Topics in HCI - Assignment 2 - Hyejin Jenny Yeon

OECD Statistics Exploratory Data Analysis

What can explain the US's decline in life expectancy?

Introduction

Recently, I stumbled upon a Wikipedia page showing the 5-year survival rate of stomach cancer in the US. I was surprised by the number - 30.6% - because I heard about how easy it is to treat early-stage stomach cancer. Then I jumped to a conclusion thinking maybe a poor cancer treatment is a part of the reason why life expectancy in the US has been declining. By the way, I am not a healthcare worker so I knew I could be very wrong. So I looked up how this number 30.6% compares with other parts of the world, and here is what I found.

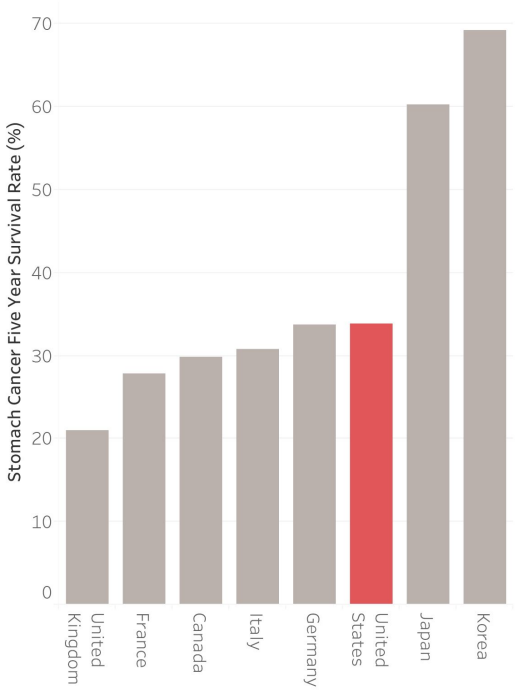


***Figure 1**. Stomach cancer five year survival rate by country. 8 out of 10 countries* with the highest nominal gross domestic product (GDP) are shown.*

Data Source: OECD Health Status - Cancer Data.

* China and India are excluded due to data being unavailable. The ranking is from List of countries by GDP (nominal) - Wikipedia

Okay, the number "30.6%" found from the Wikipedia page was not bad compared to the other countries. In fact, when I looked at how various cancers' 5 year survival rates have evolved over time in the US, it was progressing for the most part.

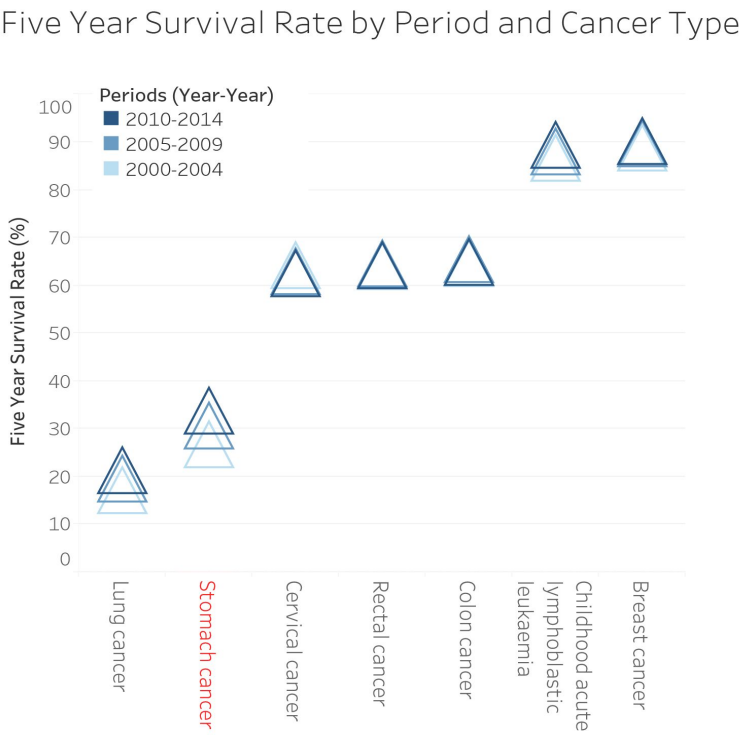


Figure 2. The US's Five Year Survival Rates of various cancers are shown. Note that Stomach cancer's survival rate has improved over time.

Data Source: OECD Health Status - Cancer Data.

