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Poverty, Demographics, and Hepatitis C Infection in the National Health and Nutrition Examination Survey

Wilson J. Washington Jr
Walden University

Walden University

College of Health Sciences

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Wilson J. Washington, Jr.

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Review Committee
Dr. Ernest Ekong, Committee Chairperson, Public Health Faculty
Dr. Wen-Hung Kuo, Committee Member, Public Health Faculty
Dr. Ahmet Sapci, University Reviewer, Public Health Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
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Abstract

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Wilson J. Washington, Jr.

MS, Naval Postgraduate School, 1991

BS, Southern Illinois University, 1989

BBA, University of Mississippi, 1984

AS, University of South Carolina, 1982

Dissertation Submitted in Partial Fulfillment of the

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Walden University

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Abstract

Hepatitis (HCV) is a communicable disease that impacts many Americans. The scholarly literature lacked the knowledge pertaining to the relationships between poverty and HCV diagnosis and prescription for HCV medication. The purpose of the study was to measure the magnitude and statistical significance of these relationships, as modeled by the health belief model and public health surveillance and action framework. Specifically, the study was designed to determine whether there is a statistically significant relationship between living below the poverty line and being diagnosed with HCV, as well as living being below the poverty line and being prescribed HCV medication. A total of 78 records of HCV-positive individuals from the National Health and Nutrition Examination Survey dataset were evaluated by applying the statistical procedure of odds ratio (*OR*) analysis. The results of the analysis revealed that (a) there was not a statistically significant relationship between being below the poverty line and being diagnosed with HCV, $OR = 0.99$ ($SE = 0.38$, $z = -0.03$, $p = .974$); and (b) there was not a statistically significant relationship between being below the poverty line and being prescribed HCV medications, $OR = 0.32$ ($SE = 0.55$, $z = -0.66$, $p = .507$). Numerous recommendations for improving measurements of the relationship between poverty and HCV are provided. This study may promote positive social change by indicating the importance of poverty as an agenda item for public health policy and practice.

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Dedication

In a society plagued with uncertainties where limitations are norms that can only be broken by "pioneers of change," this dissertation is dedicated to my wife, Daphne Bryan Washington, and six beautiful children, LaPorshia, Wilson III (Trey), Gregorie (Miguel), Chelsey, Kira and Ajani Kingslow (step son). You are my reasons for living and working hard to set a standard and raise the bar for higher education. Each day you motivate me to work harder, press forward, break down barriers, and achieve what appears impossible. Thank you for always being there and for believing in me. It is because of all of you, I have achieved my dream. Congratulations, we did it!

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This dissertation capstone journey was perhaps the greatest challenge in my life. It was long, difficult and even painful at times. However, as with any major achievements in my life, real success is virtually impossible without the agape love and support of Christ my lord and savior as well as the personal commitment of self and the many sacrifice of love ones and other social units such as faculty and friends.

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Chapter 1: Introduction

Background of the Problem

The hepatitis C virus (HCV) is a blood-borne pathogen that is rapidly emerging as a major public health concern (Valdiserri et al., 2014). HCV, which affects millions of people, damages the liver. By the time HCV carriers notice symptoms, the disease may have matured to an advanced stage of liver complications (such as liver damage or liver cancer) that can lead to death. Research shows that HCV risk is highest among baby boomers, with the prevalence of HCV in this population of Americans being 1 out of 30, or 3.3% (Valdisseri et al., 2014). Globally, over 100 million people are living with HCV, and 90% of cases of HCV worldwide exist in communities that are plagued with low socioeconomic conditions (Lanini, Esterbrook, Zumla, & Lippolito, 2016; Solomon et al., 2015). Today, roughly 3.5 million people are living with HCV in the United States (National Institute of Drug Abuse [NIDA], 2018). HCV is one of the major causes of premature mortality in the United States (Falade-Nwulia et al., 2016).

Marginalized groups, or communities with low socioeconomic status are disproportionately more likely to struggle with homelessness, mental illness, opioid drug use, injection drug use, or other substance issues (Solomon et al., 2015). The poor often lack access to insurance, affordable clinical treatment, and prevention programs (Falade-Nwulia et al., 2016; Solomon et al., 2015). Poverty alone appears to be a major risk factor for HCV. Without testing, linkage to care, and treatment effectiveness, poor carriers of HCV can unknowingly spread the disease to others through various risky acts, such as unprotected sexual intercourse or exposure through unclean needle sharing or use

(Falade-Nwulia et al., 2016). The focus of this quantitative study is on quantifying the incidence of HCV in the United States as a function of poverty, controlling for demographics.

There are numerous reasons to believe that HCV is disproportionately more prevalent among the poor, among whom it constitutes a major public health problem. One of the main reasons that HCV is a public health problem among the poor is that it can be transferred by multiple methods, such as blood and saliva exchange. Fluid exchange may occur through drug use, unprotected sex with multiple partners, and living in poorly kept homeless hostels and shelters (Beijer, Wolf, & Fazel, 2012; Gelberg et al., 2012; Neal & Stevenson, 2012; Stein et al., 2012). The problem might be more significant than it appears, because, as Chak et al. (2011) and Edlin et al. (2015) stated, almost 1.9 million people infected with hepatitis were not included in national statistics, due to being members of marginalized groups such as the mentally ill, convicts, substance abusers, and those who are homeless. Research suggests that proportionally few homeless individuals, mentally ill people, and drug users know that they have contracted hepatitis (Hermanstyne, Bangsberg, Hennessey, Weinbaum, & Hahn, 2012; Notaro et al., 2012; Nyamthi et al., 2013). Those with education and knowledge of hepatitis among marginalized groups are less likely to be infected; however, the number of those with knowledge of the disease is small (Himelhoch et al., 2011; Strehlow, 2012). Himelhoch et al. (2011) acknowledged that further studies need to be conducted regarding levels of access to healthcare and education for marginalized

groups who have a high susceptibility to hepatitis; such studies could influence health policy toward providing expanded access to health care for the poor (Notaro et al., 2013).

Statement of the Problem

HCV, a contagious and potentially deadly disease, has historically hurt many marginalized members of society, such as the homeless, mentally ill, substance abusers/users, and ex-convicts, who are at high risk for infection, and who might lack access to adequate medical treatment (Centers for Disease Control and Prevention [CDC], 2015; Chak et al., 2011). The problem addressed in the study was twofold: (a) lack of knowledge as to the odds-based relationships between HCV risk (in terms of incidence, diagnosis, disclosure, and treatment) as a function of poverty, and (b) lack of synthesized explanations of how and why HCV appears to function differentially in terms of incidence, diagnosis, disclosure, and treatment among the poor. The second problem was addressed in the literature review, whereas the first problem was addressed by the quantitative research design of the study.

Purpose of the Study

The purpose of the study was to apply statistical analysis to data from the National Health and Nutrition Examination Survey (NHANES) to (a) estimate the odds-based relationships between HCV risk (in terms of diagnosis and treatment) as a function of poverty, and (b) provide synthesized explanations of how and why HCV appears to function differentially in terms of diagnosis and treatment among the poor. These purposes were achieved through the quantitative approach described and defended in Chapter 3.

Research Questions and Hypotheses

The research questions and hypotheses of the study were as follows. The means of answering these research questions are discussed and justified in Chapter 3.

RQ1: Is there a statistically significant relationship between being below the poverty line and being diagnosed with HCV?

$H1_0$: The odds ratio (OR) of having HCV as a function of poverty = 1.

$H1_A$: The OR of having HCV as a function of poverty ≠ 1.

RQ2: Is there a statistically significant relationship between being below the poverty line and being prescribed HCV medications?

$H2_0$: The OR of being prescribed HCV medications as a function of poverty = 1.

$H2_A$: The OR of being prescribed HCV medications as a function of poverty ≠ 1.

Theoretical Frameworks

The two theoretical frameworks of the study were the health belief model (HBM) and public health surveillance and action framework (PHSA). The HBM suggests that the poor might incur HCV at disproportionate rates because of their differential beliefs about disease transmission, management, and cure, thus providing underpinnings for the two quantitative research questions of the study. The PHSA suggests that the public health of the poor might not rise to the full attention of the policy establishment, thus providing theoretical underpinnings for the research questions of the study.

Definition of Terms

Centers for Disease Control and Prevention (CDC): The U.S. agency charged with tracking and investigating public health trends. A part of the U.S. Public Health

Services (PHS) under the Department of Health and Human Services (HHS), the CDC is based in Atlanta, Georgia. It publishes key health information, including weekly data on all deaths and diseases reported in the United States, and travelers' health advisories. The CDC also fields special rapid-response teams to halt epidemic diseases (Al Knawy, 2015).

Cirrhosis: Liver disease characterized by irreversible scarring. Alcohol and viral hepatitis, including both hepatitis B and hepatitis C, are among the many causes of cirrhosis. Cirrhosis can cause yellowing of the skin (jaundice), itching, and fatigue. Diagnosis is suggested by physical examination and blood tests, and it can be confirmed by liver biopsy. Complications of cirrhosis include mental confusion, coma, fluid accumulation (ascites), internal bleeding, and kidney failure. Treatment is designed to limit any further damage to the liver and to prevent complications. Liver transplantation is becoming an important option for patients with advanced cirrhosis (Al Knawy, 2015).

Genotype: The genetic constitution (genome) of a cell, an individual, or an organism. The genotype is distinct from the expressed features, or phenotype, of the cell, individual, or organism. The genotype of a person is that person's genetic makeup. It can pertain to all genes or to a specific gene (Al Knawy, 2015).

HCV diagnosis: HCV diagnosis takes place when a physician interprets laboratory evidence as indicating that an individual has HCV (Al Knawy, 2015).

HCV treatment: Administration of pharmacological treatment for HCV (Al Knawy, 2015).

Hepatitis C: Inflammation of the liver due to the *hepatitis C virus (HCV)*, which is usually spread via rare blood transfusion, hemodialysis, or needle sticks (Al Knawy, 2015). The damage to the liver that hepatitis C does, can lead to cirrhosis and its complications, as well as cancer. Transmission of the virus by sexual contact is rare. At least half of hepatitis C patients develop chronic hepatitis C infection. Diagnosis is made by blood test. Treatment and probably cure occur via antiviral drugs, which are effective in over 90% of patients. Chronic hepatitis C was once frequently treated with injectable interferon, in combination with antiviral oral medications, but now it is most often treated with oral antivirals alone. There is no vaccine for hepatitis C (previously known as *non-A, non-B hepatitis*).

Poverty line: An income level below which an individual is considered by the U.S. government to be in poverty (Al Knawy, 2015).

Significance of the Study

There appears to be substantial agreement in the literature that HCV is disproportionately found among the poor. There is a gap in the literature on quantifying HCV (in terms of its diagnosis and treatment) as a function of poverty. The main significance of the current study lies in its ability to analyze NHANES data in order to calculate the odds of HCV diagnosis and treatment as functions of poverty, leading to more reliable and objective assessments of how HCV impacts the poor. The secondary significance of the study lies in its ability to apply a systematic literature review to better understand how and why HCV disproportionately impacts the poor.

At-risk populations such as the mentally ill and homeless have an extremely high risk of hepatitis contraction (Himelhoch et al., 2011; Stein et al., 2012). Nyamathi et al. (2013) found that among groups such as the homeless, mentally ill, and substance abusers, those educated on hepatitis were less likely to contract it. There is an established call to increase the funding and number of free clinics to help diagnose and treat hepatitis among these groups (Notaro et al., 2013; Nyamathi et al., 2012; Nyamathi et al., 2013). While researchers have evidence that accessible health care and education do help those with hepatitis infections, there has been minimal investigation on the quantitative relationship between HCV (in terms of factors such as diagnosis, disclosure, prevalence, and treatment) and poverty (Nyamthi et al., 2012). As the hepatitis threat continues to grow across the United States, especially within underprivileged communities, it is important to find policy options that maximize success (Edlin, 2015). Better understanding HCV among the poor can help to refine and target such options.

Conclusion

The purpose of Chapter 1 was to introduce the problem of a lack of knowledge about HCV diagnosis and treatment as functions of poverty. An odds ratio (OR) approach was suggested as a means of addressing this knowledge gap, and background information about HCV was provided. The remainder of the study has been structured as follows. Chapter 2 consists of the review of literature. Chapter 3 consists of the study methodology and design. Chapter 4 contains the findings. Chapter 5 consists of the conclusion.

Chapter 2: Literature Review

Introduction

The purpose of the study was to apply statistical analysis to data from NHANES to (a) estimate the odds-based relationships between HCV risk (in terms of diagnosis and treatment) as a function of poverty, and (b) provide synthesized explanations of how and why HCV appears to function differentially for the poor. The purpose of the literature review is to address the second purpose through a discussion of the theoretical framework and empirical studies that address the issues of HCV prevalence and treatment among the poor.

Literature Search Strategy

A literature review was conducted in an effort to evaluate the research for its relevance to this study. A variety of databases including EBSCO Host, Academic Search Complete, ProQuest, Google Scholar, and Research Gate were accessed. Key words and combination of key words were used to find relevant studies. These terms included, but were not limited to, *hepatitis C*, *homelessness*, *injection drug users*, and *access to care*. Overall, roughly 31 articles met inclusion criteria for the review.

Background of HCV

HCV is a contagious and potentially deadly blood-borne and sexually transmitted virus that is a public health problem not only in the United States, but worldwide (Valdiserri et al., 2014). Although the prevalence of HCV appears highest among marginalized individuals in urban communities, it has become a growing problem worldwide in suburban and rural communities (Solomon et al., 2015). HCV is

preventable. Over 50% of the individuals infected with the disease simply are not aware that they have it. In other words, they have not been tested, evaluated, diagnosed, or treated for HCV. Just knowing about the disease is not enough; those infected must be treated. Without testing, linkage to care, and effective treatment, people with HCV can unknowingly spread the disease to others through various risky acts such as unprotected sexual intercourse or exposure through unclean needle sharing or use (Falade-Nwulia et al., 2016).

Between 2013 and 2014, Falade-Nwulia et al. (2016) conducted a 9-month study of roughly 2,681 HCV-positive individuals within the Baltimore, Maryland metropolitan area. In that study, they tested the impact of an integrated care delivery model in a public health clinic on the identification and timely treatment of patients at risk of having been exposed to HCV. Falade-Nwulia et al. found that an integrated care delivery approach within a public health setting was very effective, especially when coupled with a structured screening, testing, and referral-to-treatment program for at-risk populations. In other words, an integrated care delivery program is more likely to have the needed structure and clinical protocols to identify patients with HCV infection and get them timely access to the necessary treatment, as well as follow-up counseling regarding transmission and harm reduction (Falade-Nwulia et al., 2016).

Valdiserri et al. (2014), in a recent study, estimated that approximately 2.9 million people were living with HCV in the United States, and many were not even aware that they were infected with the virus. High-risk behaviors and injectable drug use are the primary contributing factors in HCV infection for adults and young people who inject

drugs (PWID) in the United States of America (Artenie et al., 2015; Lanini et al., 2016; Page, Morris, Hahn, Maher, & Prins, 2013). In addition, PWID experience higher morbidity and mortality rates nationally (Valdiserri et al., 2014). Lanini et al. (2016) and Solomon et al. (2015) agreed that early diagnosis and timely clinical intervention are keys to successfully addressing the HCV epidemic in America, especially in marginalized communities infested with drug abuse. Without the necessary clinical diagnosis and treatment for those infected, these communities may experience remarkable increases in the incidence of HCV, along with rapidly growing premature death or mortality rates (Solomon et al., 2015). Recent improvements in HCV medications have given rise to the possibility of actually curing HCV in infected individuals (Lanini et al., 2016). Solomon et al. recommended the development of training programs from effective scholarly research and lessons learned, that could be used to improve education and increase awareness of HCV prevention and treatment options for targeted communities across the nation. In other words, a well-developed, evidence-based public health program can be used to teach individuals across the United States more effective ways to prevent or reduce the transmission of HCV. This effort may yield remarkable dividends nationally as well as worldwide, by enhancing the survivability of those suffering with HCV as well as helping to reduce the progression of the HCV and HIV diseases globally (Solomon et al., 2015).

Theoretical Framework

This research was supported by two theories: the HBM and the PHSA.

Health Belief Model (HBM)

The HBM is a type of health behavior theory (HBT). Livi, Zeri, and Baroni (2017) argued that for more than 40 years, scholars have used the HBM to understand and explain the degree to which determinants influence and modify health-related behaviors. The HBM contains some of the major psychological predictors of health-related behaviors. It is composed of four sections: perceived susceptibility, perceived severity, perceived barriers, and perceived benefits (Skinner et al., 2015). These four concepts can help determine why and when an individual will seek a remedy for a disease. In other words, these four concepts can be combined into the two main components of HBM: *behavioral evaluation* and *threat perception*. *Behavioral evaluation* focuses on the perceived benefit gained and the associated barriers experienced, while *threat perception* addresses perceived susceptibility and anticipated severity. Vulnerability to a health illness tends to drive the perception of susceptibility, whereas the perceived consequences of a health illness tend to drive anticipated severity (Livi et al., 2017). In terms of RQ1, HBT predicts that HCV will be diagnosed at a greater rate among the poor, because the poor will have disproportionately indulged in health behaviors likely to result in HCV.

Public Health Surveillance and Action (PHSA) Framework

The PHSA is a theory designed to explain the motivations behind government and the public sector taking steps to safeguard the general public from health crises (Kohl et al., 2012). The PHSA suggests that, in general, governments are highly motivated to make the diagnosis and treatment of infectious diseases simple, even if people who are

vectors for such diseases are uninsured or otherwise difficult to monitor (Kohl et al., 2012). In the context of this study, the PHSA was applied to understand the decision-making process of healthcare providers. The PHSA predicts that a country with a robust public health system, such as the United States, will take meaningful action to curtail or manage infectious diseases in all segments of the population. Therefore, in relation to RQ2, the PHSA predicts that poor people will be treated for HCV at least as frequently as people who are not poor.

Prevalence of HCV

In their review of epidemiological studies, Chak et al. (2011) obtained data from a variety of databases, including those of Medicare and Medicaid and the Department of Corrections, to arrive at the true prevalence of HCV in the United States. The results of the review indicated that there were underestimations in terms of the number of veterans with a positive diagnosis of HCV. Chak et al. and Edlin et al. (2015) stated that almost 1.9 million people infected with hepatitis were left out of national statistics, due to being members of marginalized groups such as the mentally ill, convicts, substance abusers, and those who are homeless.

