
#### Abstract

Effects of Private and Public Health Insurance on Diagnosis of Heart Disease


## Lillian Tia

Director: Leigh Greathouse, Ph.D.

This study examines the relationship between the presence of private or federal health insurance and the chances of being diagnosed with heart disease. Secondary data from the Meals on Wheels Longitudinal study ( $\mathrm{n}=807$ ) was used. A two sample Z test for difference in proportions was used to study the relationship between the presence of health insurance and the chances of being diagnosed with heart disease, while controlling for age, income, and nutrition. There was no statistically significant relationship between the presence of health insurance and diagnosis of heart disease $(\mathrm{P}$-value $=0.071)$.
Relative risk was calculated to see the probability of not getting heart disease if a subject has insurance. There is a $12 \%$ benefit of an insured person preventing a diagnosis of heart disease $(R R=0.88)$. The result of this study can help inform the debate on the effects of health insurance on a person`s chance of being diagnosed with heart disease and other preventable illnesses.

# APPROVED BY DIRECTOR OF HONORS THESIS 

Dr. Leigh Greathouse, Nutrition

## APPROVED BY THE HONOR PROGRAM

Dr. Andrew Wisely, Interim Director

Date:

# EFFECTS OF PRIVATE AND PUBLIC HEALTH INSURANCE ON DIAGNOSIS OF HEART DISEASE 

A Thesis Submitted to the Faculty of Baylor University

In Partial Fulfillment of the Requirements for the
Honors Program

By
Lillian Tia

Waco, Texas

December 2020

TABLE OF CONTENTS
Table of Figures ..... iii
Acknowledgements. ..... -iv
Chapter One: Introduction and Background ..... 1
Chapter Two: Methods ..... 5
Chapter Three: Statistics and Results ..... 7
Chapter Four: Discussion ..... 9
Bibliography ..... 12

## TABLE OF FIGURES

Figure 1: Percent of those with Heart Disease by Insurance Status-----------17

## ACKNOWLEDGMENTS

This thesis would not have been possible without the help from a whole team of people supporting me. First, I would like to thank my mentor, Dr. Leigh Greathouse, for guiding me throughout this project. Your expertise, support, and mentorship has been greatly appreciated. Though many Baylor professors have helped me on this journey, I would like to thank Dr. Paul Zinke, and Mr. Scott Prather. Your advice and support have helped immensely. Finally, I would like to thank my parents who have supported me throughout this endeavor. Your unquestionable love and support know no bounds. Without anyone of these people in my life, this project would not have been accomplished.

## CHAPTER ONE <br> Introduction and Background

Problems with healthcare coverage affect roughly 27.9 million people in America. These uninsured are unable to receive both preventative and acute care for their illnesses. Additionally, a lack of health insurance can lead to a higher mortality among those with preexisting diabetes, hypertension, or heart disease (Mcwilliams, 2004). Currently it is believed that a lack of healthcare can decrease a person`s health by lowering their ability to receive both adequate treatment and regular check-ups with a physician. Regular check-ups are used to prevent illnesses from getting severe enough to warrant a trip to the ER. With this reasoning, having healthcare for all should lead to a decreased chance of patient death and illness.

Currently, the consensus among researchers is that the uninsured receive far less treatment and health services than their insured counterparts. (Institute of Medicine, 2002). A study conducted by the Institute of Medicine (2002) showed that not having insurance can have negative consequences for not only preexisting illnesses but also hurt peoples` ability to get proper preventative care for diseases like cancer, diabetes, AIDS and kidney disease. This inability to receive the appropriate treatment stems from the uninsured being unable to afford the high prices of medication, doctor check-ups etc. Lastly, the study concludes that millions of Americans are not getting enough healthcare and are receiving care too late. Not receiving treatment in the appropriate time frame results in these uninsured Americans being diagnosed with preventable diseases, receiving poorer healthcare, and dying earlier. But there is a flaw is this study, in that
these types of studies cannot be randomized to randomly assigned subjects to be either insured or uninsured. This study did not demonstrate that healthcare can lead to better health results and care, but it does demonstrate that those with insurance receive more and/or better treatment faster than those of uninsured patients. In summary, insurance aids people in receiving affordable, timely treatment and management of chronic illnesses by the use of regular check-ups.

