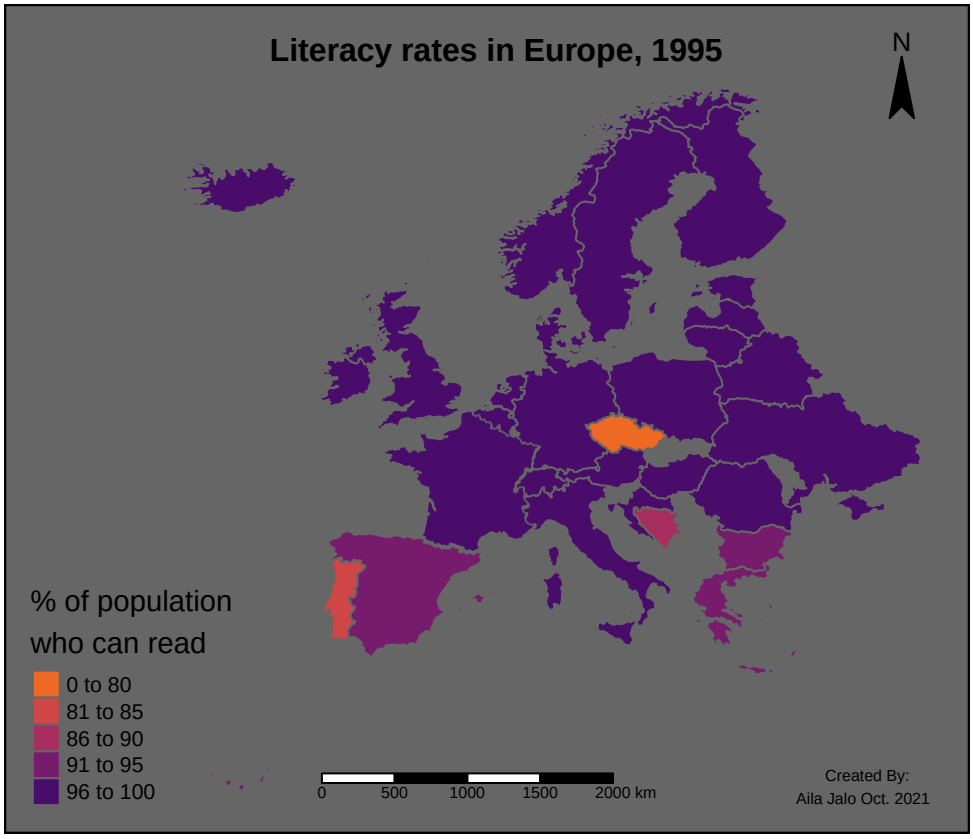

Figure 4: Literacy rates as a percentage of the population in Europe in 1995

Population Density

In Figure 5, most countries had less than 200 people per square kilometre. Germany and the United Kingdom had in between 200 and 300 people per square kilometre. Belgium had 300-400 people per square kilometre, while the Netherlands had the highest population density of 400-500 people per square kilometre.

