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Dashboards Course

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World Life Expectancy – Dashboard

Impact

The Global Health Observatory (GHO) data repository from the World Health Organization (WHO) keeps track of the health status, diseases, and immunization rates, and other factors related to life expectancy for all countries. The dataset we sourced from contained life expectancy factors for 193 countries collected from the same WHO data repository, it also corresponds to economic data collected from the UN website. Among categories of health related factors, only critical factors are chosen which are the most representative of life expectancy. Dataset: https://www.kaggle.com/datasets/kumarajarshi/life-expectancy-who

There have been major improvements in the health sector in the past 30 years leading to the 2000s, especially in developing countries. There are a couple of new factors that were added to this dataset outside of the WHO. We included immunization and the human development index which are crucial indicators of a population's overall health. That is due to the elimination of lethal illnesses so vaccinations providing immunization from many health threats contribute to life expectancy. Economic conditions are also an important force behind mortality decline and thus life expectancy increases if a country has a higher standard of living.

Another important factor is the period, which is from 2000 to 2015 as opposed to just one year of data. As we observe the period across a time series plot, the life expectancy in both developing and developed countries could be observed year-to-year. As we examined our visualizations that looked at life expectancy in developing and developed countries, we emphasized immunization, mortality, and economic, social, and health factors.

Results

I. In our first pie chart, we observed that developed countries have an average life expectancy of 79 years compared to 67 years for developing countries. In this case, life expectancy measures premature deaths, so this distance shows a large difference in health across the world. The

population of the wealthiest countries have a life expectancy much higher than developing ones, however, our team was curious about which countries had the highest life expectancy.

II. Next, we want to use a Line Chart visualization where the two axes of a graph represent the dimension (*year*) and a measure (*life expectancy*) are plotted together. We have our markers generated from our line chart and can toggle the top countries. For instance, if we toggle to the top 10 countries, there will be an additional 9 line trends given to each top 10 country. You can see Japan as a country has been trending toward a long-life expectancy while countries like Iceland and Sweden dropped trending toward dropping in life expectancy. Our group noticed that the United States did not make the top 10 or even the top 20 on life expectations. It can be because there is not enough data, or the US is in decline in health. As the baby boomer generation starts to decline, life expectancy in the US will naturally decline.

III. Our group wants to analyze our dataset based on country to evaluate countries and what is life expectancy. By showing a globe, we can visually pinpoint which region or country, or location has a higher or lower life expectancy. Our group created a map that showcases and calculates the average life expectancy of all nations. In the legend, we decided to use a color filter of orange and blue. Orange-colored countries have a life expectancy of around 46.11 years to blues which is 82.54. For instance, we can hover over blue-colored countries such as the US, Canada, Brazil, China, and Australia. Each has a higher life expectancy, but all of them have a different hue given the global level of each country.

IV. In our scatter plot, we can see that an increase in the number of deaths (per 1,000 live births) of HIV/AIDS leads to a decrease in life expectancy. Most patients observed were recorded with HIV/AIDS from 0 to 4 years. The correlation coefficient between the number of deaths per 1,000 live births of HIV/AIDs on life expectancy is -0.55. This suggests a negative relationship that is exponentially distributed due to the majority of deaths contained in the 0 to 4 years. It’s also important to note that the life expectancy is clustered around 50 to 70 years old.

V. This finding led our group to assess the effect of mortality rate on life expectancy based on three different age demographics (infant deaths, under-five deaths, and adult mortality). We observe a negative correlation between the adult mortality rate on life expectancy. Unlike the previous scatter plot observing HIV/AIDs on life expectancy, we included a reversed color filter

that shows the smaller correlations as lighter colors and larger correlations as darker colors. In the adult mortality scatter plot, we noticed that developing countries have, on average, a larger negative correlation to life expectancy. This suggests that developing countries have lower life expectancy when the adult mortality rate increases than developed countries. Compared to infant and under-five deaths, both have a smaller negative correlation with life expectancy. The adult mortality rate has the largest effect on life expectancy. An increase in the number of deaths in developing countries leads to a sharper decrease in life expectancy than in developed countries.

