

HEALTHCARE PAYER TYPE AND HIV HEALTH:  
A RETROSPECTIVE ANALYSIS

by

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## ABSTRACT

There are over half a million people living with HIV (PLWH) in the United States, all of whom require access to regular healthcare services in order to live with the disease. Borne out of the previously-fatal nature of HIV, the Ryan White HIV/AIDS Program (RWHAP) was created in 1990 in order to provide palliative services. Although the Affordable Care Act opened up additional health insurance options to PLWH, there remain questions about which healthcare payer type is associated with the best HIV health outcomes. To date, only a handful of studies have explored the association between healthcare payer type and HIV health, and few have examined this association using data collected after the Affordable Care Act was implemented.

The principal purpose of this research was to identify the relationship between healthcare payer type and two key HIV health outcomes—specifically, viral suppression and two different measures of retention in care. The study sample consisted of 3,146 patients who attended at least one scheduled HIV primary care appointment at the University of Alabama at Birmingham’s 1917 Clinic within the 2015 calendar year. The 2016 calendar year served as the observation window.

Multivariable logistic regression analyses were used to test associations between different single and multiple payer type combinations and HIV health outcomes. Results suggest that there is a meaningful and significant relationship between healthcare payer type and HIV health outcomes. In particular, receiving RWHAP supplementary services is associated with optimal

health outcomes for PLWH, even when controlling for multiple sociodemographic characteristics. Furthermore, these findings suggest that healthcare payer type has a stronger association with retention in care than viral suppression.

The results of this study provide timely insight into the criticality of health payer type in contributing to HIV health outcomes. They also have particular relevance for social work: Social workers have been integral to the provision of RWHAP wraparound services since the program's inception, and their expertise in working with marginalized and/or vulnerable populations is as important now as ever.

## LIST OF ABBREVIATIONS AND SYMBOLS

ACA	Patient Protection and Affordable Care Act
ADAP	AIDS Drug Assistance Programs
AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral therapy
CDC	Centers for Disease Control and Prevention
CD4	Cluster of differentiation 4
D2C	Data to Care
DHHS	Department of Health and Human Services
EGA	Eligible Metropolitan Area
EMR	Electronic medical record
FPL	Federal poverty level
FY	Fiscal Year
GAO	Government Accountability Office
HAB	HIV/AIDS Bureau
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
HOPWA	Housing Opportunities for People with HIV/AIDS
HRSA	Health Resources and Services Administration

HSP	Human Subjects Protocol
IAPAC	International Association of Providers of AIDS Care
IOM	Institute of Medicine
IRB	Institutional Review Board
IV	Intravenous [drug user]
IRS	Internal Revenue Service
KFF	Kaiser Family Foundation
LTFU	Lost-to-follow-up
MAGI	Modified adjusted gross income
MAI	Minority AIDS Initiative
mL	Milliliter
MMWR	Morbidity and Mortality Weekly Report
MSM	Men who have sex with men
NASTAD	National Alliance of State & Territorial AIDS Directors
NASW	National Association of Social Workers
NEP	Needle Exchange Program
NIH	National Institutes of Health
NHAS	National HIV/AIDS Strategy
PHI	Protected Health Information
PL	Public Law
PLWH	People living with HIV

PPT	Primary payer type
PT	Payer type
QALY	Quality-adjusted life-year
QHP	Qualified health plan
RiC	Retention in care
RSR	Ryan White HIV/AIDS Program Services Report
RWHAP	Ryan White HIV/AIDS Program
SSDI	Social Security Disability Insurance
SSI	Supplemental Security Income
TasP	Treatment as prevention
TGA	Transitional Grant Area
UA	University of Alabama
UAB	University of Alabama at Birmingham
μL	Microliter
US	United States
VA	Veteran's Administration
VL	Viral load
VS	Viral suppression
WHO	World Health Organization

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This dissertation is the culmination of three-and-a-half years of hard work, often spent in the isolation of a small one-bedroom apartment. To my precious cat, Georgia: I know there were many, many times you wanted to play while I, instead, remained vexingly affixed to my computer. Thank you for loving me just the same.

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this dissertation research and future research projects to come will be of benefit to you. I refuse to accept that we live in a country where some people living with HIV are grateful to have HIV just so that they can receive basic healthcare services. You can be sure that I will not stop fighting until that changes.