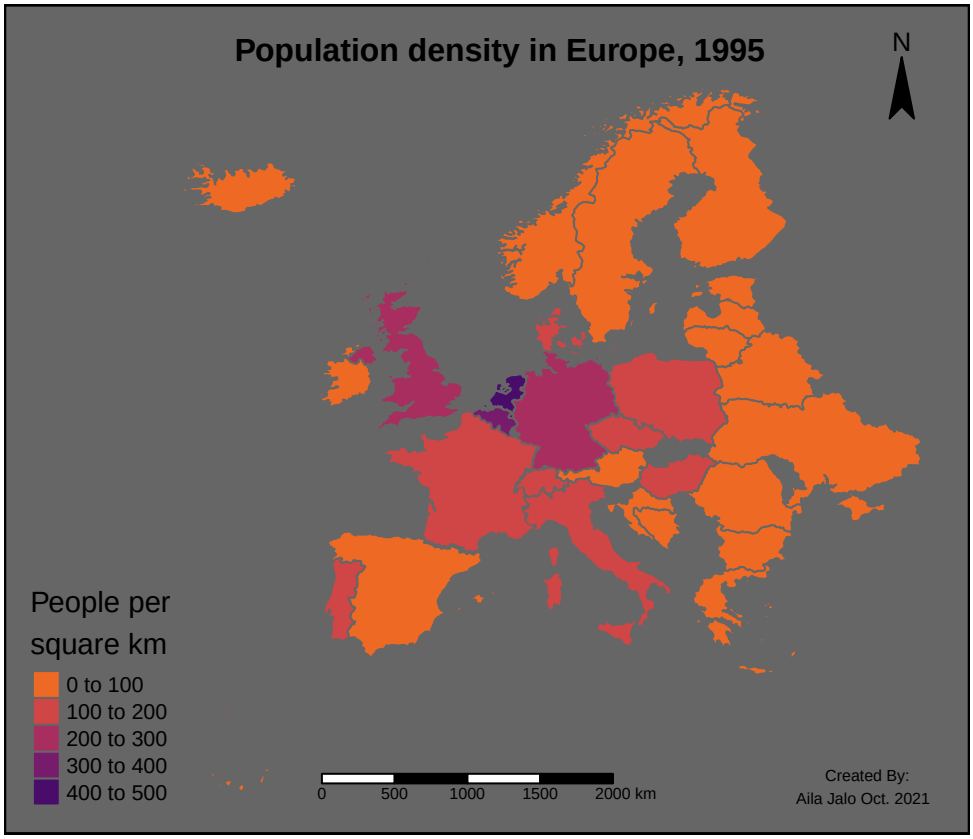

Figure 5: Population density (people per square kilometre) in Europe in 1995

Table 1: Life Expectancy, GDP, Literacy and Population Density for 10 European Countries

	Life expectancy (males)	GDP per capita	Literacy rate	Population density
United Kingdom	74	15974	99	232.05079
Spain	74	13047	95	77.65428
France	74	18944	99	105.64114
Germany	73	17539	99	228.68375
Italy	74	17500	97	192.40141
Poland	69	4429	99	122.01490
Austria	73	18396	99	92.61419
Finland	72	15877	100	15.07317
Bulgaria	69	3831	93	80.71423
Romania	69	2702	96	99.47244

A Closer Look at Ten European Countries

Table 1 shows the GDP, male life expectancy, literacy rate and population density for a subset of countries in Europe. Poland, Bulgaria, and Romania all had life expectancies of 69 years, while the rest had a literacy rate of 72 years or greater. Finland, Austria, Italy, Germany, France, Spain, and the United Kingdom all had a GDP greater than 13,000 Euros, with France having the highest at 18,944 Euros. Poland, Bulgaria, and Romania all had a GDP less than 4,429, with Romania having the lowest at 2,702 Euros. Bulgaria had a literacy rate of 93%, with the rest being greater than 95%. The entirety of Finland's population could read. The United Kingdom was the most densely populated country in the list with roughly 232 people per square kilometre. The least densely populated country in the group was Finland, with about 15 people per square kilometre.

Comparing Western and Eastern European Countries

The map in Figure 6 shows how the United Nations defined the economic regions in Europe in the year 1995. Western European countries were all in the OECD, while the Eastern European countries were not. The remaining figures display comparisons between the two regions amongst four different demographic variables.