Many previous studies analyzing the benefits of healthcare insurance did not include the top social determinants of health: nutrition, age, and income. Thus, this study aims to look at the beneficial effects of insurance while controlling for nutrition, age, and income.

Nutrition, as one of the top social determinants of health, can affect a person`s chance of becoming diagnosed with a chronic illness. In a study looking at the effects of different levels of fruit and vegetable intake effect on ischemic heart disease risk, it was found that there was a significant association between a higher level of fruit and vegetable intake and ischemic heart disease risk. By eating 1 extra portion of fruit or vegetable daily, a person can lower their chance of dying from ischemic heart disease by $22 \%$ (Linden, 2011). This helps to support the claim that proper nutrition has a positive effect on reducing the chances of being diagnosed with a chronic illness like heart disease. In another study female subjects were followed for 5 years, revealing that a higher intake of fruits and vegetables may protect against cardiovascular diseases by reducing deaths and the need for bypass grafts in the heart or coronary angioplasties (Liu el al., 2000). To conclude, nutrition has the ability to specifically affects heart health whether or not the subject had insurance.

Another one of the top social determinants on heart health is age. A study to see the exact effect of aging on heart disease diagnosis found that as age in the group increased the maximum heart rate that was able to be achieved during a stress test decreased. (Kostis et al., 1982). This means that the older a test subject is the lower their exercise tolerance is. This is probably due to general wear and tear on the body due to time and exposure to the elements. But it does prove that age is a factor that must be accounted for in studying factors that can affect heart disease.

Finally, another top social determinant factor that helps to determine the chances of a person being diagnosed with heart disease is income. More than seventy five percent of global death attributed to coronary heart disease occurs in countries classified as middle income or low income (Gaziano et al., 2009). A possible reason for the large percentage of heart disease in middle income countries is that increases in medical technology are allowing for a longer life span with more time to have wear and tear on people`s bodies and heart. Additionally, those of low income and middle income usually have diets rich in calories and not proper nutrition (Gaziano et al., 2009). Therefore, income can influence the social determinant of nutrition. Other research proposes that in lower incomes countries, communities would be unable to allocate money into their inhabitants` health by either building natural green areas for exercise or lobbying for landfills to be transposed out of their neighborhoods. This is probably due to the money being placed into more basic necessities like public safety (Osler et al., 2003). The study found that for those in the same age group, their morality rate were significantly higher in low and middle income populations in comparison to those in higher income populations
(Finegold et al., 2012). From this study we can see that income can affect heart disease and health.

The overall goal of this study is to determine if the presence of insurance, whether private or federal, can help to lessen the chance of self-reporting heart disease among older at-risk individuals. This is done by controlling for nutrition, income range, area of population, and relative age group. Thus, the hypothesis is that subjects that do not have insurance will have a greater chance of being diagnosed with heart disease.

## CHAPTER TWO

## Methods

To explore the relationship between the presence of insurance and diagnosis of heart disease, the percentage of people diagnosing with heart disease in the insurance group and in the non-insurance group were compared. Data were collected, while controlling for external variables like age, income, and nutrition.

To gather the data for the experiment, each subject was selected through advertisements through the local community center and word of mouth. Subjects then had to be qualified for the Meals on Wheels program and provide information like their income status and insurance status. Thus all test subjects are sixty years or older, unable to leave their homes due to physical or emotional disabilities, and unable to cook meals for themselves, and live in the food distribution area of the Waco and McLennan Meals on Wheels center. All meals given to the participants contained the same nutrition, types of food, and portions of food for all program participants.

After undergoing the screening process to qualify for the Meals on Wheels program, each participant was categorized into one of two groups. The first group is the insured groups or subjects that have come into the Meals on Wheels program with insurance and the second group contained subjects that are not insured when they came into the program. After two months of the same nutrition that was provided by the Meals on Wheels program, all subjects were reevaluated to see if they still qualified to be in the Meals on Wheels program. At this evaluation of two months on the Meals on Wheels program, each subject filled out a form asking for their data on their insurance status and
to self-report on their status of diagnosis of heart disease by a health professional. This was done by asking "Has your doctor diagnosed you with heart disease?" and "What is your insurance status?".