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## CHAPTER ONE

### INTRODUCTION

On April 9, 1990, an obituary was published in the *New York Times*: “Ryan White, the Indiana teen-ager who put the face of a child on AIDS and served as a leader for gaining greater understanding and compassion for those with the deadly disease, died today [April 8]. He was 18 years old” (Johnson, 1990). It was not long before policymakers realized that they had found their poster child for a national AIDS emergency act. Years later, Ryan White’s critical role in combating the AIDS epidemic is even clearer. On the 25<sup>th</sup> anniversary of the passage of the Ryan White Comprehensive AIDS Resources Emergency Act of 1990, a blog published on the Human Rights Campaign’s website had this to say:

The fact is that many public officials cruelly denied the need for a national response to the epidemic when gay men were dying. While Ryan White’s story didn’t end the anti-gay stigma, it did spur action from policymakers who hadn’t yet stepped forward. (Terry, 2015)

The year that Ryan White died, acquired immune deficiency syndrome (AIDS) had been in the American public’s consciousness for nearly a decade. During that time, and largely due to Ryan White’s media presence, the public had only partially come to acknowledge that men who had sex with men were not the only ones susceptible to HIV (human immunodeficiency virus),

the virus that causes AIDS. The first recorded instance of the as-yet unnamed disease occurred on June 5, 1981, when the Centers for Disease Control and Prevention (CDC) published a *Morbidity and Mortality Weekly Report (MMWR)* about the death of five young men in Los Angeles who were all “active homosexuals” (CDC, 1981). As the CDC’s tactless phrasing illustrates, HIV/AIDS was overwhelmingly viewed as a “homosexual” disease that was, in a very real sense, interpreted as a kind of punishment for a deviant lifestyle. It is for this reason that the young Ryan White, who contracted HIV at the age of 13 through blood transfusions for his hemophilia (Human Resources and Services Administration [HRSA], 2016c), was so vital in procuring a vision for a national response to AIDS that was amenable to the public. In Ryan, policymakers had found the perfect trifecta of an innocent, sympathetic victim of AIDS: he was a child, he was white, and he was clearly a victim of the disease. As this study’s review of the literature will demonstrate, public perception of who contracted HIV, as well as the kinds of treatment that they deserved as a result, has enduringly shaped the United States’ (US) political and economic response to HIV. In turn, this response has influenced individuals’ access to HIV care and their HIV health. While social constructions are rarely based on fact, they are pervasive, often harmful, and nearly always intractable without the occurrence of a major event or crisis that prompts legislative action. Indeed, the fact that US healthcare has always been qualified as a “benefit” rather than an essential “right” illustrates the significance of social constructions that shape the quality and availability of healthcare to those considered “deserving.”

### **Purpose of the Study**

The purpose of this study is to explore the association between healthcare payer type and HIV health. Given the uncertain climate of healthcare policy and funding of the Patient

Protection and Affordable Care Act (ACA) (Corlette, Lucia, Giovannelli, & Palanker, 2017) and ongoing debate surrounding the future of the Ryan White HIV/AIDS Program in the US (Goldman, Juday, Linthicum, & Seekins, 2014; Martin et al., 2013a; Martin et al., 2013b), the research is timely. Moreover, to date, only a handful of studies have explored the association between healthcare payer type and HIV health (Bradley et al., 2016; Diepstra et al., 2017; Keruly, Conviser, & Moore, 2002; Schneider et al., 2013; Weiser et al., 2015), and few have examined this association using post-ACA implementation data. In addition, researchers have typically collapsed healthcare payer type into categories that are too broad to facilitate detailed examination. Further, the type of healthcare available to people living with HIV (PLWH) has changed in response to changes in US healthcare policy. As HIV/AIDS has long been considered “the world’s most political disease” (Volberding, 2011, p. vii52), it follows that any thorough analysis of HIV care must consider its political context. Thus, the intended contribution of this study is to illuminate the role of healthcare payer type in HIV care retention and clinical health in a new era of US healthcare policy.