Edlin and Winkelstein (2014) argued that, based on reported statistics of the prevalence of HCV, it is feasible to eradicate HCV in high-income countries such as the United States. Eradicating HCV is not an easy task and requires increased efforts in terms of screening, prevention, treatment, policy, research, and advocacy. Edlin and Winkelstein postulated that all individuals should be tested for HCV, and health services should be prepared to provide antiviral drugs for all who are infected. Further, prices for

these treatments should be affordable. Services for those marginalized groups who are disproportionately infected with HCV should be made available, and the legal barriers to hepatitis C prevention should be removed.

HCV infection is a concern among marginalized groups due to the multiple methods by which the virus can be transmitted, such as through blood, saliva, drug use, unprotected sex, and poorly kept abodes and shelters. In a systematic review and meta-analysis, Beijer, Wolf, and Fazel (2012) reviewed the literature on the prevalence of HCV, tuberculosis (TB), and HIV in the homeless population. Beijer et al. examined research published between January 1981 and January 2012. Two criteria were set for inclusion in the review. First, the study had to include a sample of individuals considered homeless, living in shelters or institutions, or living in rough conditions not due to war or natural disasters. The second criterion was the inclusion of data on the prevalence of TB, HIV, and HCV, diagnosed through chest x-ray, blood test, or self-report questionnaires.

There were 43 studies that were included in the review and meta-analyses, representing 59,736 individuals. The review indicated that HCV was the most prevalent of the three diseases among the homeless population. Tuberculosis ranked the lowest of the three diseases. Prevalence ranged from .2% to 7% for TB, 3.9% to 36% for HPV, and .3% to 21% for HIV.

Beijer et al. (2012) also identified the need for more studies to examine local populations in order to inform best practices for public health and service measures. The implications of their review was that those in charge of planning and development services should consider as a viable alternative the management of infectious diseases in

homeless populations. Beijer et al. further suggested universal screening of homeless individuals as a consideration for reducing the prevalence of these three infectious diseases.

While some research has been conducted on specific groups of HCV victims, further research needs to be performed to determine the challenges or gaps for those who may not have access to medical treatment and are left unaware of the disease (Gelberg et al., 2012). Neal and Stevenson (2012) addressed this gap in their qualitative study. Neal and Stevenson gathered information using semi-structured interviews on the needs of homeless drug users temporarily staying in shelters or hostels. The overarching theme among the 40 participants interviewed in this study was the slow removal of blood and other bodily fluids in hostels and shelters. The presence of blood poses a risk of transmission, because blood infected with the hepatitis virus can survive for several weeks outside the body. Dried and spilt blood from risky injection in hostels and shelters may help to explain the high levels of hepatitis C virus among homeless individuals.

Strehlow et al. (2012) examined the prevalence of HCV among the homeless in primary care settings. The researchers identified the distribution and risk factors for homeless adults with a diagnosis of HCV who were using eight nationwide Health Care for the Homeless (HCH) clinics. Data were obtained using structured interviews, chart reviews, and blood draws. Within the homeless population explored, the overall prevalence of HCV-antibody positivity was 31.0%. However, when the participants were subdivided into injection drug users and non-injection drug users, it was conclusive that the prevalence of HCV-antibody positivity was 70.0% among injection drug users and

15.5% among non-injectors. Over 50 of the participants who tested positive for HCV were unaware of their health status at the time the initial interviews were conducted. Identified risk factors for HCV among injectors were prison and injection drug use. For non-injectors, the risk factors were tattoos and prison.

Hermanstyne et al. (2012) examined the relationship between HCV and implements used for non-injection drug use. A large sample of homeless individuals in San Francisco was recruited for this study. The researchers examined implements used for smoking or snorting drugs and HCV. Sociodemographic variables were controlled. They also assessed the relationship between HCV, sexual history, substance abuse, incarceration history, and presence of tattoos or piercings. The results suggested that there is no significant relationship between HCV and non-injection implements for drug use. In other words, these implements were not a risk factor for HCV status.

In another study on the vulnerable homeless population, Stein et al. (2012) assessed the influence of hepatitis C infection on the homeless population in the area known as "Skid Row" in Los Angeles, California using the Gelberg-Andersen behavioral model for vulnerable populations. This model is appropriate in predicting hepatitis B and C infection positivity, and utilization of health services in homeless individuals. The sample included 534 homeless adults. These participants were tested for hepatitis B and C, interviewed on their utilization of health services over the past 12 months, and their awareness of a positive diagnosis for hepatitis B and C. Using structural equation modeling, the researchers concluded that 72% of hepatitis B and C cases were predicted by older age, risky sexual behavior, injection drug use, and alcohol use. However,

emergency services were used far less by those diagnosed with positive hepatitis B or C. This study highlights the importance of more intensive screening of the homeless population for hepatitis B and C given the high incidence of the diseases and lack of awareness of the diseases among this vulnerable population.

Awareness of Infection Status

Himelhoch et al. (2011), Notaro et al. (2013) and Nyamathi et al. (2012) agreed that among marginalized populations studied with HCV, roughly a quarter of the people who were homeless, mentally ill, and people who injected drugs (PWID) knew that they had contracted hepatitis. Disparities in access may lead to inadequate HCV awareness and detection, as well as gaps in HCV treatment, resulting in increased health costs, poor outcomes, and worsening health. When left untreated or undiagnosed, HCV can easily be spread, with a resultant increase in emergency room visits, creating a larger health risk and costs for the general populace (Nyamathi et al., 2013).

Nyamathi et al. (2012) examined the relationship between knowledge of hepatitis and HIV among gay and bisexual homeless individuals living in Hollywood, California. A sample of 267 gay and bisexual (G/B) men participated in the study. The age range of participants was between 18 and 39 years old. The goal of this longitudinal study was to reduce the use of drugs and improve knowledge of HPC and HIV in a community center. Results of regression modeling revealed that education on HIV/AIDS previously delivered to the G/B men was related to higher levels of knowledge about HIV/AIDS. In this study, higher levels of knowledge about hepatitis were related to more moderate drug

use. This study highlights the need for accessing testing early and using teaching strategies to reduce harm.

Himelhoch et al. (2011) found that marginalized groups (i.e., PWID) that were well educated and had a strong knowledge of HCV were less likely to be infected. However, absent the education, a smaller number of the group expressed knowledge of the disease and were more likely to be infected (Himelhoch et al., 2011).

Himelhoch et al. (2011) examined screening and testing rates for HCV, HIV, and co-occurring substance use disorders in a sample of individuals with mental illness and substance abuse. The sample included 53 participants diagnosed with a serious mental illness and substance abuse disorder. The participants were tested for HCV and HIV. Within this sample, 25% tested positive for HCV, and 6% tested positive for HIV. The majority of the sample revealed a history of risky sexual behaviors and engaging in unprotected sex. Results of this study indicated that individuals diagnosed with HCV are more likely to have engaged in unsafe sex, have injected drugs, and have a sexually transmitted infection.

Treatment of HCV

Shiffman and Benhamou (2015) posited that effective treatments have been available for chronic HCV for upwards of two decades. In addition, there has been effective treatment for HCV and associated diseases, such as Recombinant ImmunoBlot Assay (RIBA) virus testing and Interferon (IFN) treatment. RIBA testing (e.g., enzyme immunoassay confirmatory testing) or HCV antibody testing and IFN treatment are current practices for properly assessing suspect HCV in at-risk populations (Shiffman &

Benhamou, 2015, p. 72). However, quite intriguing and relevant to understanding the risks of HCV, are the need for improved access. Shiffman and Benhaumou also emphasized that "pegylated interferon alpha (PEG-IFN) and RBV reduce HCV RNA to undetectable levels in approximately 66% of patients with HCV genotype 1 (HCV-1) and over 90% of those with genotypes 2 and 3 (HCV-2,3)" (p. 72). They argued that a sustained virological response (SVR) takes place in about 40%, 80%, and 70% of these patients, respectively, referring to the different types of patients considered in their study (p. 72). They also suggested that the efficacy of the treatment could vary according to "genetic susceptibility to IFN" (p. 72), but the primary observation was that long term follow up by genotype would be needed on participants in the study who had achieved SVR, before claiming the current testing and treatment resulted in 100% cure of HCV (p. 72).

The central issue is that, with a cure available and generally successful, it is a particularly poor reflection when the treatment success potential is so significant but a relatively high majority of populations at-risk for HCV decides to shy away from treatment access. Arguably, it becomes a matter of increasingly serious concern. Vulnerable populations tend to be marginalized and allowed to remain vulnerable; even in the face of a condition that can cause premature death from liver damage (i.e., HCV) and can occur alongside other more serious conditions; each of which are basically treatable.

Urban cities may be ill-equipped to handle a large outbreak among the most marginalized members of society without further knowledge of the specific disparities

within populations at-risk for HCV, the demographics, and their ability to access effective prevention, detection and treatment programs (Nyamathi et al., 2013; Stein et al., 2012; Stehlow et al., 2012). Himelhoch et al. (2011) acknowledged that further studies need to be conducted regarding levels of access and education for marginalized groups (i.e., drug users) who have a high susceptibility to hepatitis.

Access to Healthcare

Notaro et al., (2013) examined the status of health among a sample of homeless individuals, and their use of free clinics. The prevalence of many diseases including HCV was compared among the homeless population. The data for this study were collected from medical records over a five-year period. The health conditions of the homeless population using the free clinic were compared to the users of the general clinic. The results indicated similarities between the groups. However, the homeless group had significantly more cases of hepatitis, anxiety, bipolar disorder, and tuberculosis, compared to the general clinic group. This study illustrates how the homeless population who use free clinics have lower levels of health, compared to the general population. Notaro et al. (2013) found that access to health care for the mentally ill needs to be increased; doing so could help detect hepatitis infections.

Understanding the reasons why the injection drug use (IDU) community does not currently access appropriate treatments for HCV is no mean feat. There are many factors to consider, and there is much at stake. Existing studies demonstrate that there are several special interest issues.., people who inject drugs (PWID) being one of them, that

require attention because of issues such as the associated costs and the commonality of HCV and the lack of treatment access at present.

One of the most substantial issues for PWID with HCV is treatment management and completion. In some cases, patients do not necessarily make a decision to pursue treatment when it is available (NIDA, 2018, May 29) Part of the issue in this instance is that most drugs used by PWID (such as cocaine, DMT, heroin, ketamine, methamphetamine, phencyclidine [PCP], etc.) tend to alter a person's thinking and judgment, which leads to health risks that include addiction, drugged driving and infectious diseases such as HCV and HIV (NIDA, 2018, May 29).

Roux et al. (2013) considered HCV infection in non-treatment-seeking heroin users, and specifically investigated what they call the burden of cocaine injection. Their findings suggest that in heroin-dependent individuals, control of the HIV epidemic has been achieved in countries where opioid maintenance treatment (OMT) and needle exchange programs (NEP) are available and promoted as primary treatment options.

Roux et al. (2013) also insist that, despite what they call routes of contamination for both viruses, the instances of HCV infection remain high. Roux et al. stated their research objective as the identification of the prevalence of HCV, and an assessment of the correlation of being HCV-positive in a sample of individuals who have otherwise left treatment for heroin. Notably, their findings affirm that the risk of HCV-infection through intravenous drug use, with cocaine particularly, is extremely high. The results stress the significance of rethinking interventions to undermine the risk of HCV infections in the vulnerable population (p. 613). Roux et al. insisted that their research

provided important insights for public health decision makers and advice for the implementation of adequate programs that will ensure access and treatment follow-through among the vulnerable population of drug users (p. 617). This will likely be the case with the current study.

Martin et al., (2013) stressed that although it is possible to reduce HCV in PWID, a substantial reduction cannot be expected to be accomplished solely with harm reduction interventions, such as a needle exchange program. Slow uptake, higher baseline prevalence, or shorter average injecting duration appears to remain the greatest challenges to significantly reducing chronic HCV prevalence, even in countries where new, effective and tolerable interferon-free direct acting antiviral (DAA) treatments are available, such as Edinburgh, UK, Melbourne, Australia and Vancouver, Canada. Higher uptakes and lower baseline prevalence could make a major difference in treatment modalities for HCV, however, treatment costs remain a limiting factor. Based on the current HCV medications costs, it takes millions in US dollars to halve the HCV prevalence in target populations of PWID (Martin et al., 2013).

Bruggmann (2013) agreed that barriers to access remain, a problem especially in drug dependency settings. Lack of understanding or information, a low prioritization among patients, and a lack of treatment considerations based on costs a few of many challenges facing organizations seeking to scale-up of treatment among IDU. It is impossible without programs to improve the HCV and addiction literacy, and break down the barriers to treatment access, without addressing the discrimination and stigmatization

among physicians who have the appropriate training to effective treat PWID with a diagnosis of HCV.

Asher, Lum, and Page (2012) reflected on the suitability for acute HCV treatment among a more specific population: active young injection drug users. Asher et al.'s support that the treatment for acute HCV has much better outcomes than treatment for chronic infections, which perhaps pertains to the idea of reinfection that is nonetheless common in most groups. Asher et al. suggested that the acute period for the treatment of HCV is brief and, thus, creates several challenges for young PWID such as limited access to clinics and completion of treatment. However, the acute period tends to provide the best opportunity to treat young PWID (16). In their case study, Asher et al. (2012) considered five acutely-infected contributors and reported on their daily drug use at baseline (p. 16). All five acutely-infected contributors that had access to primary care decreased their drug use (p. 26) although none received treatment for their active infection; one was treated within 12 months of infection" (p. 16). Again, Asher et al. insisted that research demonstrated that HCV infection treated during the acute phase is remarkably more effective at achieving a positive result" (p. 16) compared to those with a chronic infection. Asher et al. noted that there are substantial implications for this, not least to do with potential policy revisions regarding acute versus chronic infection. The way in which this present study can contribute to this is again by showing the relevance of access and considering whether one of the more substantial issues in defining the successful outcome of different treatment patterns is not simply access.

Many studies have suggested a disparity between drug users and non-drug users in relation to treatment for HCV. What is clear is that drug users are often perceived quite negatively, and willing participants in treatment programs may not always have proper access to the treatment they need, even when they are very willing to pursue treatment. It might also be proposed that the issues with treatment decision making and even condition awareness amongst PWID could come down to general access to treatment. If they are not provided access to treatment that is catered to their condition as drug users, which is arguably a co-occurring condition, then is it viable to say that they even have access to the treatment that they need. This present study again helps to tease out that problem and will examine the social implications of this possibility.

Asher et al. (2012) conducted a 20 months study from January 2007 to September 2008 that involved six individuals (2 females and 4 males) with acute HCV that were enrolled in a treatment program. The participant ages ranged from 20 to 31 years of age. The age demographics included five Caucasian participants and one African American participant. All participants indicated daily drug use. The drugs of choice were methamphetamine, heroin, and crack cocaine.

The findings notably confirmed that the treatment candidacy for acute HCV infection pertains not only to physiological factors that can indicate treatment readiness, including "evidence of virus in the blood and no contraindications to IFN therapy" (p. 26), but also psychosocial factors. These factors, as well as “alcohol use, housing status, lack of social support, mental illness, access to health care, and continued drug use may significantly impact treatment readiness” (p. 26). Asher et al. (2012) conclude that “even

when this population willingly engages in support and education around acute HCV, becoming ‘good’ candidates is an intensive process for both patients and their care providers” (p. 26).

Asher et al. observed that many active injectors are homeless, lack primary care, and tend to have uncontrolled or untreated mental health issues (p. 26). The expectation of many treatment programs that they are then expected to alter their lifestyle very dramatically and in a short space of time is quite unrealistic, particularly when the actual supports of the program do not address many of the psychosocial issues that are undermining their quality of life to begin with.

Asher et al. (2012) noted that the advantage of the program used as a focus for their research in working with PWID was that it was based on a small patient population. The study was also supported by a nurse who had the means to provide specific care, to make referrals to meet the patients’ various other needs, and to advocate for further help as and when needed. Asher et al. (2012) suggested that the importance of challenging individual, clinician, social, and psychological barriers could hardly be exaggerated for the IDU populations in question, , and the advantage of providing individualized care and further support groups targeting the range of issues contributing to the individual condition were substantial.

Asher et al. (2012) also insisted that although the relatively short timeframe for the acute period, besetted by the multiple co-occurring disorders and social issues presented by each patient, fostered significant challenges (p. 26), the relatively short timeframe compared to cases of chronic HCV should still be regarded as significant and

impactful. The need to provide supports for individual, clinician, social, and psychological barriers is hard to overemphasize, particularly based on these findings. However, what also appears clear is that many studies and indeed many treatment programs that base their work on studies do not yet acknowledge the need for this range of support and the co-treatment and management of the various issues that IDU tend to face that impact their lifestyle choices and opportunities.

Many studies have suggested a disparity between drug users and non-drug users in relation to treatment for HCV. What is clear is that drug users are often perceived quite negatively, and willing participants in treatment programs may not always have proper access to the treatment they need, even when they are very willing to pursue treatment. It might also be proposed that the issues with treatment decision making and even condition awareness amongst PWID could come down to general access to treatment. If the PWID hey are not provided access to treatment that is catered to their condition as drug users (which is arguably a co-occurring condition), then is it untrue to say that they have access to the treatment that they need. This present study again helps to tease out that problem and will examine the social implications of this possibility.