VI. To group countries based on the percentile of life expectancy versus adult mortality rate, we created a scatter plot that groups all countries in percentiles by color while evaluating the strength of the relationship at each point. Japan has the highest life expectancy and lowest average adult mortality rate, grouped with the $<40^{th}$ & $>60^{th}$ percentile. On the other hand, developing countries such as Zimbabwe have the lowest life expectancy at 50 years and the highest average mortality rate at 4.62%. The majority of these developing countries fell in the $<10^{th}$ and $>90^{th}$ percentile of life expectancy.

VII. To evaluate the life expectancy of regular citizens in developing or developed countries, our group considered the body mass index (BMI) and alcohol consumption. An increase in the Body-Mass-Index (BMI) leads to an increase in life expectancy with a correlation coefficient of 0.5551. On the other hand, alcohol consumption has a weaker positive effect on life expectancy with a correlation coefficient of 0.3778. The richer countries have a more affluent population that can afford alcohol for consumption, and we have already found that developed countries have a higher life expectancy. Due to developed countries being present in the visualization, we believe the positive correlation of alcohol consumption increasing life expectancy being carried by them.

VIII. When evaluating the life expectancy of hospital patients in countries, we observed the effect of immunization rates of three diseases – diphtheria, measles, and polio – on life expectancy. As expected, there was a positive relationship between the immunization rate of diphtheria and polio on life expectancy. However, there was a negative relationship between the immunization rate of measles on life expectancy. Our group determined that the smaller number of immunization rates for measles or lower than 50,000 cases causes outliers to reduce the effect on life expectancy.

IX. The prevalence of thinness in developing countries due to malnutrition led our group to visualize the effect of thinness among children and adolescents. The prevalence of thinness at 5 to 9 years old on life expectancy has a correlation coefficient of -0.4631. Meanwhile, the prevalence of thinness at 10 to 19 years old on life expectancy has a similar correlation coefficient of -0.4686. Both negative correlations suggest that a prevalence of thinness (%) decreases life expectancy regardless of whether it is a child or teenager.

X. In addition to health factors, there are important economic indicators that affect life expectancy such as the effect of the human development index (in terms of income consumption of resources) on life expectancy. Our group found that an increase in the income composition of resources leads to an increase in life expectancy with a correlation coefficient of 0.6714. Income composition has a very strong effect on life expectancy, but what if we observe the government expenditure on health? We determined that an increase in government expenditure on health leads to an increase in life expectancy; however, this relationship is much weaker with a correlation coefficient of 0.1995. This suggests that government expenditures on health have a lower significance on life expectancy than the income composition of resources.

XI. Our group was not convinced of the small positive correlation between government expenditures on health and life expectancy is universal across all countries. We grouped countries based on the percentile of life expectancy versus median health expenditure per capita. Then, we created a scatter plot that groups all countries in percentiles by color while evaluating the strength of the relationship at each point. We determined that Switzerland has the highest median health expenditure per capita and life expectancy, grouped with the 50^{th} percentile. On the other hand, Sierra Leone has the lowest average life expectancy, grouped with the $<10^{th}$ and $>90^{th}$ percentile. Overall, we determined that developing countries with lower median health expenditure per capita lowered the positive correlation between government expenditure on health and life expectancy.

XII. In our final visualization, our group observed the effect of the number of years spent in school on life expectancy. As our group anticipated, there was a strong positive correlation between years spent in school and life expectancy at 0.6938. However, the omitted variable bias