### **Significance to Social Work**

Social workers are often directly involved with PLWH, as they are trained to assess the complex socioeconomic, structural, community, and individual-level needs of their patients (Andrews, Darnell, McBride, & Gehlert, 2013). In addition, social workers’ knowledge of comprehensive care is especially useful for patients who experience structural barriers such as limited resources or racial discrimination. Though HIV is a disease, it is also “...a social issue, a political issue, a cultural issue, an economic issue, and, perhaps above all, a personal issue” (Rowan & Honeycutt, p. 71, 2010). Social workers are uniquely poised to recognize this fact and

address HIV's accompanying complexities. Since PLWH represent a vulnerable and often marginalized population, social workers are key in ensuring access to quality healthcare. In fact, social workers are often in a better position than political leaders to understand what "access" actually means. As a case in point, President George W. Bush was once quoted as saying that access to healthcare was not a problem in the US because "...after all, you just go to an emergency room" (Froomkin, 2010).

Social workers' skills and knowledge are indispensable in a new and still-changing health policy environment, where many persons living with HIV have been met with new, complex healthcare coverage plans under the ACA (Andrews et al., 2013), which may soon change once again (Taylor, 2017). For social workers, it is important to understand the ways in which access to and quality of care is impacted by the broad social constructions that shape health policy. In a recent editorial, McCabe and Sullivan (2015) urged social workers to participate in the implementation of new healthcare policies that have originated from the ACA: "If we as social workers do not assert our expertise as the system is redesigned, we will lose an important opportunity to help our clients and the profession of social work" (p. 155). Given the stated intention of President Trump and Congress to "repeal and replace" the ACA under the proposed Patient Freedom Act (163 Cong. Rec. S510-S511, 2017), this call to action is more pressing than ever as people living with HIV face yet another new era of healthcare change.

While individual- and structural-level determinants of access like race, age, gender, income, and housing stability have been extensively explored in the literature (Aidala et al., 2016; Bradley et al., 2016; Chakraborty et al., 2015; Doshi et al., 2015; Meditz et al., 2011; Meyer et al., 2014; Ribaudó et al., 2013; Weiser et al., 2015; Zinski et al., 2015), less is known

about how political determinants shape healthcare access and, ultimately, health outcomes for PLWH. Further, the research that is available on this topic is written from a clinical point of view that is uninformed by theory. Thus, there exists both a research gap and a theoretical gap, which this study addresses in three primary ways: (1) apply the social construction of target populations framework (Schneider & Ingram, 1993) to different HIV healthcare financing systems in order to identify politically influential social constructs; (2) use Aday and Andersen's (1974) medical care access framework as a guide to identify individual- and structural-level determinants of HIV healthcare access; and, ultimately, (3) explore the relationship between HIV health and healthcare payer type. By applying a novel framework to a timely research problem, this study helps contribute to the HIV health literature.

## CHAPTER TWO

### LITERATURE REVIEW

#### **Healthcare and HIV/AIDS**

**The Federal Financing System.** Although HIV/AIDS programs receive less than 1% of the total federal budget, this approximates to \$34 billion overall, according to the 2017 Fiscal Year (FY)'s HIV/AIDS federal funding request (Kaiser Family Foundation [KFF], 2016c). Approximately 81% is spent on domestic care, treatment, research, and prevention, while the remaining 19% is allocated towards international treatment and prevention programs (KFF, 2016c). As the subject of this dissertation relates to US HIV/AIDS policy, the following discussion will center on the 81% of the federal HIV budget that relates to domestic programs.

Federal funding for HIV is divided into two categories of congressional spending: mandatory and discretionary (KFF, 2016c). Mandatory spending, as the name suggests, represents the portion of the congressional budget that is automatically determined by the eligibility requirements for entitlement programs like Medicaid, Medicare, and Social Security (Congressional Budget Office [CBO], 2013). Thus, mandatory spending totals cannot be altered without changing programs' eligibility requirements. Discretionary spending is not as straightforward, as it depends on yearly appropriation acts (CBO, 2016). The Ryan White HIV/AIDS Program is one such discretionary program (KFF, 2016c). Since discretionary programs are not funded through legal mandates, they are subject to budget cuts at Congress' discretion (Stern & Axinn, 2012).

