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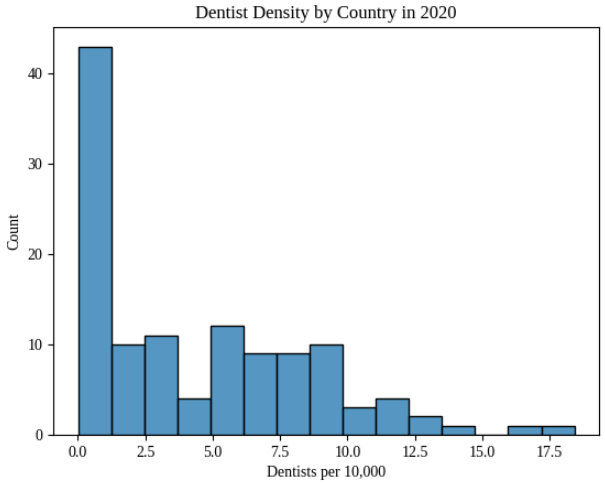
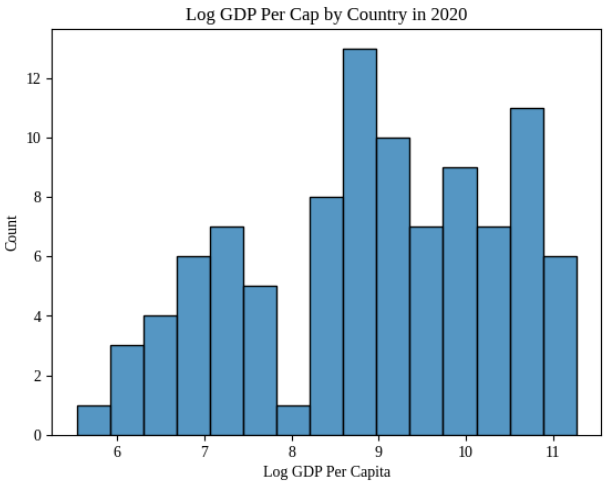
Introduction

Research question: Does the relationship between log GDP per capita and density of dentists differ between countries with universal healthcare and countries without universal healthcare? Having access to dentists is important because it contributes to overall health, and unequal distribution across the world creates unequal access. For countries with higher GDP per capita, we would expect to see a higher density of dentists. We would also expect this relationship to be stronger for countries without universal healthcare than for countries with universal healthcare.

Data

We are going to use data from the World Health Organization and World Happiness Report to collect information on GDP per capita, dentist density, and whether or not a country has universal healthcare. We took the log of GDP per capita to avoid clustering in the data and removed any columns from the data that we did not need, then merged the data sets.

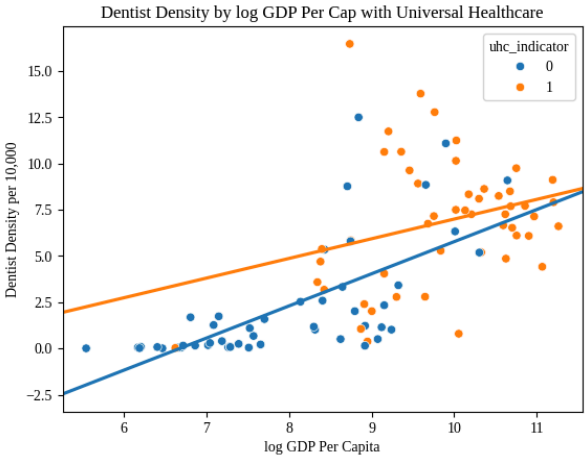




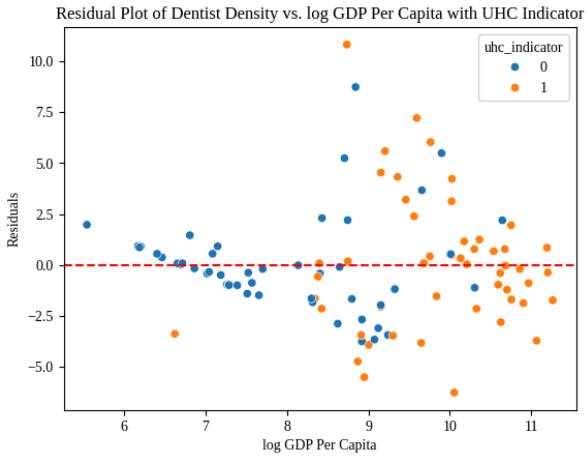
Methods

To answer whether universal health care influences how GDP per capita is related to dentist density we will set up the following statistical model:
Model: RATE_PER_1000_N = beta_0 + beta_1 * log_GDP_Per_Cap + beta_2 * uhc_indicator + beta_3 * (log_GDP_Per_Cap x uhc_indicator) + epsilon
Null hypothesis: There is no difference in relationship between GDP per capita and density of dentists per 10,000 between countries with and without universal healthcare.
Alternative hypothesis: There is a difference in relationship between GDP per capita and density of dentists per 10,000 between countries with and without universal healthcare.

Results



This scatter plot shows a positive correlation between log GDP per capita and density of dentists per 10,000 in both countries with and without universal healthcare. When universal healthcare is included as an interaction term, countries with universal healthcare tend to have a larger density of dentists than those without universal healthcare. In countries without universal healthcare, log GDP per capita has a stronger influence on dentist density.



The residual plot shows that for countries with higher log GDP per capita, the spread typically increased. Therefore, we added robust standard errors to our model to adjust for this heteroskedasticity.

Conclusion

We ran a t test with multiple variables to determine how UHC impacts the correlation between log GDP per capita and dentist density. Every 1 unit increase in log GDP Per Cap impacts the density of dentists by 0.6782 units less for countries with UHC compared to countries without UHC (beta_3). However, the p-value was 0.267, so we fail to reject the null hypothesis because the probability of obtaining a beta_3 this extreme or more extreme is greater than 0.05.

Sources

World Health Organization (WHO)- dentist density, universal health care
Dentist Density: https://data.who.int/indicators/i/C25EFD6/9F88C44
Universal healthcare: https://www.who.int/data/gho/data/indicators/indicator-details/GHO/countries-that-have-passed-legislation-on-universal-health-coverage-(uhc)
World Happiness Report- GDP per capita: https://www.worldhappiness.report/data-sharing/
Google Gemini- explain errors, add color/lines to scatter and residual plots