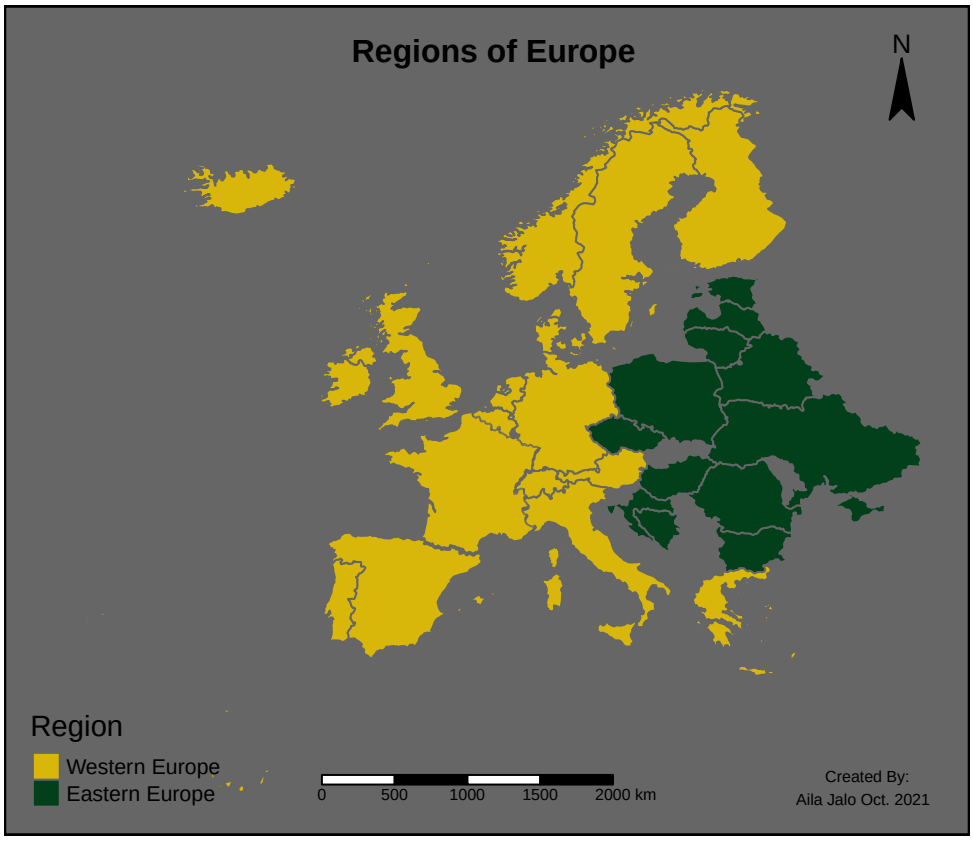

Figure 6: Map showing countries located in either Western or Eastern Europe

GDP vs Male Life Expectancy

The first scatter plot (Figure 7) compares the GDP per capita against male life expectancy. There appears to be a trend where the greater the GDP leads to males living longer. There were no Eastern European countries with a life expectancy beyond 72 years, and none had a GDP greater than 7,500 Euros. All the Western European countries had a life expectancy greater than 70, and the majority appear to have had a GDP greater than 12,000 Euros. All the countries in the west had a GDP that was greater than the ones in the east.