A two sample Z test for difference in proportions between the insured and uninsured groups at the two month mark into the program was performed. This allows us to determine if insurance has an effect on the chance of a person being diagnosed with heart disease. If the P -value is less then 0.05 then we can conclude that the P -value would be statistically significant. This would allow for me to conclude that the presence of insurance may affect a person`s chance of being diagnosed with heart disease. If the Pvalue is not less than 0.05 , then it would not be statistically significant. I can then conclude that there would not be significant difference between insured and uninsured subjects in their chances of being diagnosed with heart disease.

Lastly, relative risk was calculated to see how many times more likely a person is likely to be diagnosed with heart disease than a noninsured subject.

## CHAPTER THREE

Statistics and Results

Data provided by Meals on Wheels was analyzed to determine if having insurance has an effect on the incidence of being diagnosed with heart disease. The results of this analysis demonstrate that there was not a statistically significant effect between having insurance and the chance of being diagnosed with heart disease. The risk of having a diagnosis of heart disease for insured subjects was 0.88 times the risk of uninsured participants.

Percent of those with heart diesease by insurance status


Figure 1: The number of people with insurance ( $\mathrm{N}=606$ ) that have heart disease $(\mathrm{N}=225)$ and do not have heart disease ( $\mathrm{N}=385$ ). The proportion of insured participants with heart disease is 0.635 and the proportion of insured participants without heart disease is 0.371.The number of people without insurance $(\mathrm{N}=201)$ that have heart disease $(\mathrm{N}=85)$ and do not have heart disease ( $\mathrm{N}=116$ ). The proportions of uninsured participants with heart disease is 0.577 and the proportion of uninsured participants without heart disease is 0.443 .

The total number of insured people is 606 and those uninsured is 201 . For the 606 with insurance, 225 are diagnosing with heart disease and 385 are not diagnosing with heart disease. A two-sample proportion Z test was performed $(\mathrm{Z}$ score $=1.5 ; \mathrm{P}$-value of
0.071). A relative risk of 0.88 was then calculated to see the probability of not getting heart disease if a subject has insurance.

## CHAPTER FOUR

## Discussion

It was hypothesized that the presence of insurance would affect the chances of being diagnosed with heart disease. However, the results from this study have shown that in the Waco McLennan Meals on Wheels population, the presence of insurance does not have a statistically significant effect on the chances of being diagnosed with heart disease based on the P-value of 0.071 .

However, the relative risk of 0.88 means that participants having insurance will have a $12 \%$ decrease chance of diagnosing with heart disease. The relationship between the presence of insurance and the chance of being diagnosed with heart disease was not significantly different and does not help to support the hypothesis. However, based on the results of the study, there is a possible trend of a benefit of reducing risk of diagnosis of heart disease as a P-value of 0.071 is close to 0.05 . Additionally, the Meals on Wheels program has helped those without insurance receive better nutrition that they would outside of the program. This has lessened the gap in nutritional differences between the insured and uninsured. This gap could also aid in lessening the effects of insurance on heart disease diagnosis for this study. In conclusion, a stronger relationship between having insurance and diagnosing with heart disease might be more clearly shown in a larger and more diverse population or by controlling more confounding factors.

The study`s results shows that there was not a statistically significant difference for those with or without insurance in their chances of being diagnosed with heart disease. However, calculations for relative risk help to show that the presence of insurance does have an effect in lowering a person`s chance of begin diagnosed with heart disease. This might be explained by the many factors that were not able to be controlled for in this study like a person`s health education or genetic makeup. These factors might have influenced or overshadowed the effect of insurance on heart disease diagnosis. Thus, even though this study tells us that insurance does not have a statistically significant effect on the chances of being diagnosed with heart disease, insurance is still a vital resource for chronic disease, like heart disease, prevention.

One of the sources of error in this study is that the people that joined the Meals on Wheels program already had or did not have insurance. This could lead to bias as those with insurance usually have better paying jobs, less stress, health education on nutrition or exercise, greater ability to afford better nutrition, and greater access to early detection of diseases. This can lead to those with insurance having many health benefits over their noninsured counter parts.