The US appears to get better at coping with cancers. I could have stopped here by admitting that I was wrong. But then I decided to look at how this compares with the other countries. A spoiler alert: I was wrong again. The US was doing fine.

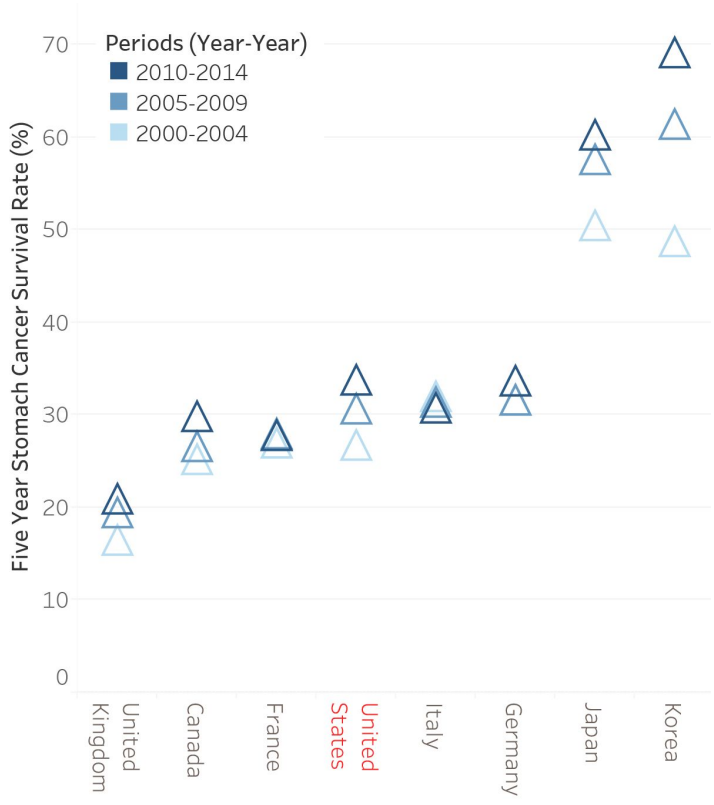


Figure 3. How the US's Five Year Stomach Cancer Survival Rate progression compares with other countries. The US shows a consistent improvement over time.

Data Source: OECD Health Status - Cancer Data.

I was surprised and did a quick fact check. I found that cancer is still one of [the leading causes of death in the US](). Confused, I started questioning if what I know about the decline in life expectancy was entirely wrong. And here is what I saw