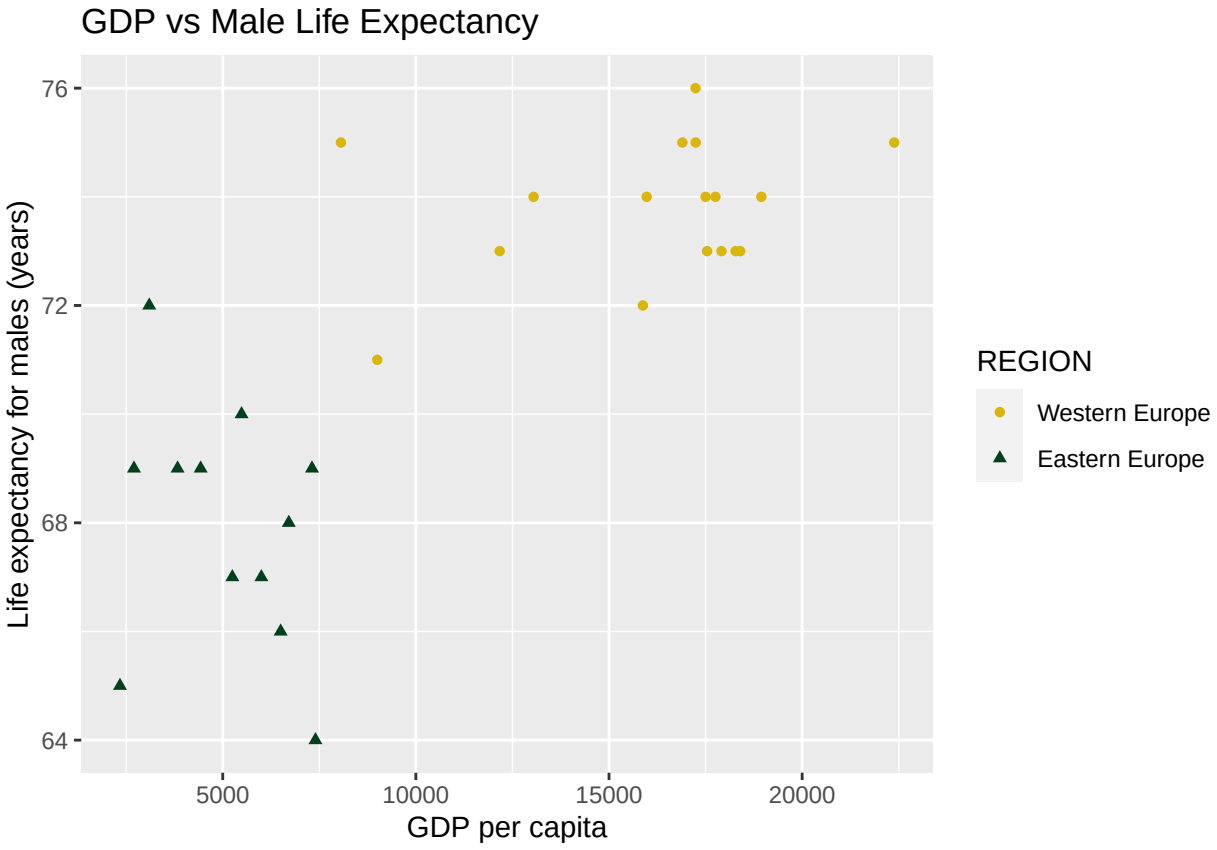

Figure 7: Scatter plot comparing GDP and male life expectancy in Western and Eastern Europe

GDP vs Literacy Rate

All of the countries except for one had a high percentage of the population that could read. The one outlier is Czech Republic, where in the dataset it was listed as having a literacy rate of 0 (Figure 8). It is very odd to have a literacy rate at 0%, even though it was only 1995. That would have meant that no one in the entire country could read, or it was too low to be recorded above 0. When looking at the trend for the rest of the Eastern European countries, even though they have a GDP less than those in the west, most of the population could still read. It seems likely that the recorded literacy rate for Czech Republic could be an error, or there was not any data on the literacy rate at the time the UN collected the data.

