Measuring Healthcare Access:
Are Income and Health Insurance Coverage Associated with whether Americans have a Usual Doctor's Office?

Abstract: Several prior studies have researched factors which impact access to a doctor's office for preventative care, but few recent studies examine the impact of income and health insurance type on the scale of the entire US adult population. We examined the survey responses of one adult per household in the 2018 US Medical Expenditure Panel Survey Household Component (*n* = 11,332) to assess whether household income and insurance coverage type are significant predictors of access to a usual doctor's office for medical care, when accounting for age and race. We found that household income and insurance coverage type were both significant predictors of doctor's office access, and we found significant differences in access between uninsured people and people with private or public insurance. However, we found no evidence of a significant difference in access between people with private and public insurance coverage, and we found no evidence that the relationship between income and doctor's office access varies depending on insurance coverage type. Thus, our research suggests that higher incomes and access to health insurance are associated with a significant increase in access to the preventative care of doctor's office visits.

Introduction

Healthcare access and insurance coverage are controversial debates in American politics. Depending on insurance types, Americans face various restrictions on which medical offices and services are covered by their insurance, such that out-of-pocket costs become a barrier to healthcare access for many Americans. In this study, we examine factors that may influence whether a person has access to a doctor's office for usual care, including type of health insurance coverage and household income. We will be controlling for age and race, since previous studies have indicated that these demographics may affect if a person has a usual doctor's office for medical care. Thus, our primary hypothesis is that there is a statistically significant difference in whether someone has a usual office for medical care based on household income, when controlling for age, race, and insurance coverage type. Our secondary hypothesis is that there is a statistically significant difference in whether someone has a usual office for medical care based on insurance coverage type, when controlling for age, race, and household income. To address these questions, we created a logistic regression model predicting whether someone has a usual doctor's office from income, insurance type, age, and race. Then, we use a *z*-test and confidence interval to assess the significance of household income, and we use nested likelihood ratio tests, individual *z*-tests, and confidence intervals to investigate the significance of insurance coverage type.

Several prior studies have researched how different factors might impact where individuals go for their medical care. One paper reported that adolescents who are in vulnerable positions, in terms of self-reported mental health, history of abuse and other factors, may be more likely to use the emergency room than a usual doctor's office (Wilson and Klein, 2000). The same study indicates that using mostly the emergency room may be associated with missing out on needed care. Another paper suggests that type of insurance coverage and having a usual place for care may have an association with the dedication to preventative healthcare (DeVoe et al., 2003). They emphasize the importance of preventative care in both the timely treatment of mental and physical conditions and the reduction of non-urgent emergency room care. Both of these studies use data from the late 1990s, and since the landscape of healthcare in the United States has now changed due to various legislation, it is important to update our models of the role income and insurance coverage play in doctor's office access. Additionally, most recent studies focus on a particular state or ethnic group, so our investigation will provide a broader view. We chose to focus on the variable household income because, while other studies include variables relating to financial status, they are often control variables. Thus, this research examines the impact of income and insurance coverage type as explanatory variables.

Methods

We obtained data from the Medical Expenditure Panel Survey Household Component (MEPS) for the year 2018 stored in the IPUMS MEPS archive. MEPS is a survey produced by the US Department of Health & Human Services Agency for Healthcare Research and Quality. Surveys were issued to subsets of households that had responded to the National Health Interview Survey in the previous year, which selected participants from a random sample of census clusters to achieve sampling efficiency due to the face-to-face interview format (Division of Health Interview Statistics, 2018). For 2018, there are 30,461 individuals in the original dataset. Because the surveys were filled out for households, we sampled one random individual from each household to maintain independence. After this sampling and the other filtering of our data, our sample includes 11,332 individuals. We intend for the sample to represent the adult population of US citizens ages 18 to 84, which is around 248.6 million people (US Census Bureau, 2019).

The outcome variable of our model is HasUsualOffice which is a binary variable for whether an individual visits a doctor's office for usual medical care. We removed respondents who did not know about their usual medical care setting. Our primary explanatory variable is Income, which collects the total income of a household (in US dollars) and includes those in debt with negative

income. Our secondary variable is Insurance with types private, public, and uninsured. We control for Age in years, and since participants ages 85 and older were grouped together into one age value (85), we filtered out those participants, such that each numerical age is a measurement unit of one year. We also eliminated minors because children tend to fall under the head of household's income and insurance. Children also have additional medical needs compared to adults, and thus may follow a different pattern of medical care. Our other control variable is Race. We recognize that it is important to handle the race variable carefully when attempting to combine different categories; however, the sum of all the eight Multiple Race categories contributes only 1% to the whole sample. Hence, we combined eight Multiple Race categories into one category called Multiple Races. The categories for the race variable now includes White, Black/African-American, Alaskan Native or American Indian, Asian, Pacific Islander, and Multiple Races.

The conditions for logistic regression are satisfied. Our empirical logit plots appeared linear for both HasUsualOffice vs. Income and HasUsualOffice vs. Age, so we were confident in the linearity of our data. We selected one participant per household to ensure independence, and the sampling process used a random sample of census clusters, which is a reasonable approximation of randomness. We also considered the possibility of multicollinearity among our explanatory variables, but after fitting our model and finding most predictors individually significant, we have little concern that multicollinearity would affect the conclusions from our model.