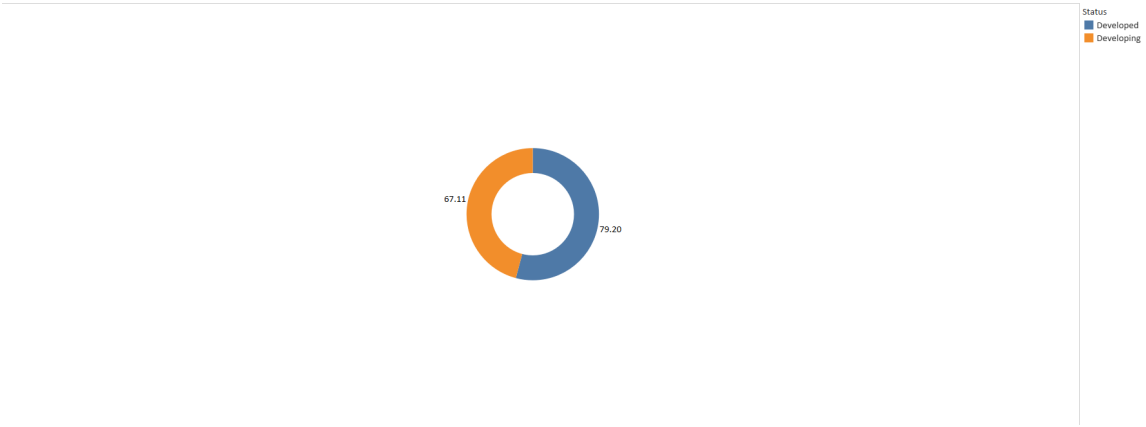
from this relationship suggests that schooling does not explain a significant portion of the variation in life expectancy.

Conclusion

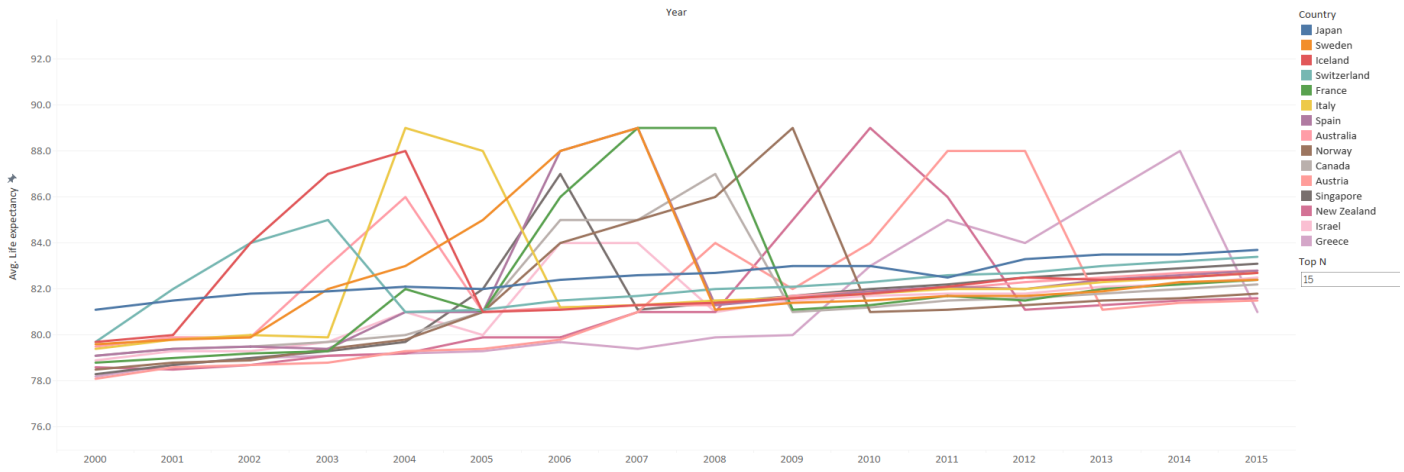
After we examined our visualizations that looked at life expectancy in developing and developed countries, our group concluded that health and social factors have a significant impact on higher life expectancy, especially in developing countries. In richer countries that could afford a greater number of resources, their citizens have higher life expectancies than those in developing countries. Despite this, economic indicators such as government expenditure and schooling positive correlation with life expectancy across all represented countries.