A little over half of federal funding for HIV is allocated towards mandatory spending (58% for FY 2017), which has increased slightly from 54% in the FY 2015 budget request (KFF 2014d, 2015). This budget increase is largely due to the increased mandatory spending for Medicaid, which has resulted from eligibility expansion in some states (KFF, 2016c). The 42% of the remaining discretionary budget for HIV/AIDS is allocated to programs like Ryan White, the Department of Veterans Affairs (VA), and Housing Opportunities for People with HIV/AIDS (HOPWA), as well as to research agencies like the Centers for Disease Control and Prevention (CDC) and National Institutes of Health (NIH) (KFF, 2016c). Within the total federal HIV/AIDS spending budget, the Ryan White Program receives approximately 12% of the funding stream, which equals \$2.3 billion in the FY 2017 budget request (KFF, 2016c). Funding to agencies like the NIH and CDC constitutes about 8% of the budget, or \$1.6 billion. Medicaid receives 30% of the total HIV federal budget, or about \$5.9 billion.

Medicare is the largest federally-funded HIV program and is slated for \$10 billion in FY 2017, which equals 51% of the total HIV federal budget (KFF, 2016c). However, the size of this budget more accurately reflects the cost of prescription medication for chronically ill beneficiaries, rather than actual program enrollment numbers. Medicare is not a primary source of care for most PLWH, as eligible beneficiaries must either be over age 65 or qualify for Social Security Disability Insurance (SSDI) as a result of permanent disability status (KFF, 2016a). Unlike Medicaid, which is funded by a federal-state matching system, Medicare is federally-funded only, which eliminates the state-level disparities associated with Medicaid (Almgren, 2007). It also reflects one of the key differences between Medicare and Medicaid recipients that undergirds their social constructions: Medicare is available to all who qualify, regardless of

income, while Medicaid is a means-tested program and therefore requires proof of income (Almgren, 2007).

Approximately 120,000 PLWH (12%) receive Medicare-funded care (KFF, 2016a). In 2009, of the PLWH who used Medicare, an estimated 93% had obtained Medicare via SSDI, while 7% had obtained Medicare as a result of age (KFF, 2009). Yet, as the first group of PLWH approaches traditional Medicare age, 2016 estimates suggest that percentage of Medicare recipients with SSDI has dropped to 79%, while the percentage of age-based beneficiaries has climbed to 21% (KFF, 2016a). That is, among all PLWH who receive Medicare, 21% do so through age-based rather than SSDI-based pathways. More than half of total Medicare spending for PLWH goes toward Part D, which subsidizes HIV prescription drugs (KFF, 2016a). While Medicare beneficiaries used to be hampered by the Medicare Part D “donut hole,” which referred to a cap on prescription medication subsidy amounts, one of the changes made by the ACA is to phase out this coverage gap (Martin, Strach, & Schackman, 2013).

As more PLWH approach traditional Medicare age, Medicare will likely become a more important program for HIV care; however, for now, the Ryan White and Medicaid programs are the two primary sources of public coverage for PLWH. Both programs are discussed in the following sections of this dissertation. Since the Ryan White HIV/AIDS Program is specifically designed for the provision of HIV care and in most states Medicaid has only recently become a potential healthcare provider for low-income persons living with HIV through the ACA, the section on the Ryan White Program is, accordingly, much more detailed.

***The Ryan White HIV/AIDS Program.*** The Ryan White HIV/AIDS Program (hereafter abbreviated as “RWHAP”) is the largest, HIV-specific, federal healthcare program for PLWH

(Crowley & Kates, 2013). It is funded through the U.S. Department of Health and Human Services (DHHS) and administered by the Health Resources and Services Administration (HRSA)'s HIV/AIDS Bureau (HAB) (HRSA, 2016a). The RWHAP was enacted on August 18, 1990 under Public Law (P.L.) 101-381 with the official title of "The Ryan White Comprehensive AIDS Resources Emergency Act of 1990," also known as the "Ryan White CARE Act." It is often helpful to refer back to the original written language of a public law to gain an understanding of its purpose that is unaltered by revisions and the passage of time. Accordingly, Section 2 of P.L. 101-381 reads as follows:

It is the purpose of this Act to provide emergency assistance to localities that are disproportionately affected by the Human Immunodeficiency Virus epidemic and to make financial assistance available to States and other public or private nonprofit entities to provide for the development, organization, coordination and operation of more effective and cost efficient systems for the delivery of essential services to individuals and families with HIV disease.