Summary, and Gaps in the Literature

Estimates indicate more than 3.5 million people in the United States are living with HCV (NIDA, 2018). This study examined access to health care and its influences on the number of acute HCV infections among PWID. Injection drug usage (IDU) is recognized as the primary route of HCV contraction (NIDA, 2018), suggesting that one of the reasons why HCV continues to affect marginalized members so dramatically is that

IDU users represent one of the most vulnerable groups and are prone to infection. A literature review thoroughly evaluated the research for its relevance to this study. Selected articles related to disparities in access and the influence on treatment for HCV in PWID. From the literature review, it was concluded that total elimination of HCV is possible as major advancements have been made with the development of sensitive diagnostics tests and very effective direct-acting antiviral (DAA) agents that are unique in delivering sustained viral response (SVR) in over 95% of patients who are diagnosed early and treated. However, the key to effectively eliminating the spread of HCV in the United States to expand or put prevention interventions into practice such as the needle exchange and clean syringe programs, opioid substitution therapies and behavioral health services (Sabb et al., 2018). In addition, improved health promotion, community awareness, needle sharing, other harm reduction strategies, and adequate public health funding for programs like the British Columbia, Canada implement implemented between 1996 and 2015 (Olding et al., 2017). In terms of risks and vulnerabilities for HCV, rural areas tend to have a very high number of documented PWID (Van Handel et al., 2016). Further, a minimal number of homeless, mentally ill, and PWID know that they have contracted hepatitis. The expanding epidemic of opioid abuse and injection drug use (IDU) have intersected the growth of HCV infections in communities across the nation; especially in non-urban communities (Van Handel et al., 2016). Zibbell et al. (2018) concurred in their study that the rapid increase in acute HCV infection in the United States was strongly correlated to the increases in IDU or PWID and the growing opioid epidemic that plagues the nation. According to data collected in the National

Notifiable Disease Surveillance System (NNDSS) from 2004 to 2014 on HCV, Zibbell et al. (2018) found that six states (Kansas, Maine, Massachusetts, New Jersey, Ohio, and Wisconsin) of the 15 states studied showed an increase of over 1000% in the number of cases of acute HCV; with the greatest disparity and most significant increases in acute HCV in persons between 18 and 39 years of age.

Disparities in disease burden among PWID and access to proper HCV therapy may lead to non-start treatment, even if diagnosed with HCV as well as inadequate awareness, detection, and gaps in the treatment of HCV, resulting in increased health costs, poor outcomes, and worsening health (Younossi et al., 2016)). This challenge is especially complicated in low socio-economic communities, Medicaid-covered groups, or poor populations with no insurance (Van Handel et al., 2016).

Globally, less than 5% of people infected with HCV are aware of their status and may go undiagnosed for years (Esterbrook et al., 2016). There is a disparity in the actual burden of HCV disease in marginalized groups like PWID because the actual population is difficult to quantify. Although the CDC may extract data from the Census Bureau to make calculations about disease rates by demographic categories (e.g. age at diagnosis, race, ethnicity and sex), there is limited data on the actual number of PWID in the U.S. Therefore, roughly 1.9 million people infected with hepatitis may be left out of national statistics due to being members of marginalized groups such as the PWID, mentally ill, convicts, other substance abusers, and those who are homeless (Lansky et al., 2014). One of the most substantial issues for PWID with HCV is treatment management and completion. In some cases, it was noted that patients do not necessarily make decisions

to pursue treatment when it is available. Those with education and knowledge of HCV among PWID (i.e., marginalized groups) are less likely to be infected; however, the number is small for those with knowledge of the disease (Harris & Rhodes, 2013). Effective treatments of patients with chronic HCV have been readily available for close to two decades (Bethea et al., 2017).

Chapter 3: Research Method

Introduction

The purpose of Chapter 3 is to describe and defend the various decisions made regarding the methodology and research design of the study. Chapter 3 is subdivided as follows. In the first section, I identified possible research methodologies for the study and described my selection of a quantitative approach. In the second section, I presented the research designs that are possible when using a quantitative methodology. In the third section, I restated the research questions and hypotheses of the study. In the fourth section, I identified the data source, NHANES, that I used in the study, and discussed NHANES's sampling. NHANES is unique in that it is the only publicly available national survey that captures both environmental and clinical data, and it is unmatched by any secondary data source in content and size. As such, the NHANES survey, or program of studies, offers researchers a very useful tool for effectively assessing the health and nutritional status of adults and children in the United States (CDC, 2018). In the fifth section, I extended a lean discussion of the data analysis pertaining to the research questions of the study. In the sixth section, I offered an overview of reliability and validity and their applicability in this study. In the seventh section, I discussed the ethical factors relevant to this study. Lastly, in the eighth and final section, I have provided a brief summary of the research orientations of the study.

Research Design and Rationale

There is a consensus (Creswell, 2015; Jackson, 2015; Moustakas, 2014; Trochim, Donnelly, & Arora, 2015) among methodologists that the three main approaches to

research methodology are quantitative, qualitative, and mixed methods (i.e., a blending of quantitative and qualitative approaches). There is also a consensus that none of the methodologies is intrinsically superior; each methodology has strengths and weaknesses. The choice of methodology is determined by factors such as the research topic, research questions, and focus of a study (Arora, 2015; Creswell, 2015; Jackson, 2015; Moustakas, 2014; Trochim et al., 2015).

Table 1 contains McNabb's (2015) summary of the characteristics of, as well as differences between, the quantitative and qualitative research methodologies. The main difference between quantitative and qualitative methods identified by McNabb is the subjective nature of qualitative methodology as compared to the objective nature of quantitative methodology. In relation to the concept of objectivity, McNabb noted that it is not necessarily the case that quantitatively oriented studies measure a single, genuine reality; rather, there is only a methodological assumption that such a reality exists and can be studied, which is a hallmark of post-positivism (Arora, 2015; Creswell, 2015; Jackson, 2015; Moustakas, 2014; Trochim et al., 2015). According to McNabb and the other methodologists cited earlier, reality is assumed to consist solely of what is measurable. Post positivists on the other hand, emphasize that in quantitative research, assumptions about measurement and reality are being made.

Table 1

Differences Between Quantitative and Qualitative Research

Philosophical Foundations	Qualitative Research Designs	Quantitative Research Designs
Ontology (perceptions of reality)	Researchers assume that multiple, subjectively derived realities can coexist.	Researchers assume that a single, objective world exists.
Epistemology (roles for the researcher)	Researchers commonly assume that they must interact with their studied phenomena.	Researchers assume that they are independent from the variables under study.
Axiology (researchers' values)	Researchers overtly act in a value-laden and biased fashion.	Researchers overtly act in a value-free and unbiased manner.
Rhetoric (language styles)	Researchers often use personalized, informal, and context-laden language.	Researchers most often use impersonal, formal, and rule-based text.
Procedures (as employed in research)	Researchers tend to apply induction, multivariate, and multiprocess interactions, following context-laden methods.	Researchers tend to apply deduction, limited cause-and-effect relationships, with context-free methods.

Note. Adapted from McNabb (2015, p. 225).

In the context of this study, quantitative methodology was required for quantifying the relationship between poverty and HCV status. As noted in the literature cited in Chapters 1 and 2, there are many reasons that HCV is more prevalent among the poor; these reasons are subjective, inductive, and somewhat open ended, rendering them a better fit for qualitative than for quantitative methodology. However, the focus of the study was on quantifying the diagnosis and treatment of HCV as a function of poverty, as such an analysis (a) could be carried out on the data available, and (b) addressed a gap in the literature by applying an odds ratio (OR) model.

In keeping with McNabb's (2015) recommendations, the findings of the study were based on assumptions of measurement objectivity, researcher independence, lack of bias, impersonal rhetoric, and deductive methods.

There are 10 major research designs recognized in the literature on methodology (Arora, 2015; Creswell, 2015; Jackson, 2015; Moustakas, 2014; Trochim et al., 2015). Several of these designs were rapidly eliminated from consideration for the current study. For example, none of the designs applied in the qualitative methodological domain was applicable to the study.

In quantitative methodology, the available research designs are experimental, quasi-experimental, correlational, and survey-based designs. In experiments, researchers possess the ability to randomly assign subjects to different conditions in order to increase the internal validity of inferences about the effect of a treatment. In the case of a public health study, an experimental approach is impossible, because researchers cannot administer diseases or randomly assign individuals to wellness versus disease groups. In

a quasi-experiment, there are treatments or exposures, but the researcher does not control them. In a correlational study, the variables under study exist naturally, and are not subject to researcher or real-world intervention. The purpose of analysis is merely to measure the correlations. A correlation design was adopted for this study.

Target Population

The population of the study was of American adults. For the purposes of the study, an *adult* is someone who was 18 years of age or older when interviewed by NHANES. The population addressed by NHANES consisted of both adults and juveniles, but the adult population was targeted in this study.

Sampling Procedures

The sampling procedures of NHANES were pertinent to this study. No original sampling was carried out. NHANES used simple random sampling to (a) identify over 30 million potential participants, and (b) approach (by telephone and mail) potential participants. Anyone who met the NHANES criterion of giving informed consent was sampled by NHANES.

Power Analysis

The statistical procedure used in this study is a logistic regression with four predictors, an alpha of .05, a desired power of .80, an odds ratio of 1.3, and two-tailed significance tests. In order to rule out the potential of a false-positive result or Type I error, it was essential to determine the appropriate sample size, significance level, and effect size necessary to achieve an adequate level of power for my study. Therefore, as depicted in Figure 1, the a priori analysis was conducted using the power analysis

software, G*Power 3.1.9.2. (Heinrich-Heine-Universität Düsseldorf; Faul et al., 2009). On the basis of parameters, that according to Cohen (2013), are standard for logistic regression (i.e., predictors, alpha, desired power, odds ratio and two tails), the recommended sample was 721. The sample collected from NHANES was over 2,000.

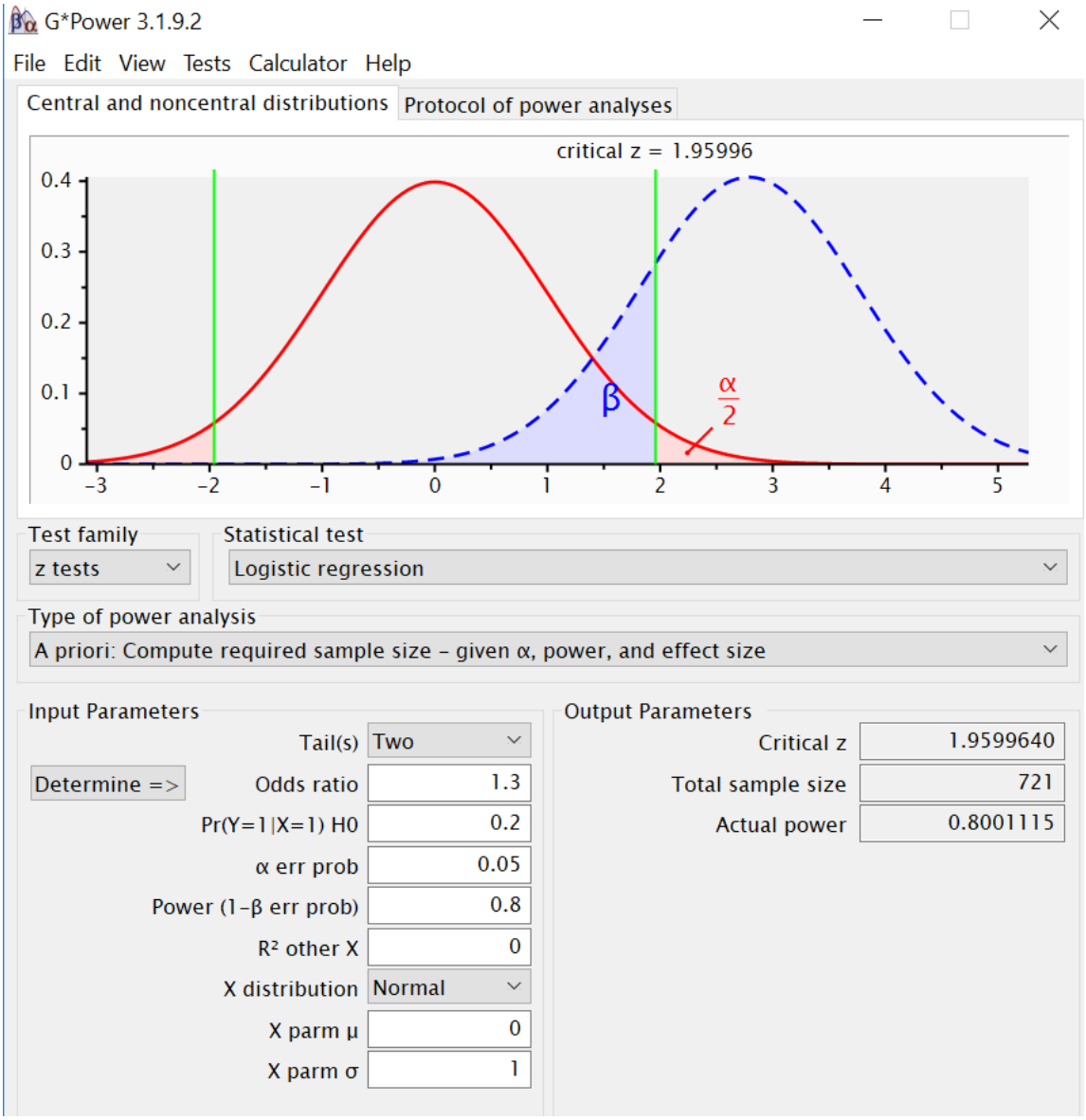


Figure 1. A priori sample size analysis (NHANES, 2016).

Reliability and Validity of Data Source

The National Health and Nutrition Examination Survey (NHANES) was the best publicly available quantitative data source for the study. NHANES is a nationwide survey conducted by the National Center for Health Statistics (NCHS) and administered by the Centers for Disease Control and Prevention (CDC).). NHANES samples Americans at random, and, has been able to sample thousands of people in each of its waves. The NHANES survey includes demographics, nutrition, and health history questionnaires to collect data participants identified for the study. In addition, NHANES carries out diagnostic and treatment services through mobile clinics (CDC, 2018).

NHANES is particularly useful in terms of analyzing HCV, because (a) the NHANES mobile clinics provide the capability of making diagnoses of HCV, and (b) the HCV questionnaires ask participants about their previous history with HCV, for example, if they have received treatment for this disease in the past. The NHANES dataset is large, randomly drawn from the population, and based on a combination of medical history taking and researcher questioning; for these reasons, NHANES was the ideal dataset through which to answer the research questions of this study. The 2015-2016 NHANES dataset was used for the purposes of this study (NHANES 2016).

The validity of a measure indicates whether that measure actually captures the phenomenon it is intended to capture. The validity of HEQ030 (Ever told you have Hepatitis C?) depends partly on whether the diagnosis of HCV was made by a certified health authority. NHANES increased the validity of answers to HEQ030 by directing

NHANES interviews to reject any self-diagnoses or diagnoses not made by a certified medical professional.

The reliability of a measure indicates whether the same answer would be given to the measure if solicited again. In the context of HEQ030, the issue of reliability arises in terms of whether (a) participants who were in fact diagnosed with HCV by a medical professional did not disclose this status in their NHANES interview, or (b) participants who were not in fact diagnosed with HCV by a medical professional reported that they were diagnosed with HCV in their NHANES interview. One way of increasing the reliability of answers to this question is to allow participants to indicate that they do not know whether they were diagnosed with HCV, thus reducing some of the inaccurate responses to this question that might be offered by individuals who feel pressured to answer *yes* or *no*, despite not knowing or not remembering.

For RQ2 (Is there a statistically significant relationship between being below the poverty line and being prescribed HCV medications?), the dependent variable was having been prescribed medicines to treat HCV. In the 2017-2018 NHANES dataset, the prescription of HCV medications ws measured by the question HEQ040 (Ever prescribed meds treat Hepatitis C?), which is provided in Figure 2.

HEQ040 - Ever prescribed meds treat Hepatitis C?

Variable Name:	HEQ040
SAS Label:	Ever prescribed meds treat Hepatitis C?
English Text:	Please look at the drugs on this card that are prescribed for Hepatitis C. {Were you/ Was/s/he/SP} ever prescribed any medicine to treat Hepatitis C?
English Instructions:	HAND CARD HEQ2 CAPI INSTRUCTION: IF SP AGE >= 16, DISPLAY "WERE YOU". IF SP AGE = 12-15 OR >=16 AND PROXY INTERVIEW, DISPLAY "WAS S/HE". IF SP AGE = 6-11, DISPLAY "WAS SP".
Target:	Both males and females 6 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Yes	22	22	
2	No	47	69	
7	Refused	0	69	
9	Don't know	9	78	
.	Missing	8289	8367	

Figure 2. NHANES Question HEQ040. From *2015-2016 Data Documentation, Codebook, and Frequencies: Hepatitis*, by National Health and Nutrition Examination Survey, 2016 (https://wwwn.cdc.gov/Nchs/Nhanes/2015-2016/HEQ_I.htm). In the public domain.

The validity of HEQ040 depends partly on whether the prescription of HCV medication was made by a certified health authority. NHANES increased the validity of answers to HEQ040 by directing NHANES interviews to reject any self-medication options for this question. In the context of HEQ040, the issue of reliability arises in terms of whether (a) participants who were in fact prescribed HCV medicines did not disclose this status in their NHANES interview, or (b) participants who were not in fact prescribed HCV medicines reported that they were prescribed HCV medicines in their NHANES interview. One way of increasing the reliability of answers to this question is to allow participants to indicate that they do not know whether they were prescribed HCV medicines, thus preventing some of the inaccurate responses to this question that might

be offered by individuals who feel pressured to answer *yes* or *no*, despite not knowing or not remembering.

In both RQ1 and RQ2, the independent variable was poverty. In the 2017-2018 NHANES dataset, poverty was measured by Question INDFMPIR (Ratio of family income to poverty), which is provided in Figure 3.

INDFMPIR - Ratio of family income to poverty

Variable Name: INDFMPIR

SAS Label: Ratio of family income to poverty

English Text: A ratio of family income to poverty guidelines.

Target: Both males and females 0 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0 to 4.99	Range of Values	7699	7699	
5	Value greater than or equal to 5.00	1220	8919	
.	Missing	1052	9971	

Figure 3. NHANES Question INDFMPIR. From *Demographic Variables*, by National Health and Nutrition Examination Survey, 2017 (https://wwwn.cdc.gov/Nchs/Nhanes /2015-2016/DEMO_I.htm#INDFMPIR). In the public domain.

Respondents are not asked to furnish the ratio of family (which NHANES considers to be equivalent to "household") income to poverty ratio directly. Rather, NHANES respondents are directed to provide data related to two other questions: (a) How many individuals are in the family (defined as legally related individuals living in the same house) of the respondent, and (b) What is the income of the family? The income of the family is measured through Question INDHHIN2 (Annual household income), on annual household income, which appears in Figure 4.