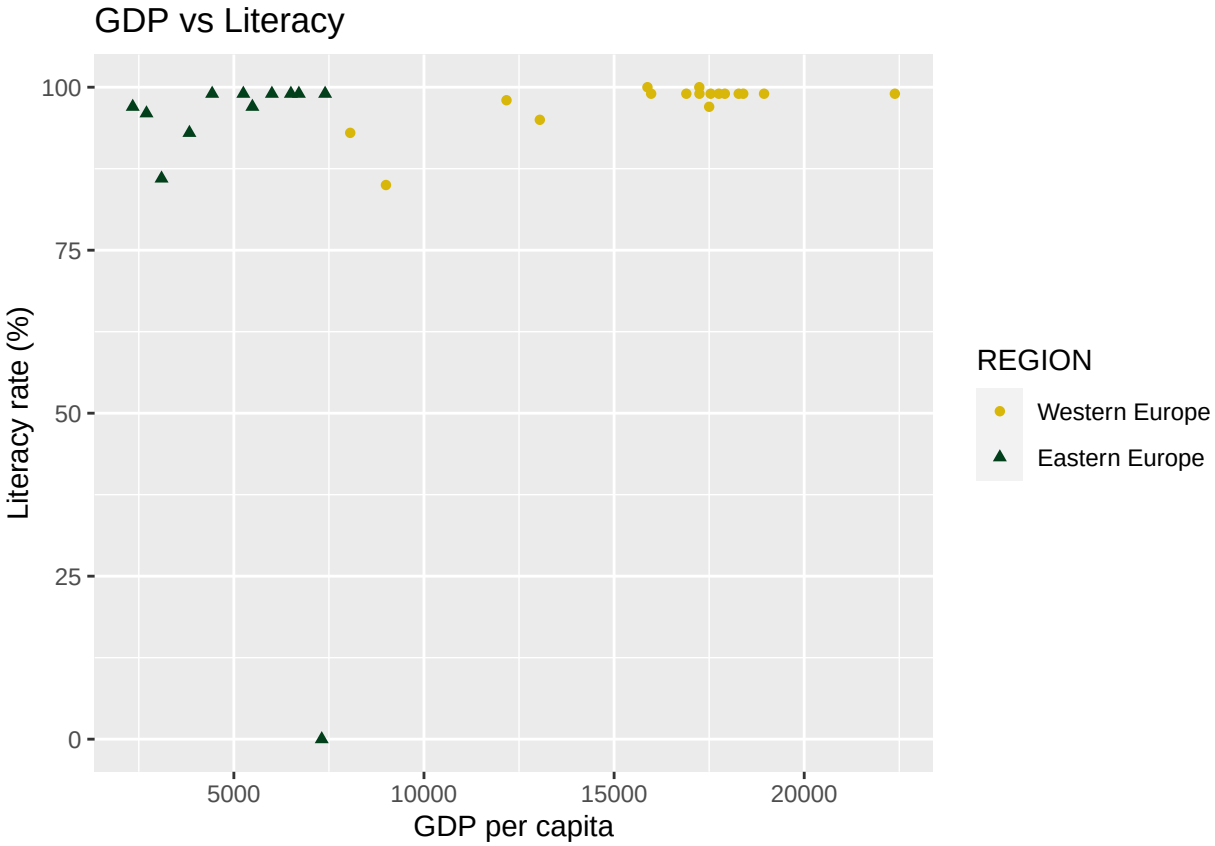

Figure 8: Scatter plot comparing GDP and literacy rates in Western and Eastern Europe

GDP vs Population Density

Figure 9 shows that there was not much correlation between the GDP and population density. The Eastern European countries all had a GDP less then 7,500 Euros, and a population density less than 150 people per square kilometre. The Western European countries that had a GDP greater than 7,500 Euros were mostly in countries where there was less than 200 people per square kilometre. The countries with the highest GDP all had a population density that was greater than any of the countries in the east.

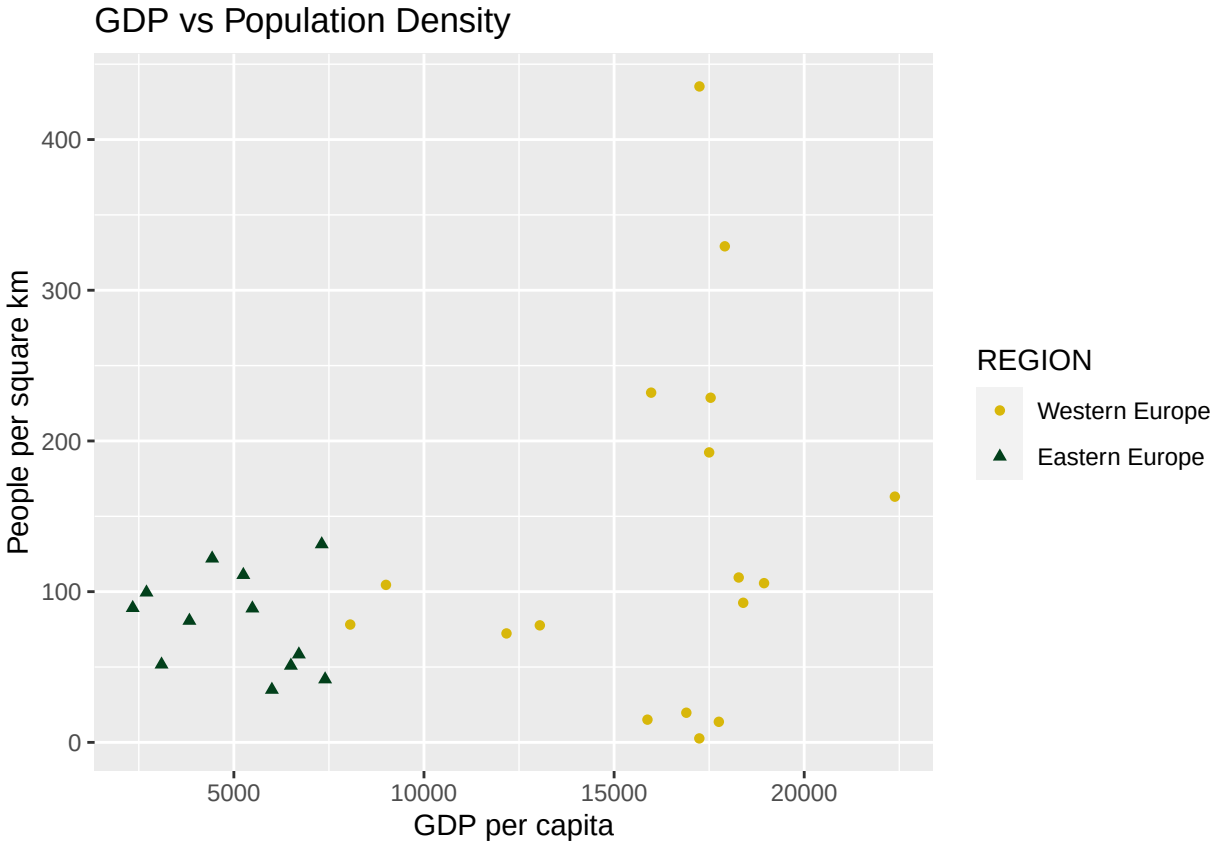

Figure 9: Scatter plot comparing GDP and population density in Western and Eastern Europe