Visualizations

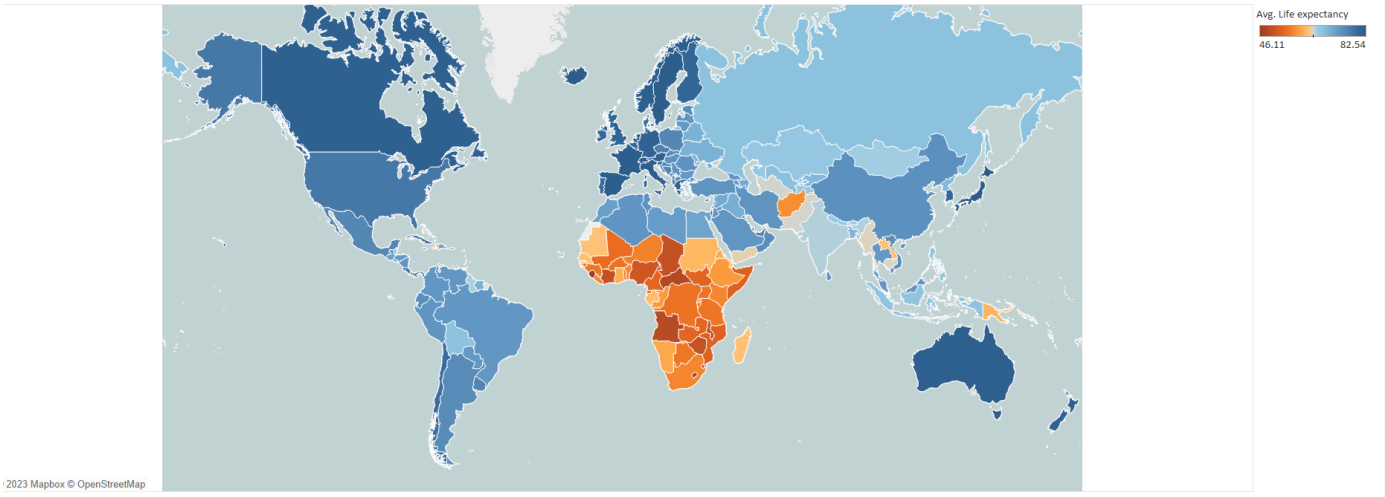
I. Pie Chart – Life Expectancy in Developed versus Developing Countries



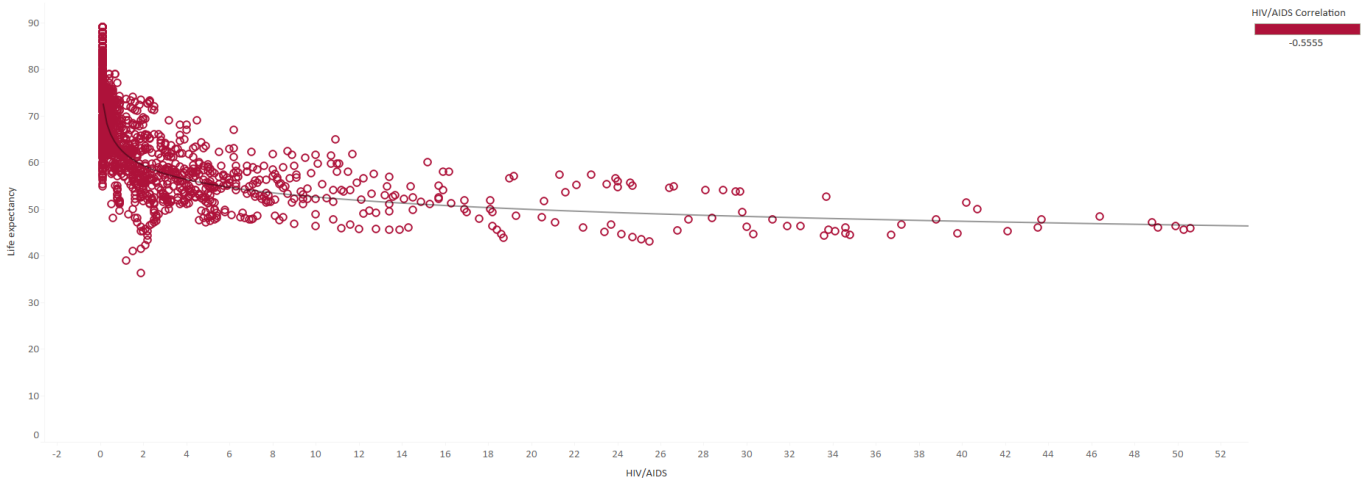
II. Line Chart – Life Expectancy of the Top countries across a period of time (2000 to 2015)