INDHHIN2 - Annual household income

Variable Name: INDHHIN2

SAS Label: Annual household income

English Text: Total household income (reported as a range value in dollars)

Target: Both males and females 0 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	$ 0 to $ 4,999	250	250	
2	$ 5,000 to $ 9,999	373	623	
3	$10,000 to $14,999	537	1160	
4	$15,000 to $19,999	600	1760	
5	$20,000 to $24,999	627	2387	
6	$25,000 to $34,999	1017	3404	
7	$35,000 to $44,999	960	4364	
8	$45,000 to $54,999	789	5153	
9	$55,000 to $64,999	629	5782	
10	$65,000 to $74,999	498	6280	
12	$20,000 and Over	292	6572	
13	Under $20,000	146	6718	
14	$75,000 to $99,999	920	7638	
15	$100,000 and Over	1634	9272	
77	Refused	220	9492	
99	Don't know	134	9626	
.	Missing	345	9971	

Figure 4. NHANES Question INDHHIN2. From *Demographic Variables*, by National Health and Nutrition Examination Survey, 2017 (https://wwwn.cdc.gov/Nchs/Nhanes/2015-2016/DEMO_I.htm#INDFMPIR). In the public domain.

The reliability of INDHHIN2 is increased by allowing participants to refuse to provide an income or to indicate that they do not know their family income; thus, for INDHHIN2, data are only collected from those participants who claim to be aware of, and who wish to provide, their family income. This figure is then divided by the number of people in the respondent's household - Question DMDFMSIZ (Total number of people in the Family), which appears as Figure 5 – in order to yield family income adjusted for

the number of people in a family. Finally, NHANES takes this quotient and analyzes it with respect to the official poverty line in each separate U.S. state in order to calculate INDFMPIR, which appears as Figure 3.

The validity of INDFMPIR is increased by NHANES adjustments for each state. NHANES notes that, in each state, the definition of poverty is slightly different, as factors such cost of living vary from state to state and can therefore influence the definition of poverty. To calculate INDFMPIR, NHANES data analysts measure the ratio derived for each participant as a function of INDHHIN2 divided by DMDFMSIZ against each participant's state's definition of the poverty line.

DMDFMSIZ - Total number of people in the Family

Variable Name: DMDFMSIZ

SAS Label: Total number of people in the Family

English Text: Total number of people in the Family

Target: Both males and females 0 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	1	1305	1305	
2	2	1510	2815	
3	3	1634	4449	
4	4	2011	6460	
5	5	1635	8095	
6	6	961	9056	
7	7 or more people in the Family	915	9971	
.	Missing	0	9971	

Figure 5. NHANES Question DMDFMSIZ. From *Demographic Variables*, by National Health and Nutrition Examination Survey, 2017 (https://wwwn.cdc.gov/Nchs/Nhanes /2015-2016/DEMO_I.htm#INDFMPIR). In the public domain.

While NHANES' adjustment of variables increases the likelihood that INDFMPIR is both a reliable and valid measure of poverty, this variable is vulnerable to

other deficiencies in reliability and validity that do not appear to be addressed in the NHANES dataset. One of the roots of the problem is that NHANES does not ask respondents (a) where they were diagnosed with HCV or prescribed HCV medications or (b) how poor they were at the time that they were diagnosed with HCV or prescribed HCV medications. Another problem is that the ratio INDFMPIR can mask actual individual poverty, as INDFMPIR is an aggregate variable. Each of these problems reduce the reliability and validity of the data analyses for RQ2 and therefore require a full discussion and acknowledgement.

The internal validity of RQ1 depends on the strength of inferences that can be drawn about the relationship between the independent variable of poverty and the dependent variable of having been diagnosed with HCV. RQ1's internal validity would be threatened if either the independent or dependent variables in this research question were not true measures of their targeted concepts. Considering the discussion of NHANES' absence of a time component with respect to either HCV diagnosis or the poverty status of an individual, it could be the case that an individual who was not poor when diagnosed with HCV was poor by the time he or she was questioned about his or her HCV diagnosis by NHANES. It could also be the case that an individual who was poor when diagnosed with HCV was not poor by the time he or she was questioned about his or her HCV diagnosis by NHANES. In either of these cases, the internal validity of RQ1 would be reduced, as the data analysis would no longer truly be measuring the link between poverty and likelihood of being diagnosed with HCV.

In precisely the same manner, the internal validity of RQ2 depends on the strength of inferences that can be drawn about the relationship between the independent variable of poverty and the dependent variable of having been prescribed HCV medications. RQ2's internal validity would be threatened if either the independent or dependent variables in this research question were not true measures of their targeted concepts. In light of the discussion of NHANES' absence of a time component with respect to either prescription of HCV medications or the poverty status of an individual, it could be the case that an individual who was not poor when prescribed HCV medicines, was poor by the time he or she was questioned about his or her HCV prescription history by NHANES. It could also be the case that an individual who was poor when prescribed HCV medication was not poor by the time he or she was questioned about his or her HCV prescription history by NHANES. In either of these cases, the internal validity of RQ2 would be reduced, as the data analysis would no longer truly be measuring the link between poverty and likelihood of having been prescribed HCV medicines.

Variable Definitions and Operationalization

For RQ1, the variable of income-to-poverty ratio was transformed. In NHANES, this variable reflects the ratio of income to poverty, with, for example, a ratio of 1 indicating that income is right at the poverty line, 0.5 indicating that income is half of poverty levels, and 2 indicating that income is twice the poverty level. This variable was recoded so as to be dichotomous, with 1 = individuals in poverty and 0 = individuals not in poverty. Having HCV was coded as 1, and not having HCV was coded as 0; any OR > 1 for RQ1 will mean that an individual in poverty has a greater chance of having HCV

than an individual not in poverty. Having been previously been prescribed HCV medicines was coded as 1, and not having been previously prescribed HCV medications was coded as 0; any OR > 1 for RQ2 means that an individual in poverty has a greater chance of having been prescribed HCV medications than an individual not in poverty.

In RQ1 (Is there a statistically significant relationship between being below the poverty line and being diagnosed with HCV?), the dependent variable is having received a diagnosis of HCV. In the 2017-2018 NHANES dataset, the diagnosis of HCV is measured by the question HEQ030, which is provided in Figure 6 below.

HEQ030 - Ever told you have Hepatitis C?

Variable Name:	HEQ030
SAS Label:	Ever told you have Hepatitis C?
English Text:	Has a doctor or other health professional ever told {you/SP} that {you have/s/he/SP has} Hepatitis C? (Hepatitis is a form of liver disease. Hepatitis C is an infection of the liver from the Hepatitis C virus (HCV).)
English Instructions:	CAPI INSTRUCTION: IF SP AGE >= 16, DISPLAY "WERE YOU". IF SP AGE = 12-15 OR >=16 AND PROXY INTERVIEW, DISPLAY "WAS S/HE". IF SP AGE = 6-11, DISPLAY "WAS SP". INTERVIEWER: DO NOT ACCEPT SELF-DIAGNOSED OR DIAGNOSED BY A PERSON WHO IS NOT A DOCTOR OR OTHER HEALTH PROFESSIONAL.
Target:	Both males and females 6 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Yes	78	78	
2	No	8254	8332	End of Section
7	Refused	0	8332	End of Section
9	Don't know	34	8366	End of Section
.	Missing	1	8367	

Figure 6. NHANES Question HEQ030. From *2015-2016 Data Documentation, Codebook, and Frequencies: Hepatitis*, by National Health and Nutrition Examination Survey, 2016 (https://wwwn.cdc.gov/Nchs/Nhanes/2015-2016/HEQ_I.htm). In the public domain.

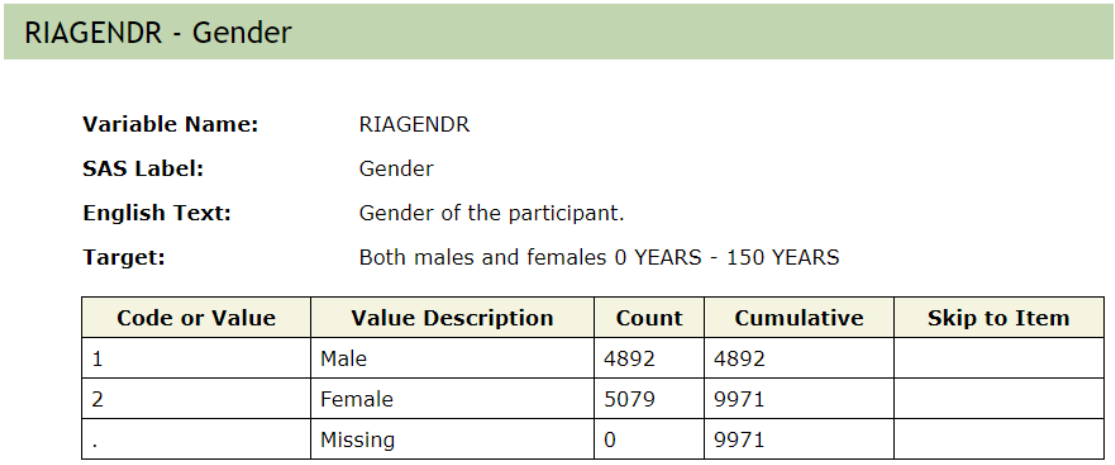
Data Analysis Plans

Data analysis is discussed below for each of the research questions of the study. The first research question of the study was as follows: Is there a statistically significant relationship between being below the poverty line and being diagnosed with HCV? RQ1 will be analyzed through the application of a multiple logistic regression model that reported an odds ratio for poverty as a predictor of HCV diagnosis. The null hypothesis associated with RQ1 will be rejected if the *p* value of the OR for poverty is < .05. If the *p* value of the OR for poverty is < .05, and the OR is > 1, it will be concluded that being poor is associated with a significantly higher risk of having HCV. After testing the null hypothesis for RQ1, the control variables of gender, race, and education level will be added in order to (a) determine whether there are subject changes in the *p* value and coefficient value of poverty with the addition of the covariates, and (b) estimate the independent effects of gender, race, and education level on the chances of having HCV.

The second research question of the study was as follows: Is there a statistically significant relationship between being below the poverty line and being prescribed HCV medications? For RQ2, the NHANES dataset already indicates which individuals had been prescribed HCV medications; therefore, there is already a dichotomous dependent variable available for logistic regression analysis of RQ2. The null hypothesis associated with RQ2 will be rejected if the *p* value of the OR for poverty is < .05. If the *p* value of the OR for poverty is < .05, and the OR is < 1, it will be concluded that being poor is associated with a significantly higher risk of not having been prescribed HCV medications. After testing the null hypothesis for RQ2, the control variables of gender,

race, and education level will be added in order to (a) determine whether there are significant changes in the *p* value and coefficient value of poverty with the addition of the covariates; and (b) estimate the independent effects of gender, race, and education level on the chances of having been previously prescribed HCV medications.

The data analysis for the study also includes the control variables of gender, race, and education level. Therefore, a discussion of these variables as they appear in NHANES has also been provided. Figure 6 below contains the NHANES coding for gender, which is measure solely as male, female, or missing Figure 7 contains NHANES coding for gender. There were 4,892 male (49.06%) and 5,079 (50.94%) female; a total of 9,971 participants in this study.



RIAGENDR - Gender

Variable Name: RIAGENDR

SAS Label: Gender

English Text: Gender of the participant.

Target: Both males and females 0 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Male	4892	4892	
2	Female	5079	9971	
.	Missing	0	9971	

Figure 7. NHANES Question RIAGENDR. From *Demographic Variables*, by National Health and Nutrition Examination Survey, 2017 (https://wwwn.cdc.gov/Nchs/Nhanes /2015-2016/DEMO_I.htm#INDFMPIR). In the public domain.

Figure 8 below contains the NHANES coding for race. There were 3,066 Non-Hispanic White (30.75%), 2,129 Non-Hispanic Black (21.35%), 1,921 Mexican Americans (19,26%).

RIDRETH3 - Race/Hispanic origin w/ NH Asian

Variable Name: RIDRETH3

SAS Label: Race/Hispanic origin w/ NH Asian

English Text: Recode of reported race and Hispanic origin information, with Non-Hispanic Asian Category

Target: Both males and females 0 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Mexican American	1921	1921	
2	Other Hispanic	1308	3229	
3	Non-Hispanic White	3066	6295	
4	Non-Hispanic Black	2129	8424	
6	Non-Hispanic Asian	1042	9466	
7	Other Race - Including Multi-Racial	505	9971	
.	Missing	0	9971	

Figure 8. NHANES Question RIDRETH3. From *Demographic Variables*, by National Health and Nutrition Examination Survey, 2017 (https://wwwn.cdc.gov/Nchs/Nhanes /2015-2016/DEMO_I.htm#INDFMPIR). In the public domain.

Figure 9 below contains the NHANES coding for education level. The number of participants with some college or an AA degree was 1,692. There were 1,422 participants who were college graduates or above; 1,236 participants that were high school graduates and GED or equivalent; 676 participants that were 9th through 11 grade or 12th grade without a diploma; and 688 participants that had less than a 9th grade education. The education level was missing for 4,252 participants or the participants chose not to report their education level.

DMDEDUC2 - Education level - Adults 20+

Variable Name: DMDEDUC2

SAS Label: Education level - Adults 20+

English Text: What is the highest grade or level of school {you have/SP has} completed or the highest degree {you have/s/he has} received?

English Instructions: HAND CARD DMQ1 READ HAND CARD CATEGORIES IF NECESSARY ENTER HIGHEST LEVEL OF SCHOOL

Target: Both males and females 20 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Less than 9th grade	688	688	
2	9-11th grade (Includes 12th grade with no diploma)	676	1364	
3	High school graduate/GED or equivalent	1236	2600	
4	Some college or AA degree	1692	4292	
5	College graduate or above	1422	5714	
7	Refused	0	5714	
9	Don't Know	5	5719	
.	Missing	4252	9971	

Figure 9. NHANES Question DMDEDUC2. From *Demographic Variables*, by National Health and Nutrition Examination Survey, 2017 (https://wwwn.cdc.gov/Nchs/Nhanes /2015-2016/DEMO_I.htm#INDFMPIR). In the public domain.

The reliability and validity of the NHANES coding for gender is limited by the absence of a category specifically for transgender or non-binary people. The reliability and validity of the NHANES coding for race is limited by the absence of more specific categories for individuals in the 'other' category. Finally, the reliability and validity of the NHANES coding for education is limited by the absence of a category to distinguish between college graduates and holders of more advanced degrees, as well as by the consideration that an individual's current educational status might be different from his or her educational status when first diagnosed with, or treated for, HCV. As was the case with the independent variable of poverty, the covariate of education might lack validity

with respect to the data analyses for both RQ1 and RQ2. For example, if an individual was a child when diagnosed with HCV, then his or her educational status would not have been measured by NHANES. Essentially, many of the validity problems that arise in the study are due to the same factor, which is the passage of an indeterminate "period of time" between (a) HCV diagnosis or HCV prescriptions, and (b) NHANES' data collection. It is in this "period of time," the poverty status of an individual, as well as his or her education level, could change substantially, threatening the validity of the data analyses. One possible means of addressing this issue, at least at the covariate level, is to present results with the covariate of education dropped as well as with the covariate of education included. However, because poverty is an independent variable in RQs 1 and 2, it must be retained, and there does not appear to be a means of approaching data analysis that can reduce or eliminate the problems caused by the passage of time between HCV diagnosis or HCV prescriptions and NHANES' data collection.

Threats to Validity

A threat to the internal validity of the data analysis for RQ1 as well as RQ2 is based on the possibility that the NHANES questions mask the individual respondent's poverty. In RQ1 and RQ2, the independent variable was poverty, and the dependent variable was having been diagnosed with HCV. For the variable of poverty in RQ1 and RQ2 to be valid, it must be a measure of an individual's poverty – which, as noted above, could be threatened by the absence of a time component in the NHANES dataset, but which could also be threatened by the method that NHANES uses to measure individual poverty. In terms of RQ1 and RQ2, it is possible that the variable of household income

masks the income of the respondent; if, for example, the respondent earns nothing, whereas his or her current spouse earns $60,000, then the respondent himself or herself might meet the individual definition of poverty. Even if a household- rather than individually based definition of poverty is considered appropriate, it is possible that a respondent who was poor when he or she was first diagnosed with HCV or prescribed HCV medications later entered a wealthier household.

The preceding discussion suggests that both the reliability and validity of the data analyses for RQ 1 and RQ 2 depend on several assumptions, limitations, and other characteristics of the NHANES dataset and its data collection method. In this respect, the issues are not those of psychometric reliability, such as those that might merit the calculation of Cronbach's Alpha or test-retest reliability (Santos, 1999), because NHANES does not ask participants to respond to scales. In the context of HCV, NHANES either collects demographic data or yes / no responses to simple questions about HCV status, diagnosis, and treatment. Therefore, the reliability and validity of NHANES need to be considered not in a psychometric sense, but in consideration of factors (whether rooted in data collection, data analysis, or both) that threaten the ability of NHANES to truly measure poverty, and, by extension, to be analyzable with respect to the relationship between poverty and HCV diagnosis or prescriptions.

A concern related to reliability is that of response rate. A response rate is the percentage of individuals in a sample who contribute data. In the NHANES methodology, individual respondents were sampled through a two-step process. First, all eligible respondents were tabulated by number and age group; for example, in 2015-2016, there

were roughly 316.5 million Americans eligible for NHANES. From the overall population, NHANES utilizes randomization to select a pool of individuals who would be approached by NHANES interviewers. The response rate can be calculated as the ratio of all individuals who are approached by NHANES to the number of individuals who agree to participate in a NHANES interview.

Lower response rates are associated with bias – that is, decreased reliability - emerging from the possibility that the answers that would have been given by individuals who choose not to respond to a survey instrument are significantly different from the answers that were given by the individuals who agreed to participate in a study. The problem of non-response rate has been described by Massey (2012) as follows:

A shift from a response rate of 95 percent to 90 percent, for example, introduces a small potential for non-response bias; the additional 5 percent of non-respondents need to be extremely different from the respondents to introduce substantial non-response bias. The potential is not so small when the response rate is 50 percent (i.e., one-half of eligible sample members are non-respondents). In this case, relatively small differences between respondents and non-respondents may yield significant biases. (Massey, 2012, p. 89).