Male Life Expectancy vs Literacy Rate

The Czech Republic was the outlier again in the scatter plot comparing the male life expectancy (Figure 10). Aside from the Czech Republic, there was no correlation between the average life expectancy and literacy rates. All the countries in Europe had a literacy rate greater than 87% except for two countries, one being in the east and one being in the west. The life expectancy in all the countries was greater than 64 years. All the countries in the east had a life expectancy of 72 or less, and the countries in the west had a life expectancy of around 71 years or longer.

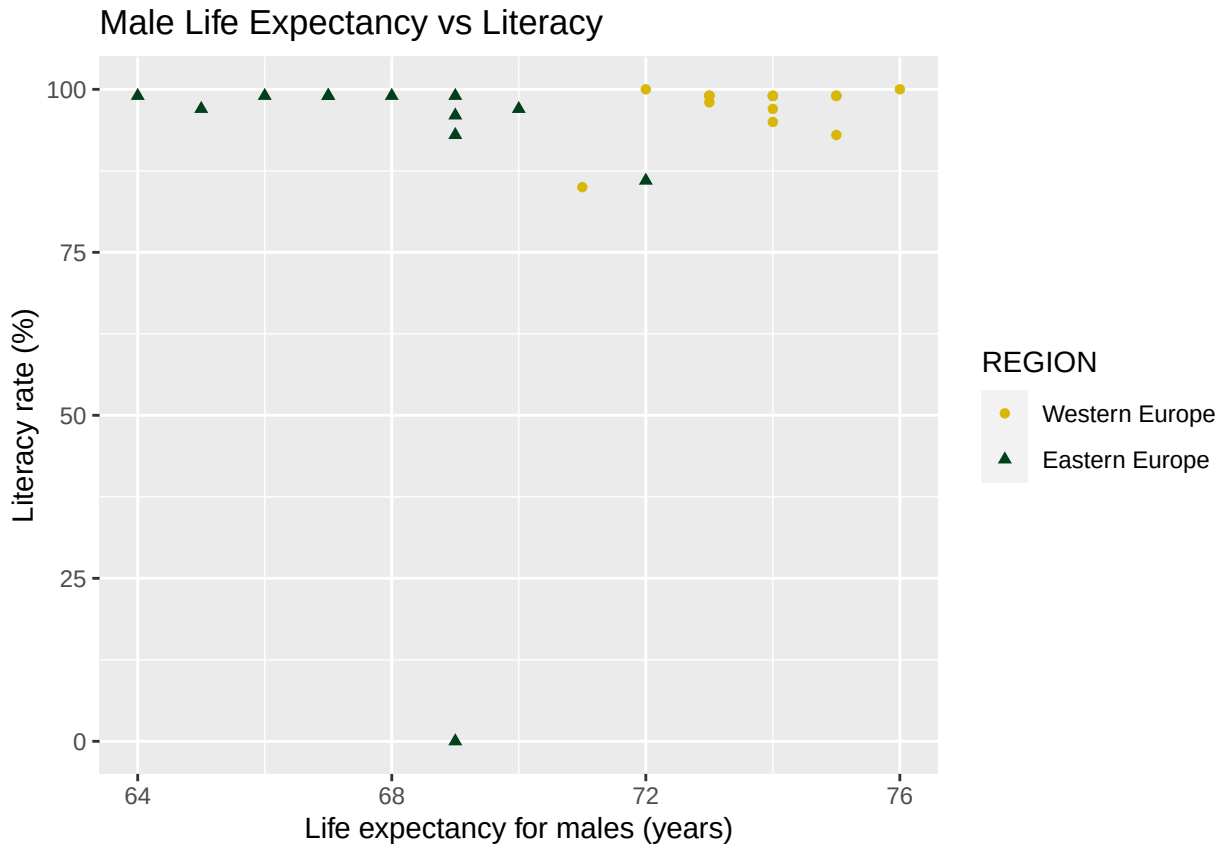

Figure 10: Scatter plot comparing the life expectancy of males and literacy rates in Western and Eastern Europe

Male Life Expectancy vs Population Density

Figure 11 compares the average male life expectancy against population density. Looking at the Eastern European countries, there is no real correlation between the average male life-span to population density. They all have a population density less than 150 per square kilometre and a life expectancy of 72 years or less. Amongst the Western European countries, most had life expectancies of 72 or greater, yet they were distributed across all densities, with most having a population density of 200 or less.