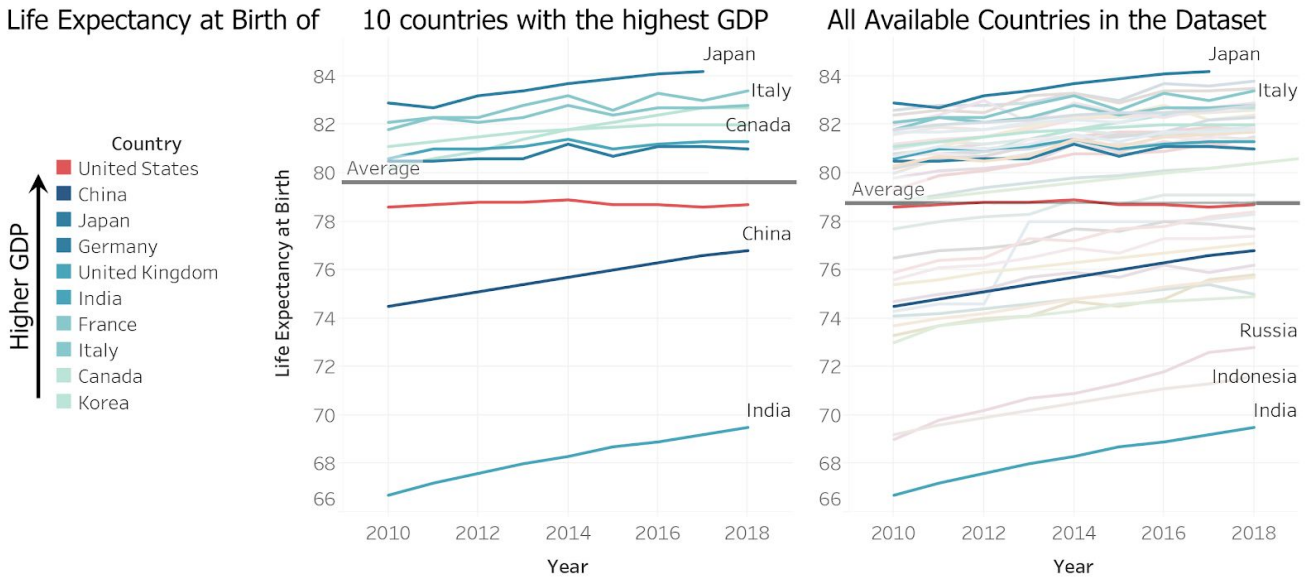


Figure 4. Life Expectancy at Birth by Year is shown. Each average line shows the average value among all the countries and all years. Data Source: OECD Health Status - Life expectancy.

In short, the US never reached an average life expectancy among the 10 countries with the highest GDP and is barely at the average if we include all the countries in the dataset. Whether the US is above or below the average may slightly change if we look at the yearly average values instead. But undeniably, it has not been increasing. Of the three countries below the average among the ten highest GDP countries - India, China, and the US - the US is the only country that is not showing growth in life expectancy. So what I heard about the US decline in life expectancy was not only true but also a very concerning problem.

Preventable Mortality

The cancer survival rate analysis before seems to contradict this life expectancy finding. While searching through various causes of death in the dataset, I found something called "*Preventable Mortality*." OECD defines this to be *causes of death that can be mainly avoided through effective public health and primary prevention interventions (i.e. before the onset of diseases/injuries, to reduce incidence)*." While many countries in the dataset showed a great decrease in preventable mortality, the US showed a slight increase over time.

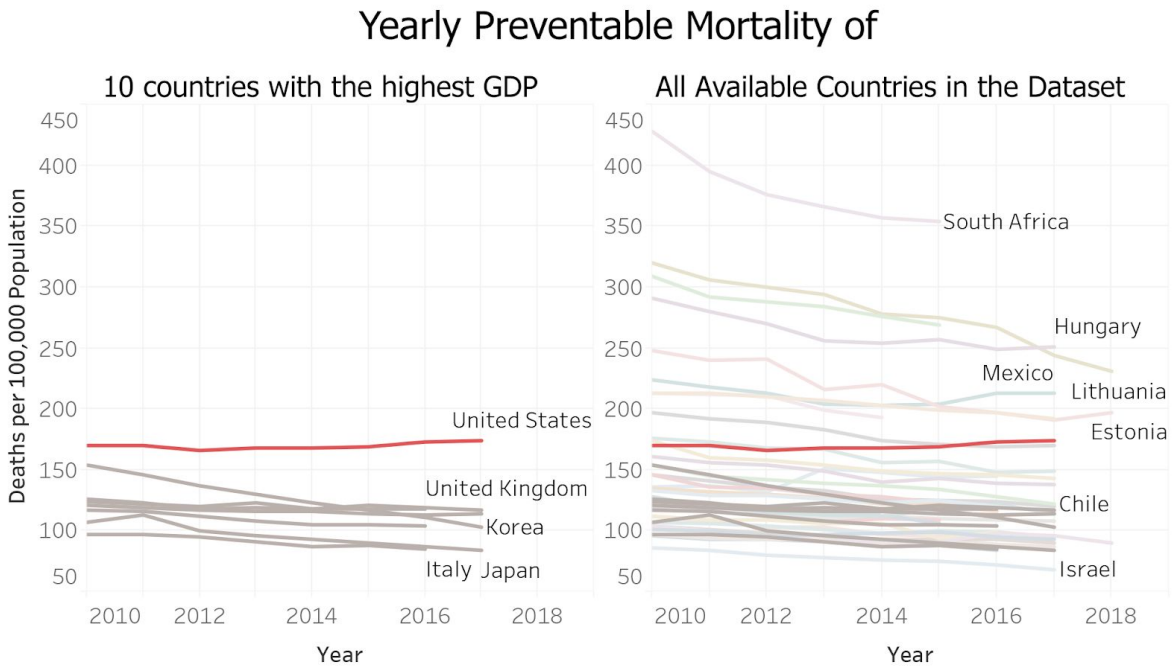


Figure 5. Preventable mortality by countries by year. Data Source: OECD Health Status - Mortality.*

* China and India are excluded from the chart on the left due to data being unavailable.