As the current study is delimited to adult respondents to NHANES (that is, individuals who are at least 20 years of age in NHANES), it would be useful to present the non-response rates reported by NHANES (2018) for the 2015-2016 dataset.

- For the sub-sample of NHANES respondents in the 20-29 age bracket, the non-response rate was 44.3%.

- For the sub-sample of NHANES respondents in the 30-39 age bracket, the non-response rate was 42.8%.
- For the sub-sample of NHANES respondents in the 40-49 age bracket, the non-response rate was 43.4%.
- For the sub-sample of NHANES respondents in the 50-59 age bracket, the non-response rate was 43.7%.
- For the sub-sample of NHANES respondents in the 60-69 age bracket, the non-response rate was 44.5%.
- For the sub-sample of NHANES respondents in the 70-79 age bracket, the non-response rate was 47.5%.
- For the sub-sample of NHANES respondents 80 or over, the non-response rate was 57.6%.

Therefore, the non-response rates for NHANES at each age bracket were quite high. These non-response rates will lower the reliability of the NHANES findings, which, in turn, will lower the reliability for the analyses of RQ1 and RQ2.

Ethical Procedures

The Walden University Institutional Review Board (IRB) approved the proposal on October 11, 2018 (IRB Proposal Approval #10-11-18-0187345). The data for the study were drawn from a public source, the National Health and Nutrition Examination Survey (NHANES). De-identified data were used in this study. No prior agreements were required to access the data. The human subjects surveyed by NHANES possess both privacy and anonymity from the researcher. For this reason, there are no ethical issues

that require resolution in collecting data for the study. The data are archival data, in that they pre-exist the study and can be collected prior to the beginning of the study, as they are publicly available. The data are not secondary data, which would be data gathered for, or from, another study and thereby subject to some of the same ethical constraints as primary data collection (Creswell, 2015). The main ethical constraint on the study is the obligation to collect and analyze the data as accurately as possible and to disseminate the findings of the study in a manner that can contribute to positive social change.

Summary and Transition

The purpose of Chapter 3 was to describe and defend the various decisions made regarding the methodology and research design of the study. The first section consisted of an identification of possible research methodologies and the selection of the quantitative approach to research because of the nature of the study and the problem identified in Chapter 1.

The second section consisted of an identification of quantitative research designs. The third section consisted of a restatement of the research questions and hypotheses of the study. The fourth section consisted of an identification of the data sources to be utilized in the study. The fifth section consisted of a discussion of data analysis pertaining to the research questions of the study. The sixth section consisted of a discussion of reliability and validity. The seventh section consisted of a discussion of ethical factors. The findings presented in Chapter 4 are in alignment with the methodological orientations described and defended in Chapter 3.

Chapter 4: Results

Introduction

The focus of this research was applying statistical analysis to data from NHANES to (a) estimate the odds-based relationships between HCV (in terms of diagnosis and treatment) risk as a function of poverty and (b) provide synthesized explanations of how and why HCV appears to function differentially in terms of diagnosis and treatment among the poor. This purpose was achieved by answering the following research questions and testing their associated null hypotheses. All statistical tests and figures were generated within Stata 15.0 software.

RQ1: Is there a statistically significant relationship between being below the poverty line and being diagnosed with HCV?

$H1_0$: The odds ratio (OR) of having HCV as a function of poverty = 1.

$H1_A$: The OR of having HCV as a function of poverty ≠ 1.

RQ2: Is there a statistically significant relationship between being below the poverty line and being prescribed HCV medications?

$H2_0$: The OR of being prescribed HCV medications as a function of poverty = 1.

$H2_A$: The OR of being prescribed HCV medications as a function of poverty ≠ 1.

The purpose of Chapter 4 is to present the findings of the study. The findings are presented in three sections. First, the descriptive statistics of the findings are presented. Second, answers to the research questions of the study are provided. Third, other inferential tests relevant to the research questions are presented.

Data Collection

All data were collected from the 2015-2016 administration of NHANES. Data were assembled from the survey in the period from November 1 to November 8, 2018. There were no discrepancies in data collection from the plan presented in Chapter 3.

Results

The results were based primarily on answering the following research questions and their associated null and alternate hypotheses.

RQ1: Is there a statistically significant relationship between being below the poverty line and being diagnosed with HCV?

$H1_0$: The odds ratio (OR) of having HCV as a function of poverty = 1.

$H1_A$: The OR of having HCV as a function of poverty $\neq$ 1.

RQ2: Is there a statistically significant relationship between being below the poverty line and being prescribed HCV medications?

$H2_0$: The OR of being prescribed HCV medications as a function of poverty = 1.

$H2_A$: The OR of being prescribed HCV medications as a function of poverty $\neq$ 1.

Application of the Research Method

Approval to conduct research was obtained on September 13, 2018. The NHANES data source contained the best publicly available secondary data and did not require a data use agreement from the CDC. The NHANES data from 2015 to 2016 were downloaded on November 2, 2018. Variable labels and coding were assigned using variable definitions from the NHANES dictionary. No patient identifiers were downloaded from NHANES. All data are therefore both private and anonymous. The

subsample size of 81 represented all 81 individuals who were diagnosed with HCV in the NHANES dataset. However, the actual sample size was 9,971, as the calculation of *OR*s required the inclusion of both diagnosed and non-diagnosed individuals.

Descriptive Statistics

The first descriptive statistic contained the proportion of respondents who were diagnosed with HCV. Of 8,332 respondents for whom HCV diagnostic data were available, 78 were diagnosed with HCV, whereas 8,254 were not diagnosed with HCV. The proportion of the sample that was diagnosed with HCV was therefore 0.94%, with a 95% confidence interval ranging from 0.73% to 1.15% (see Figure 10). Of 9,971 respondents for whom poverty data could be calculated, 2,343, or 23.50%, were below the poverty line. The 95% confidence interval for the proportion of NHANES respondents who were below the poverty line was from 22.67% to 24.33%.

Additionally, of the respondents, the 78 diagnosed with HCV were asked whether or not they had been prescribed medications for HCV, and, of these individuals, 22, or 0.26%, indicated that they had received prescriptions. The 95% confidence interval for NHANES respondents who were prescribed medications for HCV was from 0.15% to 0.37% (see Figure 11).

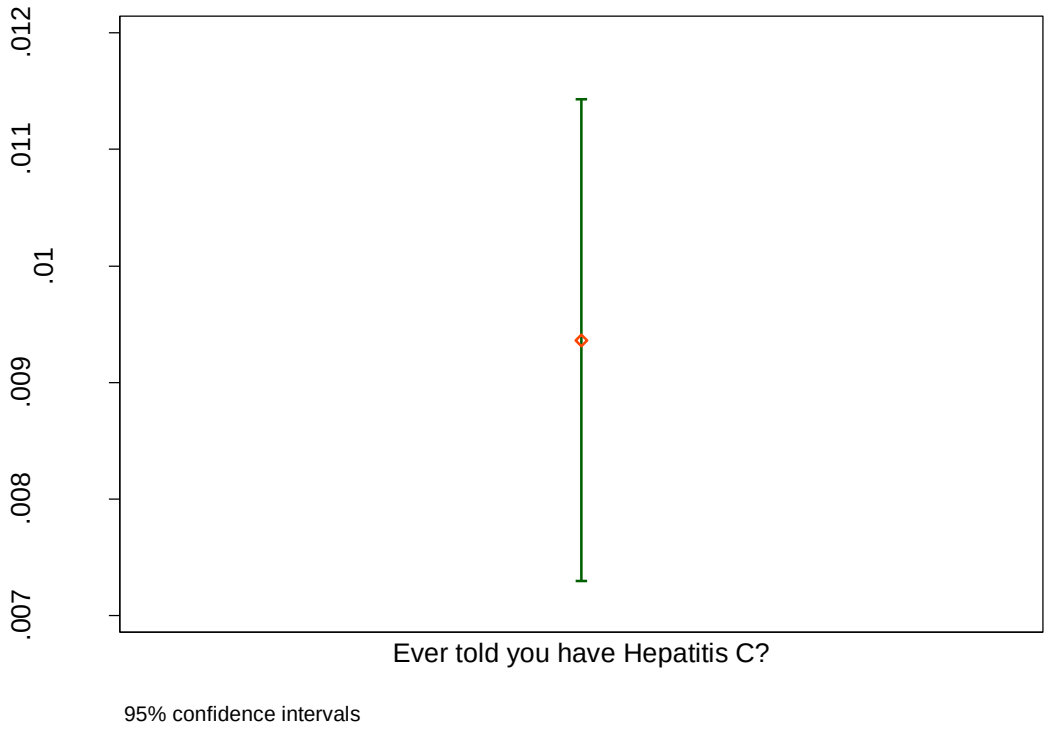


Figure 10. 95% confidence interval and point estimate, HCV diagnosis.

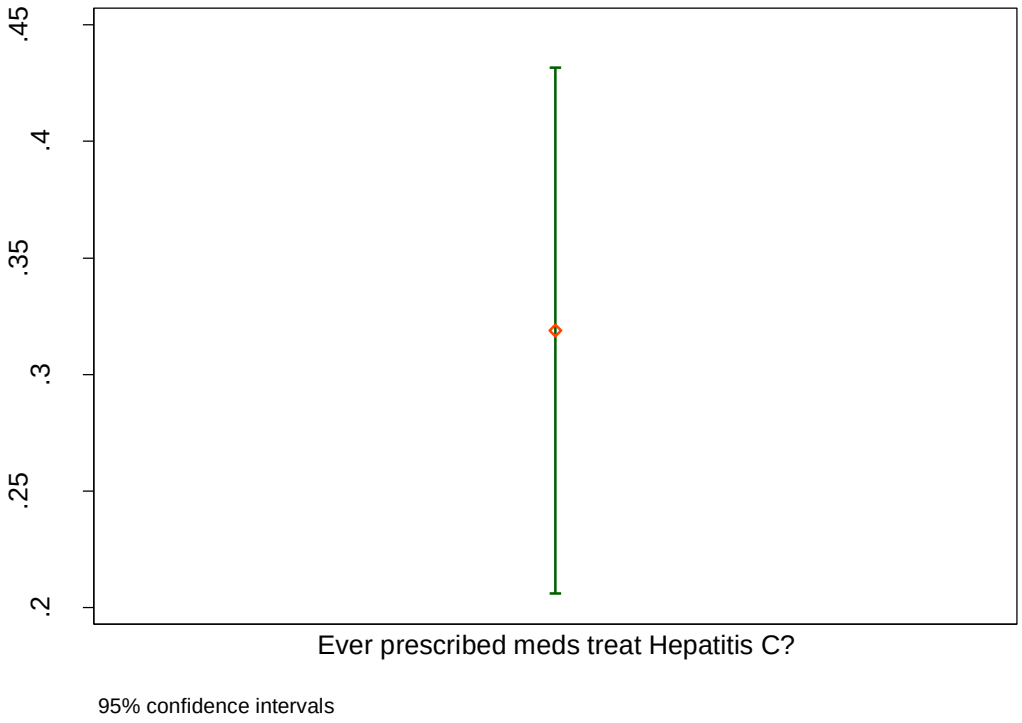


Figure 11. 95% confidence interval and point estimate, HCV medication prescription.

RQ1 Findings

The first research question of the study was as follows: Is there a statistically significant relationship between being below the poverty line and being diagnosed with HCV? In RQ1, the independent variable was being below the poverty line, the dependent variable was whether the respondent was diagnosed with HCV, and the control variables were gender, race, and education level. The model for RQ1 was fit in two stages, with the first step being to calculate the *OR* of being diagnosed with HCV as a function of poverty, and the second step being to calculate the *OR* of being diagnosed with HCV as a function of poverty after taking the explanatory power of gender, race, and education level into account. For maximum explanatory power, the *OR* models for RQ1 were

constructed additively, with one covariate added at a time to the base model in order to observe changes in the *OR* of the relationship between poverty and being diagnosed with HCV.

The first model for RQ1 was the calculation of the likelihood of being diagnosed with HCV as a function of poverty. In this model, being poor (coded as 1, with not being poor coded as 0) had an *OR* of 1.13, indicating that poor people were 1.13 times as likely as nonpoor people to be diagnosed with HCV, $SE = 0.29$, $z = 0.46$. However, this *OR* was not statistically significant, $p = .647$, and its 95% confidence interval (0.68, 1.88) included 1, meaning an absence of effect. Therefore, it appeared that being diagnosed with HCV was not a function of poverty.

The second model for RQ1 was the calculation of the likelihood of being diagnosed with HCV as a function of poverty as well as gender. In this model, being poor had an *OR* of 1.13, indicating that poor people were 1.13 times as likely as nonpoor people to be diagnosed with HCV, $SE = 0.29$, $z = 0.46$, but poverty was not a significant predictor, $p = .647$. It should be noted that the *OR* of poverty did not change from the base model after gender was added as a covariate. In terms of gender, it was found that men were 1.00 times as likely as women to be diagnosed with HCV (*OR* = 1.00, $SE = 0.23$, $z = 0.00$, $p = .999$). Therefore, gender on its own was not a significant predictor of being diagnosed with HCV, and the addition of gender to the model did not alter the *OR* of poverty as a predictor of being diagnosed with HCV.

The third model for RQ1 was the calculation of the likelihood of being diagnosed with HCV as a function of poverty as well as gender and race. In this model, being poor

had an *OR* of 1.05, indicating that poor people were 1.05 times as likely as nonpoor people to be diagnosed with HCV, *SE* = 0.28, *z* = 0.20, but poverty was not a significant predictor, *p* = .841. It should be noted that the *OR* of poverty did not change significantly from the base model after gender and race were added as covariates. In terms of gender, it was found that men were 1.01 times as likely as women to be diagnosed with HCV (*OR* = 1.01, *SE* = 0.23, *z* = 0.04, *p* = .969). Therefore, gender on its own was not a significant predictor of being diagnosed with HCV. Next, the impact of race was calculated. In comparison to the base race of Mexican, being White (*OR* = 0.83, *SE* = 0.28, *z* = -0.56, *p* = .577), being Black (*OR* = 1.19, *SE* = 0.40, *z* = 0.53, *p* = .596), being Asian (*OR* = 0.69, *SE* = 0.33, *z* = -0.75, *p* = .451), being Other (*OR* = 0.96, *SE* = 0.54, *z* = -0.08, *p* = .940), and being Other Hispanic (*OR* = 0.90, *SE* = 0.37, *z* = -0.25, *p* = .800) were not significant predictors of being diagnosed with HCV. Because none of the comparison races was significant when compared to the base race of Mexican, it can be inferred that being Mexican was also not a significant predictor of being diagnosed with HCV.

The fourth model for RQ1 (see Table 2) was the calculation of the likelihood of being diagnosed with HCV as a function of poverty as well as gender, race, and education. In this model, being poor had an *OR* of 0.99, indicating that poor people were 0.99 times as likely as nonpoor people to be diagnosed with HCV, *SE* = 0.38, *z* = -0.03, but poverty was not a significant predictor, *p* = .974. It should be noted that the *OR* of poverty did not change significantly from the base model after gender, race, and education were added as covariates. In terms of gender, it was found that men were 1.00 times as likely as women to be diagnosed with HCV (*OR* = 1.00, *SE* = 0.29, *z* = 0.00, *p* =

.996). Therefore, gender on its own was not a significant predictor of being diagnosed with HCV. Next, the impact of race was calculated. In comparison to the base race of Mexican, being White (*OR* = 0.95, *SE* = 0.44, *z* = -0.10, *p* = .920), being Black (*OR* = 1.07, *SE* = 0.51, *z* = 0.15, *p* = .883), being Asian (*OR* = 0.84, *SE* = 0.50, *z* = -0.28, *p* = .776), being Other (*OR* = 0.48, *SE* = 0.52, *z* = -0.68, *p* = .494), and being Other Hispanic (*OR* = 0.88, *SE* = 0.48, *z* = -0.24, *p* = .808) were not significant predictors of being diagnosed with HCV. Because none of the comparison races was significant when compared to the base race of Mexican, it can be inferred that being Mexican was also not a significant predictor of being diagnosed with HCV.

Finally, education was added as a covariate, with the base group being individuals who had not had a ninth-grade education. In comparison to individuals who had not been to high school, individuals who had been to Grades 9-11 (*OR* = 0.99, *SE* = 0.71, *z* = -0.02, *p* = .985), individuals who were high school graduates (*OR* = 1.21, *SE* = 0.76, *z* = 0.30, *p* = .764), individuals who had had some college or who held an associate's degree (*OR* = 2.14, *SE* = 1.25, *z* = 1.30, *p* = .194), and individuals with a college degree or higher (*OR* = 1.37, *SE* = 0.87, *z* = 0.50, *p* = .621) were not significantly more likely to have been diagnosed with HCV. Because none of the comparison education groups was significant when compared to the base education group of no high school, it can be inferred that not having attended high school was also not a significant predictor of being diagnosed with HCV. HCV.

Table 2

OR Results, RQ1 (Dependent Variable: Diagnosed With HCV)

Independent variable	OR	SE	z	p	95% CI, lower bound	95% CI, upper bound
Being poor	0.988	0.381	-0.030	0.974	0.464	2.102
Being male	1.001	0.290	< .001	0.996	0.568	1.766
Being Hispanic	0.875	0.480	-0.240	0.808	0.300	2.564
Being White	0.955	0.437	-0.100	0.920	0.390	2.340
Being Black	1.073	0.512	0.150	0.883	0.421	2.734
Being Asian	0.844	0.504	-0.280	0.776	0.216	2.721
Being other race	0.480	0.515	-0.680	0.494	0.058	3.940
9-11 grade	0.987	0.710	-0.020	0.985	0.241	4.032
HS graduate	1/208	0.757	0.300	0.764	0.353	4.130
Some college	2.135	1.248	1.300	0.194	0.679	6.715
College or above	1.369	0.868	0.500	0.621	0.395	4.740
Constant	0.007	0.004	-8.380	0.001	0.002	0.023

Note. To 3 significant figures.

The fourth *OR* model for RQ1 passed the Pearson chi-square goodness-of-fit assumption, chi-square (106) = 100.24, $p = .6395$.