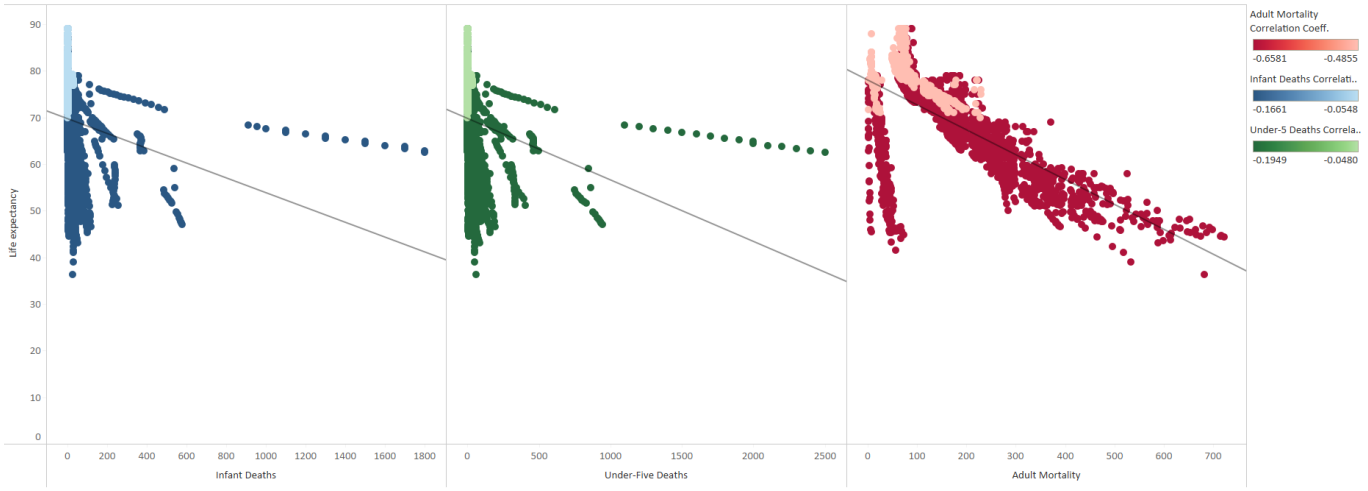
III. Map chart – Average Life Expectancy in Developed versus Developing Countries



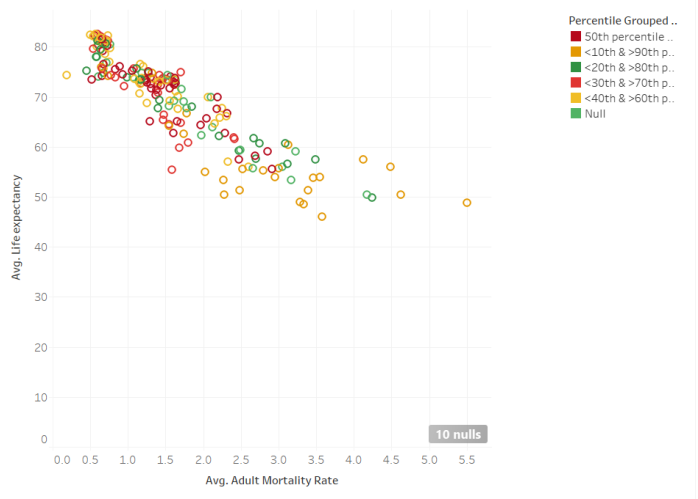
IV. Scatter plot – Number of Deaths from HIV/AIDS on Life Expectancy



