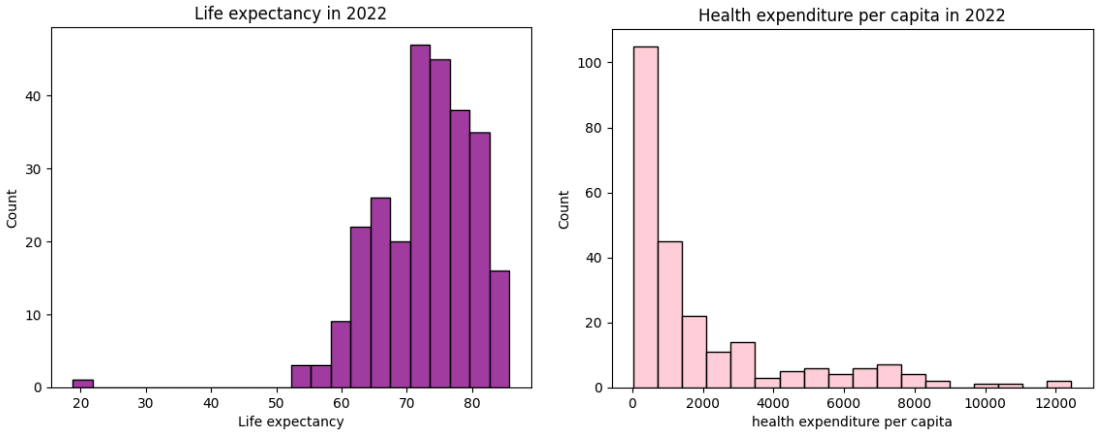
Introduction:

The health of the public is usually a top priority for governments and therefore spend money on health care accordingly. Due to this observation the question we've posed for this is: can we find a correlation between health expenditure and life expectancy while holding democracy index constant. We want to know regardless of the freedom or democracy of a country is money and healthcare correlated to one another.

Data description and sources:

To answer this question we used health expenditure per capita data and life expectancy data from World Bank Open Data and democracy index data from Our World in Data. We cleaned our data to show life expectancy, health expenditure, and democracy index for the year 2022 merging them by country . Once the data was cleaned we made two histograms. One for life expectancy, the other for health expenditure.



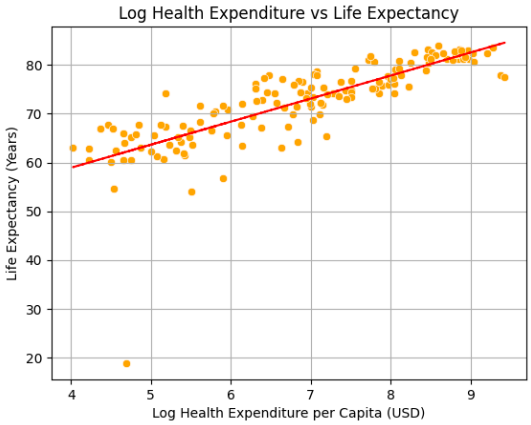
With these models we were able to see the distribution of these values across the money countries on our data set. For example we identified the outlier that hovered around a 20 year life expectancy. We also recognized the right skew nature of health expenditure and decided to reform a log transformation

Methodology:

To answer our research question we are going to perform a log transformation on health expenditure per capita then run a linear regression model. This will show us the spread of the combine from country to country.

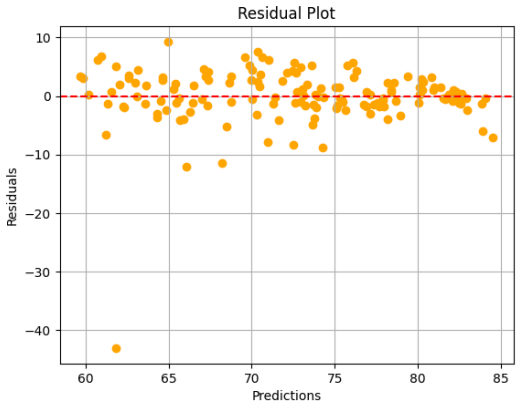
Life Expectancy = B_0 + B_1 (Health Expenditure) + B_2 (Democracy Index) + e

The visual below shows our scatter plot fitted with a regression line:



A strong positive linear relationship can be observed

We confirmed the validity of using the regression model and log transformation and the concentration around 0 conforms our model is appropriate:



Results and Analysis:

The linear regression produced the following output:

OLS Regression Results

Dep. Variable:	Life_Expectancy	R-squared:	0.646
Model:	OLS	Adj. R-squared:	0.641
Method:	Least Squares	F-statistic:	131.2
Date:	Thu, 11 Dec 2025	Prob (F-statistic):	3.60e-33
Time:	15:14:59	Log-Likelihood:	-445.08
No. Observations:	147	AIC:	896.2
Df Residuals:	144	BIC:	905.1
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	40.3997	2.111	19.135	0.000	36.227	44.573
log_value	4.5142	0.397	11.367	0.000	3.729	5.299
Democracy_index	0.1959	0.247	0.794	0.428	-0.292	0.684

Omnibus:	178.241	Durbin-Watson:	1.852
Prob(Omnibus):	0.000	Jarque-Bera (JB):	8165.410
Skew:	-4.445	Prob(JB):	0.00
Kurtosis:	38.413	Cond. No.	47.0

The model finds that for every 1% increase in health expenditure per capita is associated with about 0.045 year increase in life expectancy. We see holding health expenditure constant, democracy index is not a significant predictor ($p = 0.428$).

Conclusion:

This model shows that health expenditure is a strong predictor of life expectancy, even when democracy is held constant. Overall, we found that democracy index has little independent effect once health spending is accounted for. We see more correlation between health expenditure and life expectancy than democracy index and life expectancy.

References:

- https://data.worldbank.org/indicator/SH.XPD.CHEX.PC.CD
- https://data.worldbank.org/indicator/SP.DYN.LE00.IN?end=2023&start=1960&view=chart
- https://ourworldindata.org/grapher/democracy-index-eiu
- Gemini was used to help with code to plot our regression line