We fit a full logistic regression model predicting HasUsualOffice from Income and Insurance when accounting for Age and Race. To address our primary hypothesis regarding the significance of Income, we performed a *z*-test to assess whether Income is a significant predictor of HasUsualOffice with Age, Race, and Insurance held constant, and we created a 95% confidence interval for the log odds ratio. Then, to address our secondary hypothesis, we created a reduced model excluding Insurance as a predictor. We compared these two models with a nested likelihood ratio test to see if Insurance adds significant information beyond the explanatory power of Age, Race, and Income. We also used *z*-tests from our full model to assess for significant differences among each pair of insurance types: Private vs. Uninsured, Public vs. Uninsured, and Private vs. Public, and created 95% confidence intervals for significant log odds ratios. Finally, we added an interaction term between Income and Insurance, and we used a nested likelihood ratio test to assess whether the relationship between HasUsualOffice and Income varies among insurance types.

Results

Almost every variable in our analysis was significant at the α = .001 level, including the controls for age and most races. Most notably for our purposes, we found a statistically significant difference in whether someone has a usual office for medical care based on household income, when controlling for age, race, and insurance coverage type ($z = 3.887$, $p < .001$). Based on the log odds ratio of $1.281*10^{-6}$, our model predicts that if household income increases by $10,000, the odds that someone has a usual office for medical care increase by a factor of 1.013, with all other variables held constant. We are 95% confident that this factor falls between 1.006 and 1.019.

Additionally, we found that insurance coverage type adds statistically significant additional information to our model predicting HasUsualOffice from income when already accounting for age and race ($G(2) = 196$, $p < .001$). We found a statistically significant difference in whether someone has a usual office for medical care between people with private insurance and uninsured people ($z = -13.053$, $p < .001$), with age, race, and income held constant, and our log odds ratio of -1.074 predicts that the odds someone has a usual office for medical care decrease by a factor of 0.342 for an uninsured person, as compared to someone with private insurance, with age, race, and income held constant. We are 95% confident that this decrease falls between a factor of 0.291 and 0.401. We also found a statistically significant difference in

whether someone has a usual office for medical care between people with public insurance and uninsured people (z = -11.737, p < .001), with age, race, and income held constant, and our log odds ratio of -1.015 predicts that the odds someone has a usual office for medical care decrease by a factor of 0.362 for an uninsured person, as compared to someone with public insurance, with age, race, and income held constant. We are 95% confident that this decrease falls between a factor of 0.306 and 0.429. However, we found no evidence of a statistically significant difference in whether someone has a usual office for medical care between people with private and public insurance, with age, race, and income held constant (z = -1.243, p = 0.214). We also found no evidence that the relationship between HasUsualOffice and income varies by insurance type, when holding race and age constant (G(2) = 0, p = 1).

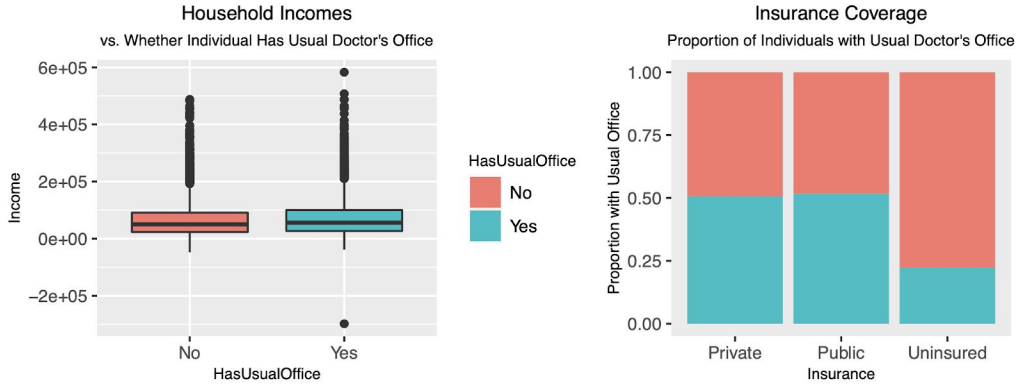

Figure 1: Doctor's office access corresponds with higher incomes. We found significant differences between uninsured people and those with private or public insurance, but we found no significant difference between public and private insurance.

Discussion

As a measure of healthcare accessibility in the United States, we aimed to establish that household income and type of health insurance coverage are associated with whether a person has a usual doctor's office as a place for care. Our data confirmed both hypotheses: we found significant differences in doctor's office access based on household income, when controlling for age, race, and insurance coverage type, and we found that insurance coverage type adds statistically significant additional information to our model predicting doctor's office access from household income when controlling for age and race.

After filtering our data, there were sufficient samples to assess this model (n = 11,332), and we successfully verified the logistic regression conditions including linearity, independence, and randomness. The advantage of using MEPS data is that it can reach more participants than a survey circulated by an insurance company or medical institution, and thus achieve a more representative sample. However, there are still many limitations to our findings. We excluded people under 18 or over 85 in our analysis, and this data has small sample sizes for Alaskan Native or Native American people, Pacific Islanders, and people of multiple races, so our findings may have limited relevance in those groups. We also chose to combine the eight multiple race categories into one, and while those participants who identified as multiple races made up a small portion of the cases, the singular category of multiple races is not representative of those participants. Finally, there is always the risk of question misinterpretation in self-reported data, however, since this data was collected by interviewers, hopefully this effect was minimized.

From our model and testing methods, we were able to conclude that income and insurance type are associated with whether a person has a usual office for medical care. While this is an observational study, and therefore any causal implications are inappropriate, this study provides an overview of the important association of income and health insurance coverage type with access to a usual doctor's office for preventative care.

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