RQ2 Findings

The second research question of the study was as follows: Is there a statistically significant relationship between being below the poverty line and being prescribed HCV medications? In RQ2, the independent variable was being below the poverty line, the dependent variable was whether the respondent was prescribed HCV medications, and the control variables were gender, race, and education level. The model for RQ2 was fit in two stages, with the first step being to calculate the *OR* of being prescribed HCV medications as a function of poverty, and the second step being to calculate the *OR* of being prescribed HCV medications as a function of poverty after taking the explanatory

power of gender, race, and education level into account. For maximum explanatory power, the *OR* models for RQ2 were constructed additively, with one covariate added at a time to the base model in order to observe changes in the *OR* of the relationship between poverty and being prescribed HCV medication.

The first model for RQ2 was the calculation of the likelihood of being prescribed HCV medications as a function of poverty. In this model, being poor (coded as 1, with not being poor coded as 0) had an *OR* of 1.73, indicating that poor people were 1.73 times as likely as nonpoor people to be prescribed HCV medication, $SE = 1.00$, $z = 0.94$. However, this *OR* was not statistically significant, $p = .346$, and its 95% confidence interval (0.55, 5.38) included 1, meaning an absence of effect. Therefore, it appeared that being prescribed HCV medications was not a function of poverty.

The second model for RQ2 was the calculation of the likelihood of being prescribed HCV medications as a function of poverty as well as gender. In this model, being poor had an *OR* of 1.89, indicating that poor people were 1.89 times as likely as nonpoor people to be prescribed HCV medication, $SE = 1.12$, $z = 1.07$, but poverty was not a significant predictor, $p = .285$. It should be noted that the *OR* of poverty did not change from the base model after gender was added as a covariate. In terms of gender, men were 0.61 times as likely as women to be prescribed HCV medication ($OR = 0.61$, $SE = 0.33$, $z = -0.91$, $p = .361$). Therefore, gender on its own was not a significant predictor of being prescribed HCV medications, and the addition of gender to the model did not alter the *OR* of poverty as a predictor of being prescribed HCV medications.

The third model for RQ2 was the calculation of the likelihood of being prescribed HCV medications as a function of poverty as well as gender and race. In this model, being poor had an *OR* of 1.64, indicating that poor people were 1.64 times as likely as non-poor people to be prescribed HCV medication, *SE* = 1.05, *z* = 0.77, but poverty was not a significant predictor, *p* = .441. It should be noted that the *OR* of poverty did not change significantly from the base model after gender and race were added as covariates. In terms of gender, men were 0.75 times as likely as women to be prescribed HCV medication (*OR* = 0.74, *SE* = 0.42, *z* = -0.51, *p* = .609). Therefore, gender on its own was not a significant predictor of being prescribed HCV medications. Next, the impact of race was calculated. In comparison to the base race of Mexican, being White (*OR* = 0.36, *SE* = 0.31, *z* = -1.19, *p* = .234), being Black (*OR* = 1.03, *SE* = 0.76, *z* = 0.04, *p* = .969), being Other (*OR* = 0.51, *SE* = 0.68, *z* = -0.51, *p* = .612), and being Other Hispanic (*OR* = 2.14, *SE* = 1.91, *z* = 0.85, *p* = .397) were not significant predictors of being prescribed HCV medications. Because no Asians were prescribed HCV medications, being Asian could not be included in the logistic regression. Finally, because none of the included comparison races was significant when compared to the base race of Mexican, it can be inferred that being Mexican was also not a significant predictor of being prescribed HCV medications.

The fourth model for RQ2 (see Table 3 below) was the calculation of the likelihood of being prescribed HCV medications as a function of poverty as well as gender, race, and education. In this model, being poor had an *OR* of 0.32, indicating that poor people were 0.32 times as likely as non-poor people to be prescribed HCV

medication, *SE* = 0.55, *z* = -0.66, but poverty was not a significant predictor, *p* = .507. It should be noted that the *OR* of poverty did not change significantly from the base model after gender, race, and education were added as covariates. In terms of gender, men were 1.60 times as likely as women to be prescribed HCV medication (*OR* = 1.60, *SE* = 1.52, *z* = 0.50, *p* = .617). Therefore, gender on its own was not a significant predictor of being prescribed HCV medications. Next, the impact of race was calculated. In comparison to the base race of Mexican, being White (*OR* = 0.19, *SE* = 0.30, *z* = -1.04, *p* = .299), being Black (*OR* = 0.42, *SE* = 0.65, *z* = -0.56, *p* = .577), and being Other Hispanic (*OR* = 2.40, *SE* = 4.17, *z* = 0.50, *p* = .507) were not significant predictors of being prescribed HCV medications. Members of Asian and Other races were excluded because of not being prescribed HCV medications. Because none of the included comparison races was significant when compared to the base race of Mexican, it can be inferred that being Mexican was also not a significant predictor of being prescribed HCV medications. Finally, education was added as a covariate, with the base group being individuals who had not had a 9th-grade education. In comparison to individuals who had not been to high school, individuals who had been to grades 9-11 (*OR* = 0.32, *SE* = 0.60, *z* = -0.61, *p* = .540), individuals who were high school graduates (*OR* = 0.51, *SE* = 0.64, *z* = -0.54, *p* = .588), and individuals who had had some college or who held an Associate's degree (*OR* = 0.16, *SE* = 0.21, *z* = -1.40, *p* = .162) were not significantly more likely to have been diagnosed with HCV. The education class of college above was excluded because none of its members were prescribed HCV medications. Because none of the included comparison education groups was significant when compared to the base education group

of no high school, it can be inferred that not having attended high school was also not a significant predictor of being prescribed HCV medications.

Table 3

OR Results, RQ1 (Dependent Variable: Prescribed HCV Medicines)

Independent variable	OR	SE	z	p	95% CI, lower bound	95% CI, upper bound
Being poor	0.322	0.550	-0.660	0.507	0.011	9.188
Being male	1.605	1.520	0.500	0.617	0.250	10.274
Being Hispanic	2.396	4.163	0.500	0.615	0.079	72.327
Being White	0.189	0.303	-1.040	0.299	0.008	4.392
Being Black	0.416	0.650	-0.560	0.575	0.019	8.908
Being Asian	--	--	--	--	--	--
Being other race	--	--	--	--	--	--
9-11 grade	0.326	0.596	-0.610	0.540	0.009	11.722
HS graduate	0.506	0.636	-0.540	0.588	0.042	5.950
Some college	0.160	0.210	-1.400	0.162	0.012	2.092
College or above	--	--	--	--	--	--
Constant	1.661	2.645	0.320	0.750	0.073	37.662

Note. To 3 significant figures.

The fourth *OR* model for RQ2 passed the Pearson Chi-square goodness-of-fit assumption, Chi-square (106) = 26.13, $p = .0567$.

Additional Inferential Statistics

Because of the wealth of data in the NHANES dataset, and because no statistically significant findings emerged from the analysis of the research questions, the

opportunity was taken to examine the influence of two other possible confounding variables, including having any health insurance and having Medicaid.

Health Insurance Effects

Health insurance effects were tested separately for RQ1 and RQ2. For RQ1, health insurance was added to the final model, that is, the model in which poverty, gender, race, and education were present as predictors of having been diagnosed with HCV. For RQ2, health insurance was also added to the final model, in which poverty, gender, race, and education were present as predictors of having been prescribed HCV medication.

The health insurance model for RQ1 (see Table 4) was the calculation of the likelihood of being diagnosed with HCV as a function of poverty, health insurance, gender, race, and education. In this model, being poor had an *OR* of 0.89, indicating that poor people were 0.89 times as likely as non-poor people to be diagnosed with HCV, *SE* = 0.34, *z* = -0.31, but poverty was not a significant predictor, *p* = .755. It should be noted that the *OR* of poverty did not change significantly from the base model after health insurance, gender, race, and education were added as covariates. In terms of health insurance, individuals with health insurance were 0.49 times as likely as individuals without health insurance to be told that they had HCV, and this *OR* was significant (*OR* = 0.49, *SE* = 0.17, *z* = -2.08, *p* = .038). In terms of gender, men were 0.97 times as likely as women to be diagnosed with HCV (*OR* = 0.97, *SE* = 0.28, *z* = -0.11, *p* = .914). Therefore, gender on its own was not a significant predictor of being diagnosed with HCV when health insurance was added as a covariate to the expanded model for RQ1.

Table 4

OR Results, Health Insurance Model (Dependent Variable: Diagnosed With HCV)

Independent variable	OR	SE	z	p	95% CI, lower bound	95% CI, upper bound
Being poor	0.886	0.345	-0.310	.755	0.413	1.900
Being male	0.970	0.281	-0.110	.914	0.549	1.710
Being Hispanic	0.933	0.513	-0.130	.900	0.318	2.734
Being White	1.100	0.512	0.200	.841	0.440	2.734
Being Black	1.195	0.577	0.370	.712	0.464	3.076
Being Asian	0.944	0.570	-0.090	.924	0.289	3.077
Being other race	0.524	0.564	-0.600	.549	0.063	4.323
9-11 grade	0.980	0.704	-0.030	.977	0.250	4.008
HS graduate	1.233	0.774	0.330	.738	0.360	4.222
Some college	2.284	1.340	1.410	.159	0.723	7.211
College or above	1.558	0.997	0.690	.488	0.445	5.463
Insured	0.486	0.169	-2.080	.038	0.245	0.960
Constant	0.012	0.007	-7.270	<.001	0.003	0.039

Note. To 3 significant figures.

Next, the impact of race was calculated. In comparison to the base race of Mexican, being White (*OR* = 1.10, *SE* = 0.51, *z* = -0.13, *p* = .900), being Black (*OR* = 1.19, *SE* = 0.58, *z* = 0.37, *p* = .712), being Asian (*OR* = 0.94, *SE* = 0.57, *z* = -0.09, *p* = .924), being Other (*OR* = 0.52, *SE* = 0.56, *z* = -0.60, *p* = .549), and being Other Hispanic (*OR* = 0.93, *SE* = 0.51, *z* = -0.13, *p* = .900) were not significant predictors of being

diagnosed with HCV. Because none of the comparison races was significant when compared to the base race of Mexican, it can be inferred that being Mexican was also not a significant predictor of being diagnosed with HCV when health insurance was added as a covariate to the expanded model for RQ1. Finally, education was added as a covariate, with the base group being individuals who had not had a 9th-grade education. In comparison to individuals who had not been to high school, individuals who had been to Grades 9-11 (*OR* = 0.98, *SE* = 0.70, *z* = -0.03, *p* = .977), individuals who were high school graduates (*OR* = 1.23, *SE* = 0.77, *z* = 0.33, *p* = .738), individuals who had had some college or who held an Associate's degree (*OR* = 2.28, *SE* = 1.34, *z* = 1.41, *p* = .159), and individuals with a college degree or higher (*OR* = 1.56, *SE* = 1.00, *z* = 0.69, *p* = .488) were not significantly more likely to have been diagnosed with HCV. Because none of the comparison education groups was significant when compared to the base education group of no high school, it can be inferred that not having attended high school was also not a significant predictor of being diagnosed with HCV.

In terms of RQ1, the addition of having health insurance did not alter the non-significance of any of the variables in the initial model (that is, poverty, gender, race, and education). However, having health insurance was, on its own, a significant predictor of being diagnosed with HCV. Specifically, individuals without health insurance were almost twice as likely to be diagnosed with HCV as individuals without health insurance. This cross-tabulation appears as Table 5 below.

Table 5

Cross-Tabulation of Health Insurance Status and HCV Diagnosis

Ever told you have HCV?	Health insurance status		Total
	Not insured	Insured	
No	1,084 (98%))	7,154 (99%)	8,238 (99%)
Yes	17 (2%)	61 (1%)	78 (1%)
Total	1,101 (100%)	7,215 (100%)	8,316 (100%)

Pearson's χ^2 for the data in Table 2 is 5.02, $p = .025$. A higher-than-expected proportion of individuals diagnosed with HCV were not insured. As will be discussed further in Chapter 5, this finding suggests the possibility that uninsured individuals might be tested for HCV through other means, such as mobile medical clinics, free clinics, or research studies.

The health insurance model for RQ2 was the calculation of the likelihood of being prescribed medications for HCV as a function of poverty, health insurance, gender, race, and education. In this model, being poor had an *OR* of 0.01, indicating that poor people were 0.01 times as likely as non-poor people to be diagnosed with HCV, $SE = 0.03$, $z = -1.69$, but poverty was not a significant predictor, $p = .091$. It should be noted that the *OR* of poverty did not change significantly from the base model after health insurance, gender, race, and education were added as covariates. In terms of health insurance, individuals with health insurance were 0.03 times as likely as individuals without health insurance to be prescribed HCV medications, and this *OR* was significant ($OR = 0.05$, $SE = -2.11$, $z = -2.08$, $p = .035$). In terms of gender, men were 1.57 times as likely as women

to be diagnosed with HCV (*OR* = 1.57, *SE* = 1.81, *z* = 0.39, *p* = .698). Therefore, gender on its own was not a significant predictor of being prescribed medications for HCV when health insurance was added as a covariate to the expanded model for RQ2. Next, the impact of race was calculated. In comparison to the base race of Mexican, being White (*OR* = 1.15, *SE* = 2.22, *z* = 0.07, *p* = .372), being Black (*OR* = 2.18, *SE* = 4.18, *z* = 0.41, *p* = 685), and being Other Hispanic (*OR* = 7.00, *SE* = 15.27, *z* = 0.89, *p* = .900) were not significant predictors of being prescribed medications for HCV (note that the classes of Asian and Other were empty and therefore not included in this logistic regression). Because none of the included comparison races was significant when compared to the base race of Mexican, it can be inferred that being Mexican was also not a significant predictor of being prescribed medications for HCV when health insurance was added as a covariate to the expanded model for RQ2. Finally, education was added as a covariate, with the base group being individuals who had not had a 9th grade education. In comparison to individuals who had not been to high school, individuals who had been to grades 9-11 (*OR* = 0.20, *SE* = 0.42, *z* = -0.76, *p* = .449), individuals who were high school graduates (*OR* = 0.27, *SE* = 0.37, *z* = -0.96, *p* = .339), and individuals who had had some college or who held an Associate's degree (*OR* = 2.28, *SE* = 1.34, *z* = 1.41, *p* = .159), and individuals with a college degree or higher (*OR* = 0.05, *SE* = 0.09, *z* = -1.69, *p* = .091) were not significantly more likely to have been diagnosed with HCV (note that the class of individuals with college degrees or higher was empty and therefore excluded from this analysis). Because none of the included comparison education groups was significant when compared to the base education group of no high school, it can be

inferred that not having attended high school was also not a significant predictor of being prescribed medications for HCV.

In terms of RQ2, the addition of having health insurance did not alter the non-significance of any of the variables in the initial model (that is, poverty, gender, race, and education). One point of interest arising from the addition of health insurance to the model for RQ2 is that, when health insurance is isolated from the other covariates, it is no longer a statistically significant predictor of being prescribed HCV medications. For example, Chi-square analysis indicates that the distribution of individuals in the HCV medication groups by health insurance status does not violate the null assumption, as Pearson's χ^2 for the data in Table 6 is 3.15, $p = .076$.

Table 6

Cross-Tabulation of Health Insurance Status and Being Prescribed HCV Medications

Ever prescribed HCV medication?	Health insurance status		Total
	Not insured	Insured	
No	8 (50%)	39 (74%)	47
Yes	8 (50%)	14 (26%)	22
Total	16	53	69

In addition, when health insurance is the sole predictor in a logistic regression model with having been prescribed HCV medications as the dependent variable, health insurance is not a significant predictor ($OR = 0.36$, $SE = 0.21$, $z = -1.74$, $p = .082$). Thus, the significance of health insurance as a predictor of being prescribed HCV medications only exists in the combined model, indicating that the other demographic variables interact somehow to make health insurance significant in the expanded model.

Medicaid Effects

Medicaid effects were tested separately for RQ1 and RQ2. For RQ1, Medicaid was added to the final model, that is, the model in which poverty, gender, race, and education were present as predictors of having been diagnosed with HCV. For RQ2, Medicaid was also added to the final model, in which poverty, gender, race, and education were present as predictors of having been prescribed HCV medication.

The Medicaid model for RQ1 was the calculation of the likelihood of being diagnosed with HCV as a function of poverty, Medicaid, gender, race, and education. In this model, being poor had an *OR* of 1.05, indicating that poor people were 1.05 times as likely as non-poor people to be diagnosed with HCV, *SE* = 0.42, *z* = 0.13, but poverty was not a significant predictor, *p* = .900. It should be noted that the *OR* of poverty did not change significantly from the base model after Medicaid, gender, race, and education were added as covariates. In terms of Medicaid, individuals with Medicaid were 0.75 times as likely as individuals without Medicaid to be told that they had HCV, but this *OR* was not significant (*OR* = 0.75, *SE* = 0.38, *z* = -0.57, *p* = .568). In terms of gender, men were 0.99 times as likely as women to be diagnosed with HCV (*OR* = 0.99, *SE* = 0.29, *z* = -0.03, *p* = .973). Therefore, gender on its own was not a significant predictor of being diagnosed with HCV when Medicaid was added as a covariate to the expanded model for RQ1. Next, the impact of race was calculated. In comparison to the base race of Mexican, being White (*OR* = 0.96, *SE* = 0.44, *z* = -0.09, *p* = .931), being Black (*OR* = 1.10, *SE* = 0.53, *z* = 0.20, *p* = .840), being Asian (*OR* = 0.85, *SE* = 0.51, *z* = -0.26, *p* = .792), being Other (*OR* = 0.49, *SE* = 0.52, *z* = -0.67, *p* = .505), and being Other Hispanic

(*OR* = 0.88, *SE* = 0.48, *z* = -0.23, *p* = .820) were not significant predictors of being diagnosed with HCV. Because none of the comparison races was significant when compared to the base race of Mexican, it can be inferred that being Mexican was also not a significant predictor of being diagnosed with HCV when Medicaid was added as a covariate to the expanded model for RQ1. Finally, education was added as a covariate, with the base group being individuals who had not had a 9th-grade education. In comparison to individuals who had not been to high school, individuals who had been to Grades 9-11 (*OR* = 0.98, *SE* = 0.71, *z* = -0.02, *p* = .983), individuals who were high school graduates (*OR* = 1.19, *SE* = 0.75, *z* = 0.28, *p* = .777), individuals who had had some college or who held an Associate's degree (*OR* = 2.10, *SE* = 1.23, *z* = 1.27, *p* = .206), and individuals with a college degree or higher (*OR* = 1.33, *SE* = 0.84, *z* = 0.44, *p* = .657) were not significantly more likely to have been diagnosed with HCV. Because none of the comparison education groups was significant when compared to the base education group of no high school, it can be inferred that not having attended high school was also not a significant predictor of being diagnosed with HCV. In terms of RQ1, the addition of having Medicaid did not alter the non-significance of any of the variables in the initial model (that is, poverty, gender, race, and education), and Medicaid also failed to be a significant predictor of being diagnosed with HCV when included with the covariates of poverty, gender, race, and education. For RQ2, because no individuals who had Medicaid were prescribed HCV medications, the logistic regression model could not be carried out.