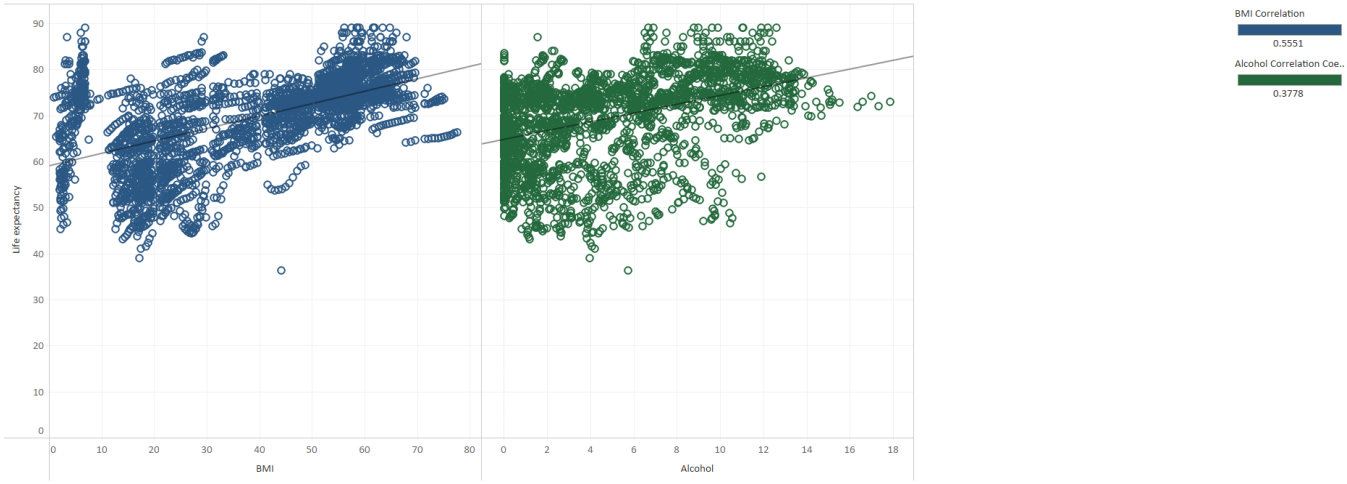
V. Scatter plot – Infant, Under-Five, and Adult Mortality Rate on Life Expectancy