It is not a secret that access to preventative healthcare can be limited by one's financial situation. The US appeared to have both high preventable mortality and a large proportion of the financially insecure population:

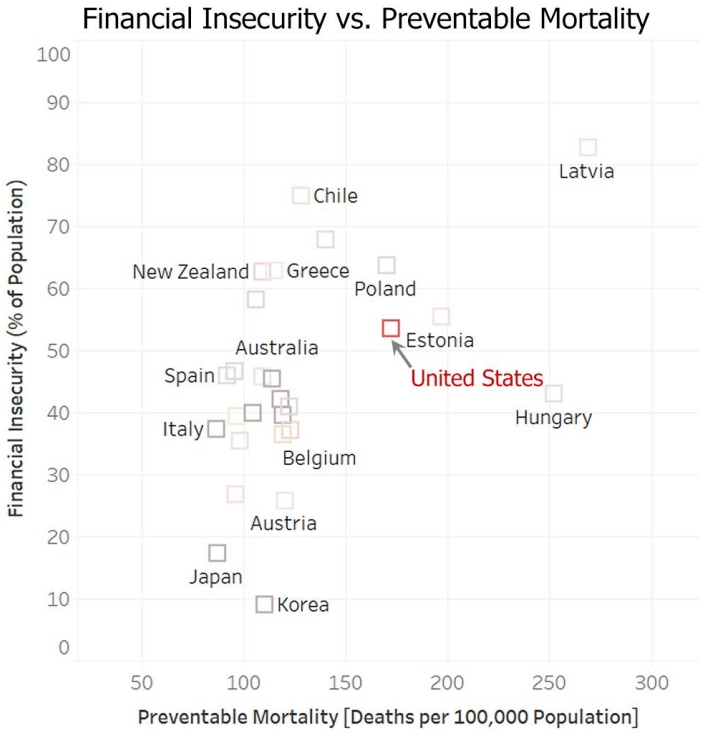


Figure 6. Financial insecurity is measured by the estimated percentage of the population in financial insecurity.

Data Source: OECD How's Life? Well-Being and OECD Health Status - Mortality.

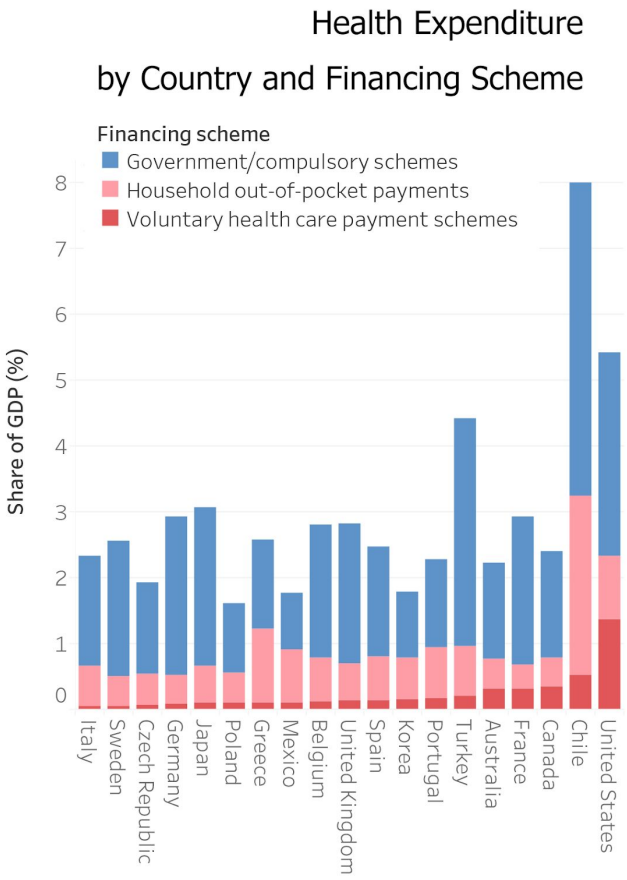
Let's Talk About Money

So are people in the US not spending enough money on healthcare because they are financially insecure? No, the data suggests that the people in the US do spend a lot of money on healthcare. It's not just the individuals, but the government also spends a lot of money.

Figure 7. Average health expenditure by financing scheme is shown as a percentage of the country's GDP. Only the countries with 10,000,000 or more people are shown. Here, the US not only has the highest nominal GDP, but also the highest per capita GDP.