Prescription as a Function of Diagnosis

Another analytical procedure carried out on the data was to model the likelihood of being prescribed HCV medications after being diagnosed with HCV. Seventy-eight individuals in the sample were diagnosed with HCV, and 22 of these individuals were prescribed HCV medication. Thus, the point estimate of the likelihood of being prescribed HCV medication was 22 / 78, or roughly 28.20%, with a confidence interval of 18.21% to 38.19%. Thus, there is substantial variability in the likelihood of a person with HCV being prescribed HCV medications.

Summary

The purpose of Chapter 4 was to present the findings of the study. The findings were presented in three sections. First, the descriptive statistics were presented. Second, answers to the research questions of the study were provided. Third, other inferential tests relevant to the research questions were presented.

To summarize the first research question, it was found that there was not a statistically significant relationship between being below the poverty line and being diagnosed with HCV when gender, race, and education were also included as covariates, $OR = 0.99$ ($SE = 0.38$, $z = -0.03$, $p = .974$). To summarize the second research question, it was found that there was not a statistically significant relationship between being below the poverty line and being prescribed HCV medications when gender, race, and education were also included as covariates, $OR = 0.32$ ($SE = 0.55$, $z = -0.66$, $p = .507$). It was found, unexpectedly, that having health insurance was associated with a significantly lower chance of being diagnosed with HCV, $OR = 0.49$ ($SE = 0.17$, $z = -2.08$, $p = .038$);

the public health implications of this finding, and the other findings of the study, have been discussed in Chapter 5.

Chapter 5: Conclusion

Introduction

The focus of this research was applying statistical analysis to data from NHANES to (a) estimate the odds-based relationships between HCV risk (in terms of diagnosis and treatment) as a function of poverty, and (b) provide synthesized explanations of how and why HCV appears to function differentially in terms of diagnosis and treatment among the poor. The purposes of Chapter 5 are to discuss the findings of the study, make recommendations for practice and future scholarship, and acknowledge the limitations of the study. The discussion relates the findings of the study to the theoretical framework discussed in Chapter 2. One of the main recommendations for future practice is to learn both how and why (i.e., through a mixed-methods approach) HCV diagnosis appears to be significantly higher for individuals who do not have health insurance.

Interpretation of the Findings

The purpose of the study was to apply statistical analysis to data from NHANES in order to (a) estimate the odds-based relationships between HCV (in terms of diagnosis and treatment) risk as a function of poverty, and (b) provide synthesized explanations of how and why HCV appears to function differentially in terms of diagnosis and treatment among the poor. This purpose was approached through two research questions:

RQ1: Is there a statistically significant relationship between being below the poverty line and being diagnosed with HCV?

RQ2: Is there a statistically significant relationship between being below the poverty line and being prescribed HCV medications?

As noted in Chapter 4, the answer to the first research question was that there was not a statistically significant relationship between being below the poverty line and being diagnosed with HCV when gender, race, and education were also included as covariates, *OR* = 0.99 (*SE* = 0.38, *z* = -0.03, *p* = .974), and the answer to the second research question was that there was not a statistically significant relationship between being below the poverty line and being prescribed HCV medications when gender, race, and education were also included as covariates, *OR* = 0.32 (*SE* = 0.55, *z* = -0.66, *p* = .507).

The findings of the study can be discussed with respect to the two theoretical frameworks of the study. The first framework, that of the HBM, was taken to suggest that the poor might incur HCV at disproportionate rates because of their differential beliefs about disease transmission, management, and cure. The second framework, that of the PHSA, was taken to suggest that the public health of the poor might not rise to the full attention of the policy establishment, thus providing theoretical underpinnings for the research questions of the study; in the discussion of positive social change implications, the role of the current study in contributing to the establishment of poverty as an agenda item in public health has been specially noted.

In terms of the PHSA, it is important to note that, because having health insurance was associated with a significantly lower chance of being diagnosed with HCV, *OR* = 0.49 (*SE* = 0.17, *z* = -2.08, *p* = .038), it seems that public health authorities might have adequate methods in place for screening the poor for HCV. As noted in Chapter 3, the statistical analysis in Chapter 4 relied upon a specific operational definition of poverty

obtained from the NHANES dataset. This measure of poverty failed to be a significant predictor of either being diagnosed with HCV or being prescribed HCV medications.

It could be the case that the variable of poverty, as operationally defined in the study, was not as valid a measure of true poverty as not having health insurance. If it is assumed that not having health insurance is a better measurement of poverty than the income-to-family-member ratio described in Chapter 3, then it is important to note that individuals without health insurance were (a) more likely to be diagnosed with HCV, and (b) not less likely to be prescribed HCV medications. Especially in respect to the PHSA, the findings related to health insurance indicated that public health authorities might in fact be prioritizing the poor by providing diagnostic services through mobile clinics, research studies, free clinics, or other means. Similarly, the finding that individuals' HCV medication prescriptions do not vary depending on either poverty or health insurance status suggested that the poor are not systematically deprioritized in terms of their access to prescription medications for HCV, but, because of the cross-sectional design of the study, this interpretation was not necessarily supported by the statistical data analysis procedures.

The interpretation of the PHSA provided in Chapter 1 and 2 of the study indicates that in a public health environment, in which the poor are not prioritized or even treated equitably, the poor will be (a) less likely to be diagnosed with HCV, and (b) less likely to be prescribed medication for HCV. Neither of these predictions, made by the PHSA, as found in Falade-Nwulia et al.'s (2016) study, was borne out by the findings presented in Chapter 4. The scope of the current study does not allow speculation on how and why the

poor might be equitably treated by public health authorities, because the cross-sectional approach of the study posed important limitations in this context; however, in the recommendations for future study, there are discussions of potentially appropriate mixed-method approaches to learning more about public health attention to HCV among the poor.

One possible interpretation of the HBM is that poor people are less likely to know their health status and less likely to seek treatment. Empirically, the HBM suggested that poor people would be less likely to know their HCV status and less likely to have been prescribed medicine for HCV (Solomon et al., 2015). Neither of these predictions were supported by the empirical analysis presented in Chapter 4. The PHSA suggests that poverty's failure to predict differences in HCV diagnostic or prescriptive status is a possible result of public health authorities' proactivity and diligence in serving the poor, whereas the HBM framework suggests that poor people might be no different than the nonpoor in terms of seeking out appropriate care and medication.

In this manner, the PHSA and HBM provide complementary explanations for the absence of significant findings in the current study. The HBM suggests that poor people's knowledge of their HCV status and history of prescriptions are functions of poor people's own beliefs and behaviors about the importance of learning about and managing their health. The PHSA suggests that the reason for the equality between the poor and nonpoor in terms of HCV diagnoses and prescriptions is a function of the diligence of public health authorities. The recommendations for further study, offered subsequently

in the chapter, include a discussion of how mixed-methods research designs can better isolate and measure the relative importance of the HBM and PHSA.

Limitations of the Study

The study had numerous limitations. Each limitation has been discussed separately. Several of the recommendations have been taken as bases for suggestions for future scholarly research as provided in the next subsection of the chapter.

First, one of the main limitations, applicable to both RQ1 and RQ2, was that relatively few individuals who participated in NHANES were either diagnosed with HCV, or given prescription medications for HCV. One of the reasons that a small sample size is a limitation for *OR* calculations, is that the smaller the sample, the larger the 95% confidence interval of an *OR* (Jackson, 2015). In practical terms, this limitation means that when sample sizes are small, *OR* calculations will only identify very large differences. If there exist small but still statistically significant differences between comparison groups, if at least one of these groups is small in number of members, then the *OR* calculations will fail to identify significant differences (Jackson, 2015).

A second, more general limitation of the study, is that the concept of poverty might have had a narrow specification space. One of the intrinsic limitations of the study, is the possibility that it had low specification space, a concept that has been of previous concern to statistical methodologists (Leamer, 1983; Roodman, 2007). Roodman (2007), citing the pioneering work of Leamer (1983) in the domain of specification space, suggested that many statistical analyses might be arbitrary in that they fail to capture sufficiently dimensions of a research problem or concept.

Roodman (2007) and Leamer (1983) studies differ not only in their conclusions but in their specifications as well. Although probably none of the choices are made on a whim; these differences appear to be examples of what Leamer (1983) called "whimsy." From Leamer's point of view, both studies represent a small sampling of specification space. Few include much robustness testing. Without further analysis, it is hard to know whether the results reveal solid underlying regularities in the data or are fragile artefacts of certain specification choices (Roodman, 2007, p. 262).

Chapter 3 contained a discussion of the means whereby a poverty variable was generated for statistical analysis. It is possible that this approach did not constitute a valid measurement of poverty. One indication that the chosen means of operationalizing poverty might have failed in terms of specification space is that the variable of having health insurance, which can be considered an appropriate proxy variable for poverty, was statistically significant when added to the analyses for RQ1 and RQ2. The different results generated by these two possible measures of poverty suggests the possibility that the variable of poverty was not appropriately captured in the study.

Third, the study was limited by the application of a cross-sectional rather than a longitudinal study design. In a cross-sectional design, data are all collected at the same time, and the temporal relationship between different variables cannot be studied. The limitations of a cross-sectional design apply to the design of the study, in the sense that the independent variable of the study, poverty status, might have changed over time in a manner that cannot be captured in cross-sectional statistical research. For example, it is possible that people who were not poor were diagnosed with, and prescribed medicines

for, HCV; later, when contributing data to NHANES, these people might have become poor.

One of the tacit assumptions of the cross-sectional design of the study was that poverty status was unchanged; thus, it was assumed that someone who was both poor and diagnosed with HCV was poor at the time of HCV diagnosis. As noted above, it is conceptually possible that an individual's poverty status can change at several points during the cycle, introducing the possibility of a systematic error in the relationship between poverty and HCV diagnosis or HCV medication prescription. In a longitudinal approach, there might have been a way of segmenting the sample based on poverty status at the time of HCV diagnosis or at the time of being prescribed HCV medication. Such an approach would have added to the internal validity of the findings.

A fourth limitation of the study was that of secondary rather than primary data analysis. The current study was carried out on secondary data, that is, data that had already been collected, tabulated, and interpreted by NHANES. One limitation of not having carried out primary research is that the exact nonresponse rate of the study cannot be calculated. Because NHANES reports nonresponse rates by questionnaire, not by individual question, a nonresponse rate cannot be calculated on the basis of the specific NHANES questions that were interpreted in this study. Another limitation of secondary data analysis is that of variable selection. The NHANES questionnaire contained a set list of questions, which were not necessarily designed for the specific purpose of measuring the relationship between poverty and HCV diagnosis or the prescription of HCV medication. In this context, one of the advantages of primary data collection might have

been the ability to specify questions about, and collect data pertaining to, specific aspects of the relationship between poverty and HCV that were not necessarily captured in the NHANES questions. NHANES is an epidemiological dataset that does not necessarily include all of the questions of interest in assessing the possible relationship between poverty and HCV.

Recommendations

The finding that poor people are essentially no different from nonpoor people in terms of their likelihood of having been diagnosed with HCV or having been prescribed medications for HCV. In this case, the parity found between poor and nonpoor people suggests the possibility that public health authorities might be addressing the needs of this population through expedients such as mobile health clinics, free clinics, and other means of testing and diagnosis. Because HCV is detrimental to public health, public health authorities ought to continue to undertake, and even intensify, actions designed to diagnose and treat poor people with HCV.

Based on the results of this study, it is strongly recommended that larger samples be drawn when conducting future studies. Even though the overall NHANES sample is large (nearly 10,000 individuals in the case of 2015-2016 dataset that furnished the data source for this study), relatively few individuals within the dataset were either diagnosed with HCV or prescribed medicines for HCV. As noted earlier in Chapter 5, small sample sizes make *OR* calculations less likely to be able to detect small or medium-sized but still statistically significant effects. For this reason, future researchers would be well advised to draw larger samples. Larger samples could be driven by eschewing epidemiological

datasets such as NHANES and choosing to purposively sample individuals who are more likely to have HCV.

The second recommendation for future study can be made based on a design that can differentiate between PHSA- and HBM-based theories of poverty, HCV diagnosis, and HCV prescription. As noted earlier in the chapter, both PHSA and HBM can help to explain why poor individuals are just as likely as nonpoor individuals to be diagnosed with HCV and be prescribed HCV medications. The PHSA could explain this scenario by suggesting that public authorities are responsible for better service provision to the poor, whereas the HBM suggests that the poor themselves might be more diligent about seeking care. One means of isolating the respective impact of PHSA and HBM on HCV diagnosis and prescription is by asking poor people who have been diagnosed with HCV, and who have received HCV prescriptions, about the circumstances involved in diagnosis and prescription. The HBM could be formally explored by means of the HBM questionnaires, which measure the influence of health beliefs over participants' decisions to obtain diagnosis or treatment for HCV. The relative influence of the PHSA could be explored by questionnaires measuring the exposure of individual subjects to mobile health clinics, free clinics, and other public health initiatives. An *OR* model of the kind used in this study could be applied to these data to determine whether health beliefs were more predictive than exposure to public health initiatives in terms of (a) being diagnosed with HCV, and (b) having been prescribed HCV medications. After applying this quantitative approach, future researchers could apply qualitative methods to explore how and why the health-seeking behaviors of poor people with HCV are formed.

In order to study health beliefs more closely, future researchers could draw on more specific aspects of the HBM (Hayden, 2013). Table 7 contains the elements of the HBM as specified by Hayden.

Table 7

Elements of the HBM

HBM component	Definition
1. Perceived susceptibility	An individual's assessment of his or her chances of getting the disease.
2. Perceived benefits	An individual's conclusion as to whether the new behavior is better than what he or she is already doing.
3. Perceived barriers	An individual's opinion as to what will stop him or her from adopting the new behavior.
4. Perceived seriousness	An individual's judgment as to the severity of the disease.
5. Modifying variables	An individual's personal factors that affect whether the new behavior is adopted.
6. Cues to action	Those factors that will start a person on the way to changing behavior.
7. Self-efficacy	Personal belief in one's own ability to do something.

Note. Table adapted from Hayden (2013, p. 35).

Table 8 is an example of a data structure that could be adopted by future researchers who wish to measure the relationship between poverty, HCV diagnosis, and HBM Component 1, that is, an assessment of individual susceptibility to HCV.

Table 8

Possible Data Model for HBM Study (Poverty Held Equal)

Always poor, diagnosed with HCV	Always poor, not diagnosed with HCV	Gender (a & b)	Race (a & b)	Age (a & b)	Difference in HBM score, Component 1 (a-b)
1 a	1 b	Female	White	21-25	1 a-1 b
2 a	2 b	Male	Black	36-40	2 a-2 b
3 a	3 b	Male	Hispanic	41-45	3 a-3 b
4 a	4 b	Female	Asian	65+	4 a-4 b
5 a	5 b	Male	Other	26-30	5 a-5 b
6 a	6 b	Female	White	21-25	6 a-6 b
7 a	7 b	Female	White	26-30	7 a-7 b
8 a	8 b	Male	Black	26-30	8 a-8 b
9 a	9 b	Male	Black	31-35	9 a-9 b
10 a	10 b	Male	White	31-35	10 a-10 b
11 a	11 b	Female	Asian	21-25	11 a-11 b
12 a	12 b	Male	White	36-40	12 a-12 b
13 a	13 b	Female	White	41-45	13 a-13 b
14 a	14 b	Female	Black	65+	14 a-14 b
15 a	15 b	Male	White	26-30	15 a-15 b
16 a	16 b	Female	Black	21-25	16 a-16 b
17 a	17 b	Male	Hispanic	26-30	17 a-17 b
18 a	18 b	Female	Asian	26-30	18 a-18 b
19 a	19 b	Male	Other	31-35	19 a-19 b
20 a	20 b	Male	White	31-35	20 a-20 b
21 a	21 b	Female	White	21-25	21 a-21 b
22 a	22 b	Male	Black	36-40	22 a-22 b
23 a	23 b	Female	Black	41-45	23 a-23 b
24 a	24 b	Female	White	65+	24 a-24 b
25 a	25 b	Male	Asian	26-30	25 a-25 b
26 a	26 b	Male	White	21-25	26 a-26 b
27 a	27 b	Male	White	26-30	27 a-27 b
28 a	28 b	Female	Black	26-30	28 a-28 b

29 a	29 b	Male	White	31-35	29 a-29 b
30 a	30 b	Female	Black	31-35	30 a-30 b
31 a	31 b	Female	Hispanic	21-25	31 a-31 b
32 a	32 b	Male	Asian	36-40	32 a-32 b
33 a	33 b	Female	Other	41-45	33 a-33 b
34 a	34 b	Male	White	65+	34 a-34 b
35 a	35 b	Female	White	26-30	35 a-35 b
36 a	36 b	Male	Black	21-25	36 a-36 b
37 a	37 b	Male	Black	26-30	37 a-37 b
38 a	38 b	Female	White	26-30	38 a-38 b
39 a	39 b	Male	Asian	31-35	39 a-39 b

The data model represented in Table 8 would allow future researchers to apply the following approaches. First, *n* subjects could be divided and stratified into two groups of size *n/2*. As in Table 8, the paired samples could be matched on the demographic bases of gender, race, and age. Subsample *a* could consist of people who have always been poor, and who were diagnosed with HCV. Subsample *b* could consist of people who have always been poor, and who have not been diagnosed with HCV. If, for poor people, belief in individual susceptibility to HCV has no effect on HCV diagnosis, then the expectation is that the *t* statistic generated from the last vector in Table 8 (difference in HBM score, component #1) would not be statistically significant. If the *t* statistic is not statistically significant, it could be concluded that the HBM does not predict HCV diagnosis among poor people, after controlling for variations gender, race, and age. As *t* is to be calculated as *a-b*, a *t* statistic that is negative as well as statistically significant would indicate that poor people not diagnosed with HCV have a greater belief in their individual susceptibility to HCV and might therefore be more likely to take HCV-avoiding actions.