A second source of error is that all subjects live in the same neighborhoods and general area. This can lead to bias as confounding factors from the environment like air pollution that can affect the health of the participants. This is shown in the longitudinal Children`s health study where over five thousand children in southern California were followed for eight years. The results of the study were that exposure to air pollution as a child results in particulate matter in the lungs, reduced lung growth, and a higher chance of respiratory illness (USC Environmental Health, 2017). Those with asthma increased their chance of heart disease by $50 \%$, and those with COPD increased their chances of heart disease by 75\% (USC Environmental Health, 2017). The large effect of air
pollution and other environmental factors might help explain why there was not a significant relationship between having insurance and heart disease diagnosis.

Steps for future studies include randomizing the data to select an equal number of participants to be used in the study. This would allow for a better comparison of the relationship between insurance and heart disease between the number of subjects in the insured and uninsured groups. Additionally, future studies would aim to recruit participants from a more diverse area to help control for environmental effects like pollution.

In conclusion the goal of the study was to find the relationship between the presence of insurance and the chance of being diagnosed with heart disease. The results of the study indicate that being insured or uninsured does not have any statistically significant effect on lowering the chances of being diagnosed with heart disease. However, there is a trend that having insurance would help reduce heart disease as seen in the P-value. Overall, more research needs to be conducted within the Meals on Wheels program to ascertain its effectiveness on reducing morbidity from heart disease.

## BIBLIOGRAPHY

Finegold, Judith A., et al. "Mortality from Ischaemic Heart Disease by Country, Region, and Age: Statistics from World Health Organisation and United Nations." International Journal of Cardiology, vol. 168, no. 2, 2013, pp. 934-945., doi:10.1016/j.ijcard.2012.10.046.

Gaziano, Thomas A., et al. "Growing Epidemic of Coronary Heart Disease in Low- and Middle-Income Countries." Current Problems in Cardiology, vol. 35, no. 2, 2010, pp. 72-115., doi:10.1016/j.cpcardiol.2009.10.002.

Institute of Medicine (US) Committee on the Consequences of Uninsurance. Care Without Coverage: Too Little, Too Late. Washington (DC): National Academies Press (US); 2002.

Kostis, J B, et al. "The Effect of Age on Heart Rate in Subjects Free of Heart Disease. Studies by Ambulatory Electrocardiography and Maximal Exercise Stress Test." Circulation, vol. 65, no. 1, 1982, pp. 141-145., doi:10.1161/01.cir.65.1.141.

Linden, Belinda. "Fruit and Vegetable Intake and Coronary Heart DiseaseCrowe F, Roddam AW, Key T Et Al for the EPIC Heart Study Investigators (2011) Fruit and Vegetable Intake and Mortality from Ischaemic Heart Disease: Results from the European Prospective Investigation into Cancer and Nutrition (EPIC)-Heart Study. Eur Heart J 10.1093/Eurheartj/ehq465 (Online Ahead of Print)." British Journal of Cardiac Nursing, vol. 6, no. 4, 2011, pp. 202-202., doi:10.12968/bjca.2011.6.4.202.

Mcwilliams, J. Michael, et al. "Health Insurance Coverage And Mortality Among The Near-Elderly." Health Affairs, vol. 23, no. 4, 2004, pp. 223-233., doi:10.1377/hlthaff.23.4.223.

Osler, Merete, et al. "Income Inequality and Ischaemic Heart Disease in Danish Men and Women." International Journal of Epidemiology, vol. 32, no. 3, 2003, pp. 375380., doi:10.1093/ije/dyg074.

Simin Liu, JoAnn E Manson, I-Min Lee, Stephen R Cole, Charles H Hennekens, Walter C Willett, Julie E Buring, Fruit and vegetable intake and risk of cardiovascular disease: the Women's Health Study, The American Journal of Clinical Nutrition, Volume 72, Issue 4, October 2000, Pages 922928, https://doi.org/10.1093/ajcn/72.4.922

USC Environmental Health. "USC Environmental Health Centers." Children's Health Study: New Comprehensive Report Published - USC Environmental Health

Centers, 2017, envhealthcenters.usc.edu/2017/01/childrens-health-study-new-comprehensive-report-published.html.