"Voluntary health care payment schemes" include a cost to buy private insurance. "Household out-of-pocket payments" include the out-of-pocket payments for either private or public health insurance.

Data Source: OECD Health expenditure and financing



The chart above shows that the US spends over 1% of the nation's GDP on "Voluntary health care payment schemes." This includes a cost to buy private health insurance, and the US is an outlier when it comes to the ratio between this and the overall healthcare expenditure:

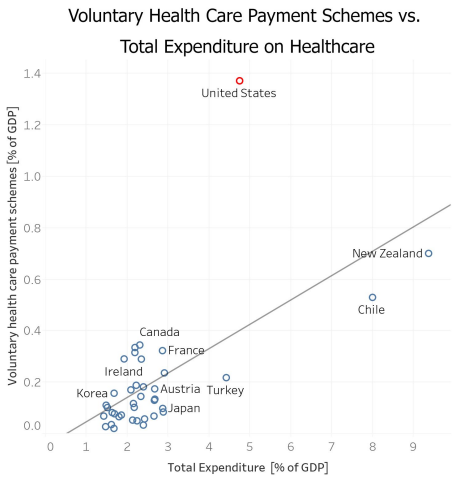


Figure 8. The chart shows the total expenditure on healthcare and "Voluntary health care payment schemes" from all available data. The US has a large proportion of "Voluntary health care payment schemes" in the total expenditure on healthcare.

Data Source: OECD Health expenditure and financing

So why do people in the US need to spend so much money on these "Voluntary health care payment schemes"? This appears to be largely spent on affording the health care system itself. The function "*Governance, and health system and financing administration*" is defined as "*[t]hese services focus on the health system rather than direct health care, and are considered to be collective, as they are not allocated to specific individuals but benefit all health system users. They direct and support health system functioning*." The proportional of this function under "Voluntary health care payment schemes" is very large for the US:

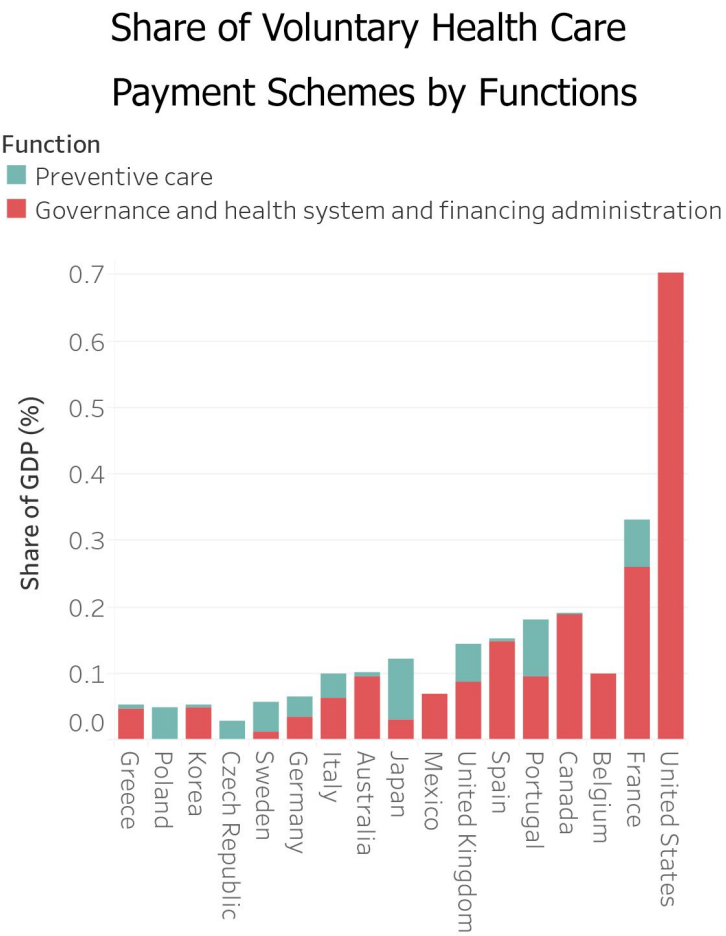


Figure 9. Of the "Voluntary Health Care Payment Schemes," two functions - Preventative care and Governance and health care system and financing administration are shown. Preventative care in the US is only included in "Government/ compulsory schemes" so does not show up in the chart.