The approach modeled in Table 8 is one of many ways in which health beliefs could be integrated into the statistical models of future researchers. This data model can be modified by future researchers to isolate groups of interest. In Table 9, the comparison groups of interest have been changed from poor people diagnosed or not diagnosed with HCV to people diagnosed with HCV, with poverty status being the main differentiator between them.

Table 9

Possible Data Model for HBM Study (HCV Held Equal)

Always poor, diagnosed with HCV	Never poor diagnosed with HCV	Gender (a & b)	Race (a & b)	Age (a & b)	Difference in HBM score, Component 1 (a-b)
1 a	1 b	Female	White	21-25	1 a-1 b
2 a	2 b	Male	Black	36-40	2 a-2 b
3 a	3 b	Male	Hispanic	41-45	3 a-3 b
4 a	4 b	Female	Asian	65+	4 a-4 b
5 a	5 b	Male	Other	26-30	5 a-5 b
6 a	6 b	Female	White	21-25	6 a-6 b
7 a	7 b	Female	White	26-30	7 a-7 b
8 a	8 b	Male	Black	26-30	8 a-8 b
9 a	9 b	Male	Black	31-35	9 a-9 b
10 a	10 b	Male	White	31-35	10 a-10 b
11 a	11 b	Female	Asian	21-25	11 a-11 b
12 a	12 b	Male	White	36-40	12 a-12 b
13 a	13 b	Female	White	41-45	13 a-13 b
14 a	14 b	Female	Black	65+	14 a-14 b
15 a	15 b	Male	White	26-30	15 a-15 b
16 a	16 b	Female	Black	21-25	16 a-16 b
17 a	17 b	Male	Hispanic	26-30	17 a-17 b
18 a	18 b	Female	Asian	26-30	18 a-18 b
19 a	19 b	Male	Other	31-35	19 a-19 b
20 a	20 b	Male	White	31-35	20 a-20 b
21 a	21 b	Female	White	21-25	21 a-21 b

22 a	22 b	Male	Black	36-40	22 a-22 b
23 a	23 b	Female	Black	41-45	23 a-23 b
24 a	24 b	Female	White	65+	24 a-24 b
25 a	25 b	Male	Asian	26-30	25 a-25 b
26 a	26 b	Male	White	21-25	26 a-26 b
27 a	27 b	Male	White	26-30	27 a-27 b
28 a	28 b	Female	Black	26-30	28 a-28 b
29 a	29 b	Male	White	31-35	29 a-29 b
30 a	30 b	Female	Black	31-35	30 a-30 b
31 a	31 b	Female	Hispanic	21-25	31 a-31 b
32 a	32 b	Male	Asian	36-40	32 a-32 b
33 a	33 b	Female	Other	41-45	33 a-33 b
34 a	34 b	Male	White	65+	34 a-34 b
35 a	35 b	Female	White	26-30	35 a-35 b
36 a	36 b	Male	Black	21-25	36 a-36 b
37 a	37 b	Male	Black	26-30	37 a-37 b
38 a	38 b	Female	White	26-30	38 a-38 b
39 a	39 b	Male	Asian	31-35	39 a-39 b

Other approaches are also possible. One such approach (see Table 10) would be to treat variations in health beliefs as predictors of the likelihood of being diagnosed with HCV; in such an *OR* model, poverty could function as a mediating variable. A mediated logistic regression model could then be applied to determining whether a statistically significant relationship between health belief and HCV status exists because of poverty. The Sobel-Goodman test of mediation is one statistical approach that could be applied to this model; bootstrapping is another viable approach. The approach modeled in Table 9 can also be applied to the dependent variable of HCV diagnosis, as demonstrated in Table 10.

Table 10

Possible Data Model for HBM Study, Version 2 (Dependent Variable: Diagnosis)

Subject #	Poor or not poor?	Gender	Race	HBM score, Component 1	HCV diagnosis ?
1	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
2	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
3	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
4	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
5	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
6	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
7	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
8	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
9	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
10	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
11	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
12	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
13	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
14	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
15	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
16	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
17	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
18	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
19	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
20	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
21	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
22	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
23	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
24	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
25	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
26	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
27	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
28	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
29	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
30	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
31	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
32	Poor/Not poor	M / F	Minority / White	1-7	No / Yes

33	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
34	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
35	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
36	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
37	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
38	Poor/Not poor	M / F	Minority / White	1-7	No / Yes
39	Poor/Not poor	M / F	Minority / White	1-7	No / Yes

Table 11

Possible Data Model for HBM Study, Version 2 (Dependent Variable: Prescription)

Subject #	Poor or not poor?	Gender	Race	HBM score, Component 1	HCV prescription?
1	Poor/Not poor	M / F	M / W	1-7	No / Yes
2	Poor/Not poor	M / F	M / W	1-7	No / Yes
3	Poor/Not poor	M / F	M / W	1-7	No / Yes
4	Poor/Not poor	M / F	M / W	1-7	No / Yes
5	Poor/Not poor	M / F	M / W	1-7	No / Yes
6	Poor/Not poor	M / F	M / W	1-7	No / Yes
7	Poor/Not poor	M / F	M / W	1-7	No / Yes
8	Poor/Not poor	M / F	M / W	1-7	No / Yes
9	Poor/Not poor	M / F	M / W	1-7	No / Yes
10	Poor/Not poor	M / F	M / W	1-7	No / Yes
11	Poor/Not poor	M / F	M / W	1-7	No / Yes
12	Poor/Not poor	M / F	M / W	1-7	No / Yes
13	Poor/Not poor	M / F	M / W	1-7	No / Yes
14	Poor/Not poor	M / F	M / W	1-7	No / Yes
15	Poor/Not poor	M / F	M / W	1-7	No / Yes
16	Poor/Not poor	M / F	M / W	1-7	No / Yes
17	Poor/Not poor	M / F	M / W	1-7	No / Yes
18	Poor/Not poor	M / F	M / W	1-7	No / Yes
19	Poor/Not poor	M / F	M / W	1-7	No / Yes
20	Poor/Not poor	M / F	M / W	1-7	No / Yes
21	Poor/Not poor	M / F	M / W	1-7	No / Yes
22	Poor/Not poor	M / F	M / W	1-7	No / Yes

23	Poor/Not poor	M / F	M / W	1-7	No / Yes
24	Poor/Not poor	M / F	M / W	1-7	No / Yes
25	Poor/Not poor	M / F	M / W	1-7	No / Yes
26	Poor/Not poor	M / F	M / W	1-7	No / Yes
27	Poor/Not poor	M / F	M / W	1-7	No / Yes
28	Poor/Not poor	M / F	M / W	1-7	No / Yes
29	Poor/Not poor	M / F	M / W	1-7	No / Yes
30	Poor/Not poor	M / F	M / W	1-7	No / Yes
31	Poor/Not poor	M / F	M / W	1-7	No / Yes
32	Poor/Not poor	M / F	M / W	1-7	No / Yes
33	Poor/Not poor	M / F	M / W	1-7	No / Yes
34	Poor/Not poor	M / F	M / W	1-7	No / Yes
35	Poor/Not poor	M / F	M / W	1-7	No / Yes
36	Poor/Not poor	M / F	M / W	1-7	No / Yes
37	Poor/Not poor	M / F	M / W	1-7	No / Yes
38	Poor/Not poor	M / F	M / W	1-7	No / Yes
39	Poor/Not poor	M / F	M / W	1-7	No / Yes

Implications

The study implies that public health authorities are performing adequately in terms of diagnosing poor individuals with HCV, indicating that poverty is not necessarily a separate transmission risk or vector for HCV. The study also implies that public health authorities are succeeding in diagnosing HCV equitably, regardless of the poverty of the person being tested. Collectively, these implications suggest that public health is achieving social justice as well as diagnostic and prescriptive efficiency in dealing with poor people with HCV.

Positive Social Change Implications

The first positive social change implications of the study lies in calling attention to the possible relationships between poverty and disease status. In this context, the contribution of the study is not based on having found a statistically significant

relationship between poverty and HCV, but in having modeled an approach to understanding the relationship between poverty and HCV, in a manner that can positively influence future public health analyses and thereby strengthen the social justice aspects of public health and policy.

One of the foundations of positive social change is that of placing an item on an agenda for further consideration and analysis. Indeed, both in terms of health policy and general policy, some scholars have suggested that social change tends to take place in three phases, each of which is related to the concept of a change agenda. First, a problem is not acknowledged or identified as a problem; in this stage, the problem does not exist on agendas and therefore cannot guide change. Second, a problem is acknowledged and placed on an agenda. At this stage, there can be disagreement about the precise nature of the problem as well as disagreement about the severity of the problem. Nevertheless, at this second stage, the problem exists on an agenda and can therefore inform change. In the third and final stage, a problem is sufficiently prominent and recognized on an agenda as to inform an actual change process.

The study of the relationship between poverty and HCV could have informed positive social change by calling attention to a deficiency in actual public health policy and practice. If, for example, there had been a statistically significant relationship between HCV and diagnosis, such that the likelihood of HCV diagnosis was lower for poor people, one possible positive social change implication could have been the identification of a specific weakness in how the poor are screened for HCV (assuming that HCV is equally distributed regardless of socioeconomic status).

If the likelihood of HCV diagnosis was higher for poor people, one possible positive social change implication could have been the identification of a specific need to protect the poor from HCV, for example, through more effective public health campaigns. In the absence of statistically significant findings, the main positive social change implication of the study is contributing to the existing body of studies indicating that poverty (and other measures of socioeconomic status) should be taken into consideration when designing public health policies and practices. Therefore, although the absence of statistically significant findings meant that the study could not make a specific contribution to changes in public health policy, the study itself made a contribution to the objective of further entrenching poverty and socioeconomic status on public health agendas.

The reason that poverty should be further entrenched on public health agendas is that positive change based on health policy has often been denied to the poor. Historically, the distribution of health is unequal in a manner that privileges the wealthy, who have superior access to healthcare, more access to healthcare education, and other tangible and intangible advantages related to the pursuit and maintenance of health. Given the role of economic privilege in determining levels of health, any attempt to further entrench poverty in public health agendas carries the possibility of positive social change insofar as an accumulation of research could convince public health authorities, and the public in general, to act more effectively to protect the health of the poor.

Conclusion

The main expectations of this study were that the poor would be more likely to have HCV, and less likely to have been prescribed medications for it. The failure to meet these expectations suggests that public authorities are performing adequately as to the tasks of screening for, and treating, HCV among the poor. Therefore, public authorities should continue to receive public funding as well as private consideration for successfully achieving both socio-medical justice for the poor and impeding the transmission of HCV.

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Appendix A: Raw Data, Individuals With HCV

Subject	Diagnosis	Prescribed?	Poverty	Gender	Race	Education	Insurance	Medicaid
92373	HCV positive		No	Female	White	Some College / AA	Insured	No Medicaid
90223	HCV positive	No	No	Female	Black		Insured	Medicaid
87995	HCV positive	No	Yes	Male	Other Hispanic		Insured	Medicaid
85710	HCV positive	No	No	Female	Black	HS Graduate	Insured	No Medicaid
90775	HCV positive		No	Female	Black	College or Above	Insured	No Medicaid
91722	HCV positive	No	No	Male	Asian	College or Above	Insured	No Medicaid
92614	HCV positive	Prescribed	No	Male	Black		Insured	Medicaid
91478	HCV positive	No	No	Male	White		Insured	Medicaid
92298	HCV positive	No	No	Female	White	College or Above	Insured	No Medicaid
92283	HCV positive	No	No	Female	White		Insured	No Medicaid
92824	HCV positive	Prescribed	No	Female	White	HS Graduate	Insured	No Medicaid
88775	HCV positive	No	No	Male	Asian	< 9th Grade	Insured	No Medicaid
88804	HCV positive	Prescribed	No	Female	Other Hispanic		Insured	No Medicaid
90449	HCV positive	No	Yes	Male	White	College or Above	Not Insured	No Medicaid
92814	HCV positive	No	No	Male	Other		Insured	Medicaid
87260	HCV positive	Prescribed	No	Male	White	College or Above	Insured	No Medicaid
87783	HCV positive	No	No	Male	White	HS Graduate	Insured	No Medicaid
87891	HCV positive	No	No	Male	Mexican	< 9th Grade	Not Insured	No Medicaid
85215	HCV positive	Prescribed	No	Female	Black	College or Above	Insured	No Medicaid
91732	HCV positive	No	No	Male	Black	Some College / AA	Not Insured	No Medicaid
93568	HCV positive	Prescribed	Yes	Female	Other	Some College / AA	Not Insured	No Medicaid
91341	HCV positive	No	No	Female	Black	Some College / AA	Insured	No Medicaid
85028	HCV positive	No	No	Female	White	College or Above	Insured	No Medicaid
83827	HCV positive	Prescribed	No	Female	Mexican		Not Insured	No Medicaid
89208	HCV positive	Prescribed	Yes	Male	Other Hispanic	College or Above	Not Insured	No Medicaid
87916	HCV positive	No	No	Male	Other		Not Insured	No Medicaid
87750	HCV positive	No	No	Female	Mexican		Insured	No Medicaid
86094	HCV positive	No	No	Male	Other Hispanic	Some College / AA	Insured	No Medicaid
93449	HCV positive	Prescribed	Yes	Female	Mexican		Insured	Medicaid
83884	HCV positive	No	No	Male	White	Some College / AA	Insured	No Medicaid
89967	HCV positive		No	Female	Other Hispanic	College or Above	Insured	No Medicaid
93522	HCV positive	No	No	Male	White	Some College / AA	Insured	No Medicaid
92243	HCV positive	Prescribed	No	Female	Mexican		Insured	No Medicaid
90447	HCV positive	Prescribed	Yes	Male	Black		Insured	Medicaid
90034	HCV positive	No	No	Male	Asian	9-11 Grade	Insured	No Medicaid
90200	HCV positive	Prescribed	No	Female	Other Hispanic	Some College / AA	Not Insured	No Medicaid
89806	HCV positive	No	No	Male	Mexican	College or Above	Insured	No Medicaid
85648	HCV positive	No	No	Female	Black	Some College / AA	Insured	No Medicaid
84225	HCV positive	Prescribed	No	Female	Other Hispanic		Insured	No Medicaid
87818	HCV positive		Yes	Male	White	HS Graduate	Not Insured	No Medicaid
91965	HCV positive	No	Yes	Female	Black		Insured	Medicaid
89351	HCV positive	Prescribed	No	Male	Mexican	9-11 Grade	Not Insured	No Medicaid
89538	HCV positive	No	Yes	Male	Asian		Insured	No Medicaid
91600	HCV positive	No	No	Female	White	Some College / AA	Insured	No Medicaid
91793	HCV positive	No	No	Male	Other Hispanic		Insured	Medicaid
91343	HCV positive	No	No	Male	White	Some College / AA	Insured	No Medicaid
84785	HCV positive	No	Yes	Female	Mexican		Not Insured	No Medicaid
91924	HCV positive	No	Yes	Male	Black	HS Graduate	Not Insured	No Medicaid
90480	HCV positive	No	No	Female	White	Some College / AA	Insured	No Medicaid
90131	HCV positive	No	No	Female	White	College or Above	Insured	No Medicaid
83845	HCV positive	No	Yes	Female	Mexican	< 9th Grade	Not Insured	No Medicaid
92472	HCV positive		Yes	Female	Asian	Some College / AA	Insured	Medicaid
90367	HCV positive	Prescribed	Yes	Male	Black		Insured	Medicaid
87064	HCV positive		No	Female	Mexican		Insured	Medicaid
91455	HCV positive	No	Yes	Male	Other		Insured	Medicaid
84111	HCV positive	No	No	Male	Mexican		Insured	No Medicaid
90671	HCV positive		Yes	Male	Mexican	Some College / AA	Insured	Medicaid
87736	HCV positive	No	No	Male	Black	HS Graduate	Insured	No Medicaid
90204	HCV positive	Prescribed	Yes	Male	Black		Insured	Medicaid
90303	HCV positive	Prescribed	No	Female	Black		Insured	Medicaid
93168	HCV positive	No	No	Female	Asian	Some College / AA	Not Insured	No Medicaid
93068	HCV positive	No	Yes	Female	Black	Some College / AA	Insured	No Medicaid
86809	HCV positive	Prescribed	Yes	Male	White		Not Insured	No Medicaid
91018	HCV positive		No	Female	Mexican	< 9th Grade	Insured	Medicaid
89518	HCV positive	No	No	Female	Black	Some College / AA	Insured	No Medicaid
91886	HCV positive	Prescribed	No	Female	Mexican	HS Graduate	Not Insured	No Medicaid
84267	HCV positive	No	No	Female	White		Insured	No Medicaid

84309	HCV positive	Prescribed	No	Female	Black		Insured	No Medicaid
93454	HCV positive	Prescribed	No	Male	Black	Some College / AA	Insured	No Medicaid
92312	HCV positive	No	No	Female	Other Hispanic	HS Graduate	Insured	Medicaid
86052	HCV positive	No	No	Male	Mexican		Insured	No Medicaid
89107	HCV positive	No	No	Male	White	Some College / AA	Insured	No Medicaid
86319	HCV positive	No	No	Male	White	Some College / AA	Insured	No Medicaid
85790	HCV positive	No	No	Female	Black	9-11 Grade	Insured	No Medicaid
85803	HCV positive	No	No	Female	Mexican	9-11 Grade	Insured	Medicaid
91681	HCV positive	Prescribed	No	Male	Other Hispanic	HS Graduate	Not Insured	No Medicaid
83894	HCV positive	No	Yes	Male	Black		Insured	Medicaid
87605	HCV positive		No	Female	White	Some College / AA	Insured	No Medicaid