There are several notable terms in this section that are worth examining more closely, as they highlight the urgency which lawmakers felt in 1990. First, HIV/AIDS had already earned an "epidemic" status and was viewed as a medical emergency. Second, the use of the word "families" is probably not by accident, as it brings to mind women and children. Since policymakers' choice presentation of the Ryan White CARE Act was meant to neutralize concerns that so-called deviant populations were going to receive federal services, it makes sense that the language used was intended to assuage public concern. Third, and perhaps most starkly, Ryan White's name was used in the title of the act just four months after his death.

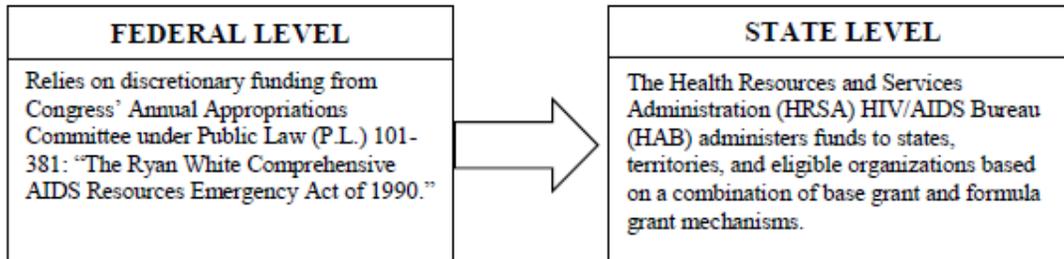
Although RWHAP was originally designed as a palliative care provider, in the advent of antiretroviral therapy (ART) treatment, HIV/AIDS has become more of a managed chronic

health condition than a fatal disease (Morin, 2015). Today, RWHAP serves over 500,000 PLWH, which is over half of all PLWH (HRSA, 2016a). RWHAP is not a health insurance program; rather, it serves as a “payer of last resort” for PLWH by providing HIV treatment services to individuals who are unable to pay for services through any other means (KFF, 2013c).

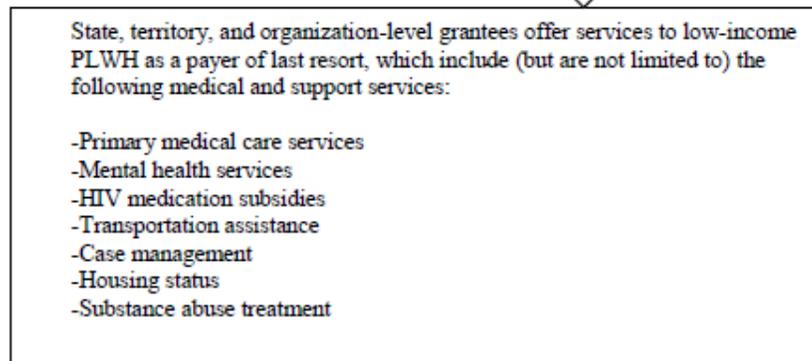
*Services and delivery systems.* The RWHAP has been reauthorized four times, most recently in 2009 (KFF, 2013c). Although the most current reauthorization expired in 2013, legislation in the 2009 version, officially called the “Ryan White HIV/AIDS Treatment Extension Act of 2009,” removed the sunset provision from the previous 2006 version (Ryan White HIV/AIDS Treatment Extension Act, 2009). A sunset provision is defined as “a legal provision that provides for the automatic termination of a government program, agency, or law on a certain date unless the legislature affirmatively acts to renew it” (Latham, n.d.). The elimination of the sunset provision has enabled Congress’s Annual Appropriations Committee to continue allocating funding to the RWHAP; however, there is no guarantee that Congress will continue to apportion discretionary funds to the RWHAP in coming years. Figure 1 provides a logic model of the RWHAP.

**Figure 1**  
*Logic Model for the Ryan White HIV/AIDS Program (RWHAP)*

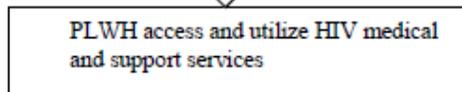
**I. Inputs**



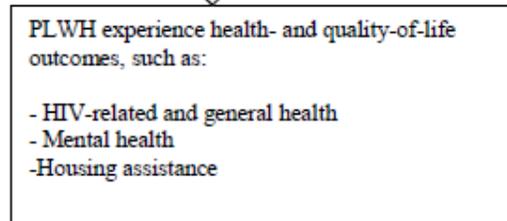
**II. Activities**



**III. Outputs**



**IV. Outcomes**



The RWHAP is divided into multiple programs, or “parts,” each of which has specific funding formulas, services offered, and populations served (KFF, 2013c). All five parts are described in detail in the following subsections.