Data Source: OECD Health expenditure and financing

And In fact, if we look at the overall percentage shares of different functions on the total healthcare expenditure regardless of the financing schemes, the US spends more money on affording the healthcare system itself than it spends on preventative care. The US is not an exception, however, although it still remains to be the country with the highest percentage share for affording the healthcare system.

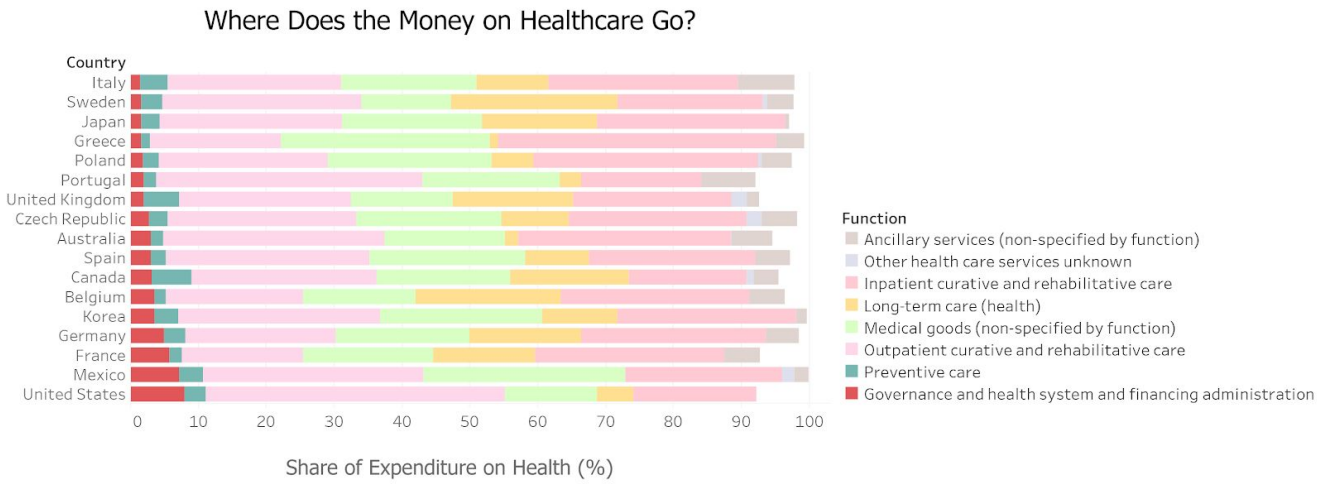


Figure 10. The chart shows the share of expenditure on health by function. It is ordered by "Governance and health system and financing administration." Data Source: OECD Health expenditure and financing.

Having an effective overall healthcare system is important hence most countries would spend some money on this function. However, what distinguishes the US from the rest is how large the amount is and how a large contribution is coming from a "Voluntary health care payment scheme." The chart below summarizes this:

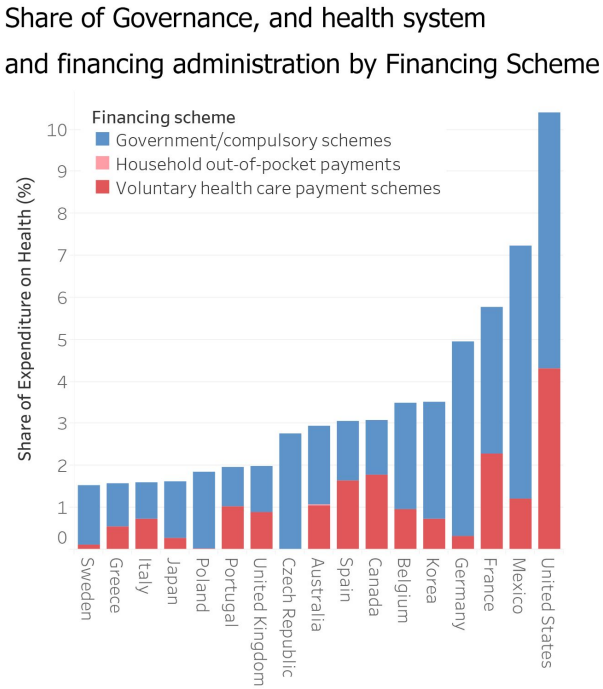


Figure 10.1. In the US, both individuals and the government spend a large share of money on "Governance and health system and financing administration."

Data Source: OECD Health expenditure and financing.