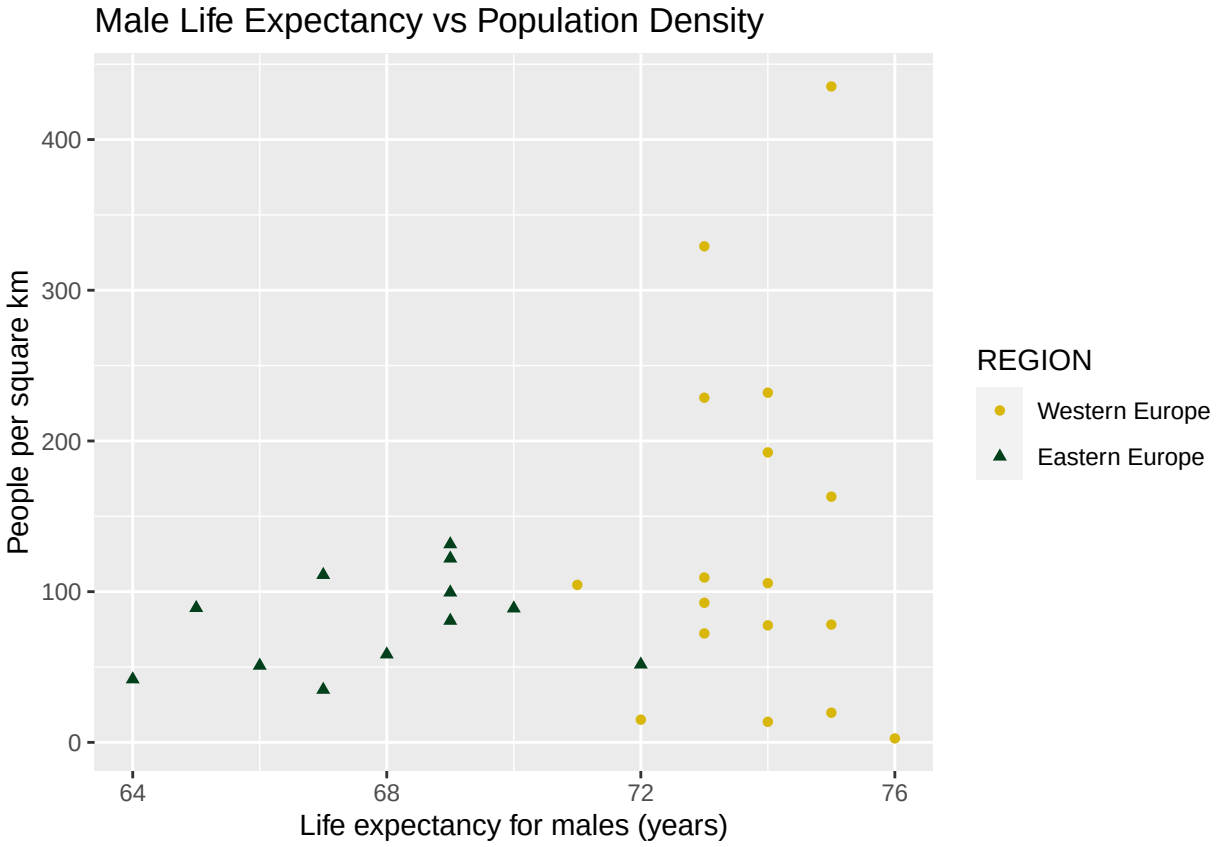

Figure 11: Scatter plot comparing the life expectancy of males and population density in Western and Eastern Europe

Literacy Rate vs Population Density

Countries in Eastern Europe (not Czech Republic) all had literacy rates comparable to those in the west. None of the countries in the east had a population density greater than 150. The Western European countries had high literacy rates, yet they had population densities all along the y-axis (Figure 12).