*Part A.* Part A of the RWHAP distributes emergency funding for medical and support services to “Eligible Metropolitan Areas (EMAs)” which are communities that have at least 2,000 reported cases of HIV/AIDS and a minimum population of 50,000 (HRSA, 2012a). Other areas, called “Transitional Grant Areas” (TGAs), are also eligible for funding (HRSA, 2012a). TGAs must also have a minimum population of 50,000, as well as a reported 1,000 to 1,999 cases of HIV/AIDS (HRSA, 2012a).

Until the 2006 reauthorization of the RWHAP, grantees had to provide proof of AIDS, not HIV, diagnoses. This meant that only individuals with an advanced stage of the disease were eligible. Another change in the 2006 reauthorization mandated that states report documented cases of HIV infection using a name-based system (Kaiser Family Foundation 2013c). This legislative modification was in response to the CDC’s 2005 recommendation that states utilize name-based, rather than code-based, reporting (CDC, 2015c). The CDC maintained that this would improve the accuracy of surveillance data, as the code-based system was prone to errors resulting from improper coding and case duplication (CDC, 2005). As of 2008, all 50 US states utilize a name-based, confidential reporting system (CDC, 2015c). Finally, the 2006 reauthorization also removed a funding mechanism from Part A that allowed the number of non-living AIDS cases to contribute to the formula grant, which unfairly favored urban areas where the AIDS epidemic had started, rather than the areas where living cases were concentrated (KFF, 2013c). Even today, HIV researchers and activists uphold that Part A of the RWHAP

disproportionately favors urban over rural areas, since funding allocation is dependent on community size (Martin, Pollack, & Paltiel, 2006).

*Part B.* Part B of the RWHAP allocates formula grants to state health departments based on the number of living, name-based HIV/AIDS diagnoses reported by the CDC (HRSA, 2014b; Johnson & Heisler, 2015). Thus, while some states do not receive Part A funding based on their population density, all states receive Part B funding. Part B receives the majority of RWHAP funds because it encompasses expensive state AIDS Drug Assistance Programs, or ADAPs, which provide medication to PLWH who cannot afford ART treatment as a result of being uninsured or underinsured (HRSA, 2012b). In FY 2015, Part B received 57.5% of total RWHAP funds (KFF, 2015). For comparison's sake, Part A, which is the second-largest component of RWHAP, received just 27.9% of total funds (KFF, 2015).

ADAP is the “payer of last resort” for HIV/AIDS medication, so it regularly interfaces with other healthcare programs, including Medicaid (Johnson & Heisler, 2015). In fact, the National Alliance of State & Territorial AIDS Directors (NASTAD) recently reported that state ADAPs had assisted 20,061 PLWH in transitioning to Medicaid (NASTAD, 2015). Since the ACA's implementation, ADAP's role in aiding PLWH in transition from RWHAP to a private or public insurance plan has grown. States are allowed to use a portion of their ADAP funds to help RWHAP clients purchase qualified insurance plans, as the co-payments associated with these insurance plans are more cost-effective in subsidizing the high costs of ART regimens (NASTAD, 2016). In fact, ADAP pays an average of \$2,720 per insured client, while the direct purchasing cost for ART is \$8,663 per uninsured client (NASTAD, 2017). While this ADAP/insurance provider interface is complex and often ever-evolving, state ADAPs will often

purchase insurance plans on behalf of their clients rather than having them navigate the process alone (NASTAD, 2016). In fact, ADAP's insurance purchasing role has grown exponentially in the last decade: between 2002 and 2015, the number of PLWH who receive ADAP-purchased insurance has increased by 1,162% (NASTAD, 2016). This provides an excellent illustration of the important role that ADAP continues to play in ensuring continuous medical coverage of PLWH and access to lifesaving drugs.