VI. Scatter plot – Average Adult Mortality Rate on Average Life Expectancy

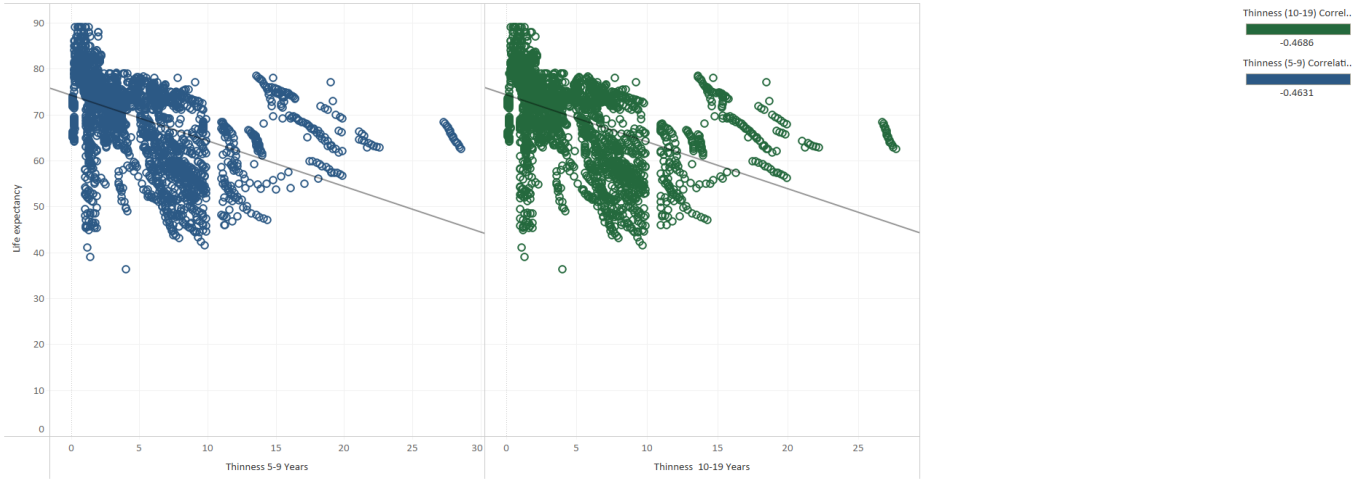


VII. Scatter plot – Body Mass Index (BMI) and Alcohol Consumption on Life Expectancy

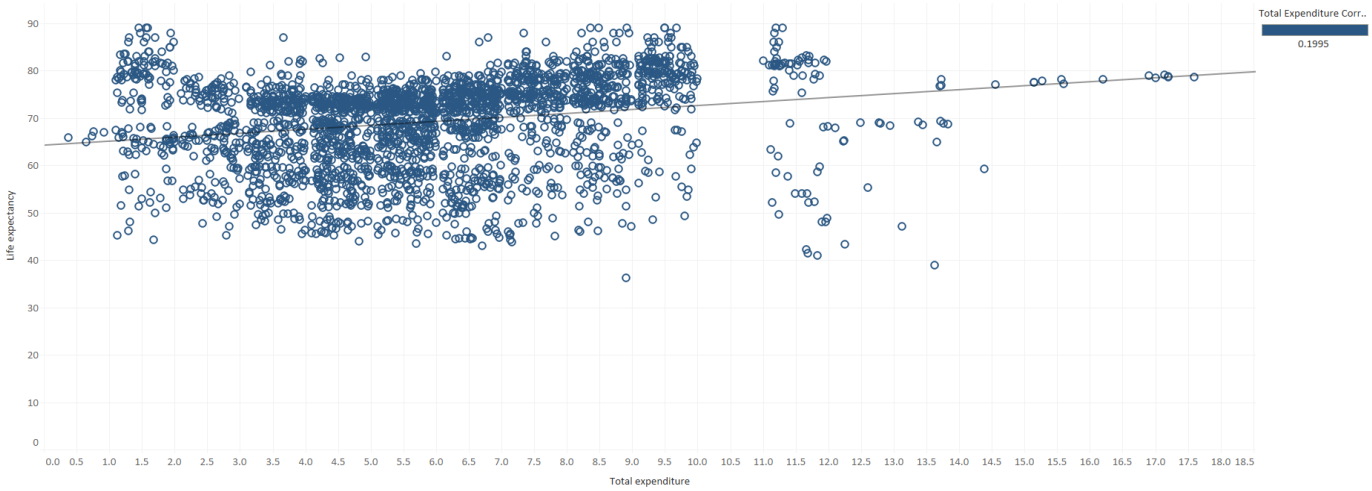


VIII. Scatter plot – Immunization Rate (of diphtheria, measles, and polio) on Life Expectancy

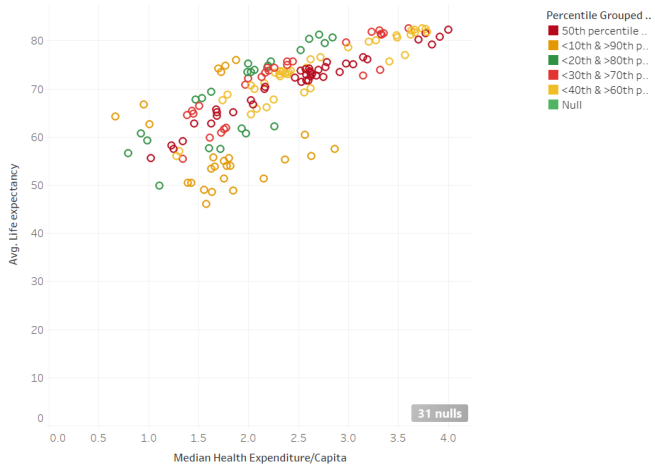
IX. Scatter plot – Prevalence of Thinness (5 to 9 years & 10 to 19 years) on Life Expectancy



X. Scatter Plot – Total Government Expenditure on Life Expectancy



XI. Scatter plot – Median Health Expenditure per Capita on Average Life Expectancy



XII. Scatter plot – Years on Schooling on Life Expectancy