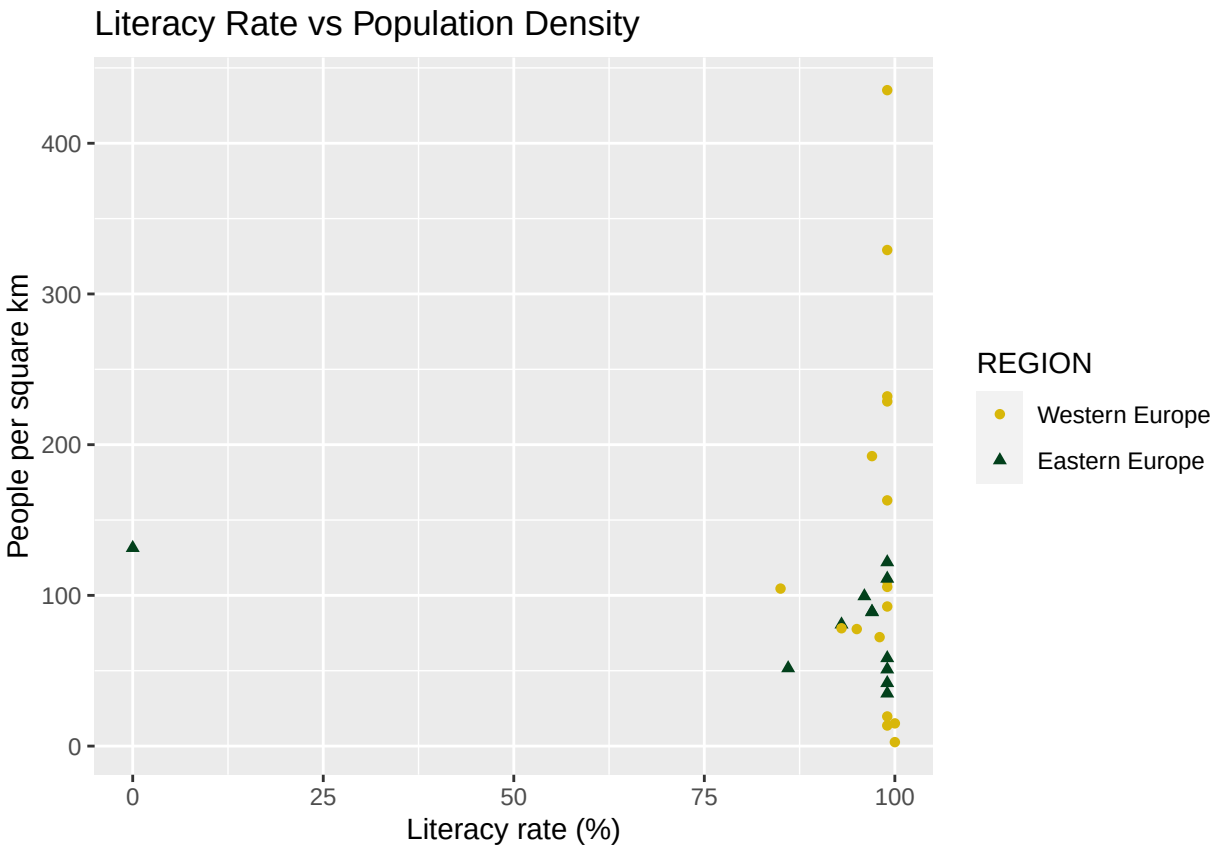

Figure 12: Scatter plot comparing the literacy rates and population density in Western and Eastern Europe

Discussion and Conclusion

There was no correlation between literacy rates and two regions of Europe, or any of the other variables. It could be assumed that there was no data for the literacy rate in Czech Republic as a literacy rate of 0% is highly unlikely, as the rest of the eastern countries all had literacy rates greater than 80%. Population density also did not have a great influence over the other variables. The GDP and life expectancy were highest in western countries. Life expectancy and GDP were highest in the European countries that were part of the Organization for Economic Co-operation and Development. Being a member of the OECD could have meant that there were more opportunities for economic development and trade with other wealthy nations, enabling the GDP to grow, which would lead to more spending on public services such as healthcare, leading to a higher life expectancy. In conclusion, a country being a member of the OECD is going to be the greatest determinant of GDP and life expectancy.