The US Spends a Lot of Money, but Not Everyone Spends

You may have noticed that even if the share of preventative care in the US is not as large as we would hope, it is still a large amount of money, given the country spends a significant percentage of its GDP on healthcare. Not to mention the US has both the highest GDP and per capita GDP among the countries shown in Figure 10. This large expenditure may also explain an increase in the cancer survival rate. However, if we ask the question of "are we spending enough to cover everyone?" then the answer is muddled.

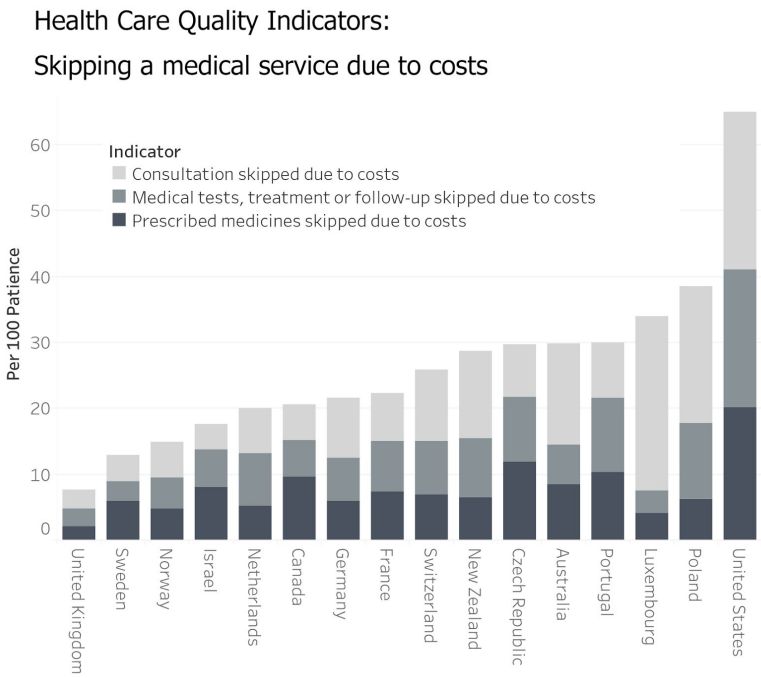


Figure 11. The number of medical services skipped due to costs is shown. All countries with such data are shown. Data Source: Health Care Quality Indicators - Patient Experiences.

The US stands out in terms of the number of skipped medical services in all three categories. As previously shown in Figure 6, Poland has higher financial insecurity than the US yet the US's two categories combined are larger than Poland's total number. This may indicate that there are people who can not spend money on healthcare, even if it is for obtaining a prescribed medication. This is startling given how much money is spent on healthcare. Why do some people skip medical service, especially in the US? When we look at the share of total net wealth owned by the households in the bottom quintile of wealth vs. upper quintile of wealth, the gap is the greatest for the US:

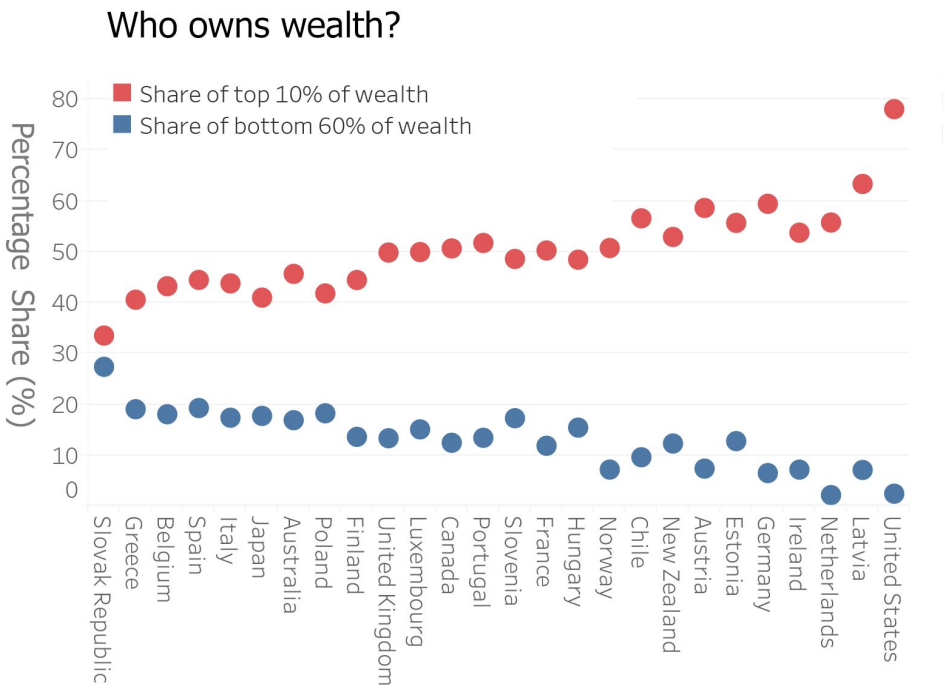


Figure 12. The share of total net wealth owned by the households in the bottom 60% of wealth vs. top 10% wealth. All available data has been used. Data Source: OECD Wealth

The average percentage for the share of the bottom 60% of wealth is around 2.45%, and this number has been slightly decreasing over time as well, from 2.54% in 2010 to 2.5% in 2016. Incidentally, in Figure 2, we see that around 54% of the population was financially insecure in the US. After looking at various aspects of the dataset, I finally searched the term "life expectancy in the US low." The very first thing found was an article saying that income disparity may be a major factor in the decline in life expectancy, indicated by how life expectancy in the US is also dependent on things like "income and race."

Final Thoughts

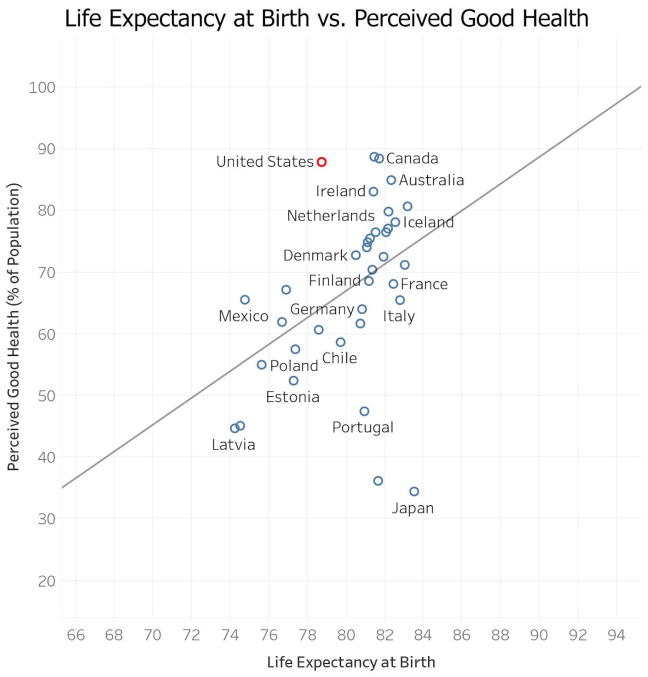
While the quality of healthcare in the US may be superior and improving over time, the limited access to healthcare can still stagnate the life expectancy. The trend in life expectancy appears to be closely related to the non-decreasing number of preventable mortality. Despite the huge expenditure on healthcare, the US is still leading in terms of people not seeking healthcare due to costs.

Here is interesting data where the US is an outlier when it comes to the positive correlation between overall perceived health and life expectancy. This can surely be interpreted in many

ways and I will leave it to the reader to think about this. Nearly 90% of people in the US think they are healthy compared to countries with higher life expectancy.

Figure 13. Life Expectancy at Birth vs. Percentage of the population thinking they have good health.

Data Source: OECD Health Status and How's Life- Well Being



Revisiting the stomach cancer data, two countries - Japan and Korea - have both high life expectancy and high 5-year survival rates for stomach cancer. The Wikipedia article on this cancer suggests that two countries have the highest occurrences of this cancer as well as the highest survival rate, both of which may be due to screening effort. The other two outliers in the above figure - the countries that think they are in poor health but live long - happen to be Japan and Korea.

How the EDA can Help Model User Experience

EDA can help both analyze and improve user modeling and user experience. For example, data showing a large proportion of the users dismissing a dialog may indicate inefficiency in dialog invocation. It may also show an outlier user and such information can help to fine-tune the model itself. EDA can help analyze data collected in A/B testing comparing two different UI/UX or two different models. Furthermore, EDA can suggest how to model the user or user experience by detecting a common pattern among users doing a specific task. A repeated and rigid pattern may also suggest what task may be beneficial to automate.