ADAP eligibility criteria is based on clients' income levels and is largely state-determined. The only federal requirements are formal documentation of HIV infection and state residency (Kaiser Family Foundation, 2014a). State income eligibility ranges from 200% to 500% of the federal poverty level (FPL) (Kaiser Family Foundation, 2014a). In recent years, the increasing number of PLWH coupled with the rising cost of ART medications has led several states to enact ADAP waiting lists as a cost-containment measure (Kaiser Family Foundation, 2014a). During ADAP's peak budget crisis in 2011, eleven states had clients on medication waiting lists (Alabama, Florida, Georgia, Idaho, Louisiana, Montana, Nebraska, North Carolina, South Carolina, Utah, and Virginia), which affected 9,298 PLWH who were unable to obtain treatment (Pund, 2011; Kaiser Family Foundation, 2014a). Since ADAP is intended as a safety net program and sometimes requires emergency funding to meet demand, all clients who are able to obtain health insurance transition out of ADAP. States that not have expanded Medicaid continue to place an unnecessary strain on the program and, in fact, NASTAD has estimated that if "the remaining non-Medicaid expansion states were to expand Medicaid eligibility to 138% of FPL, 33,828 of the ADAP clients served in June 2015 would be eligible to transition into

Medicaid coverage” (Bowes, 2016, para. 3). Instead, some non-expansion states have seen a 5% increase in the number of ADAP clients since the ACA was implemented (NASTAD, 2016).

*Part C.* Part C of the RWHAP, called “Early Intervention Services and Capacity Development,” is the third largest section of the program and received 8.5% of the total budget in FY 2015 (KFF, 2015). Part C funds are distributed directly to rural health clinics, federally qualified health centers, nonprofit organizations, Indian Health Services, and community health centers (HRSA, 2014c; Johnson & Heisler, 2015). RWHAP’s Part C provides funding for outpatient HIV primary care services, including HIV testing, prevention education, case management, transportation assistance, and primary medical care (HRSA, 2014c). As such, Part C is the primary provider of HIV-related services in rural communities (HIV Medicine Association, 2012). Part C grantees can also receive assistance for capacity development in order to improve or streamline HIV services delivery (KFF, 2015). There has been yearly discussion since 2014 about consolidating Parts C and D of the RWHAP in order for resources to “...be better targeted to points along the care continuum and populations most in need, including women, infants, children, and youth, while reducing duplication of effort and administrative burden among grantees” (HRSA, FY 2017). However, the House and Senate have consistently rejected the proposal (Johnson & Heisler, 2015). The following section on RWHAP Part D examines the philosophy behind consolidation resistance in greater detail.

*Part D.* The fourth-largest part of the RWHAP is structured similarly to Part C and received 3% of total program funding for RWHAP in 2015 (KFF, 2015). The primary difference is that it directly funds organizations that specialize in family health services for women, youth, children, and infants (HRSA, 2014d). However, the risk of HIV infection in children and infants

is almost non-existent. Perinatal transmission has been nearly eradicated as medical advances have allowed pregnant women living with HIV to give birth to healthy, uninfected infants (CDC, 2016d). To illustrate the very low level of risk exposure, there were just 174 cases of HIV diagnosis in children in 2014 (CDC, 2016d), while there were 44,073 total HIV diagnoses among all groups that year (CDC, 2016a). Thus, while services for women and children are needed, proponents for consolidation argue that it would make more fiscal sense to combine Parts C and D. Congress' refusal to approve this consolidation is likely due to the symbolic appeal of providing services to women and children over the groups who are actually at higher risk, like men who have sex with men (MSM). For comparison's sake, African American MSM now represent the population most at risk for HIV, and the CDC (2016c) estimates that one in two men in this group will contract HIV at some point in their lives.

*Part F.* The remaining 3.1% of the RWHAP budget is divided into four other sections that are together categorized as "Part F" (KFF, 2015). Part F finances several specialty health service programs, including the AIDS Dental Reimbursement and Community-Based Dental Partnership Programs that reimburse dental schools to treat PLWH; AIDS Education and Training Centers, which provide HIV-specific medical training to health providers; Special Programs of National Significance, which provide grants to HIV treatment initiatives; and the Minority AIDS Initiative, which targets minority populations (Johnson & Heisler, 2015). In light of the recent surveillance data that show African American MSM to be uniquely at risk, the CDC funded several million-dollar HIV/AIDS grant programs that target African American MSM in 2015 (Office of HIV/AIDS and Infectious Disease Policy, 2016). These grant programs are funded through the RWHAP's Parts A and B, as the MAI does not currently function as an

independent funding stream (Johnson & Heisler, 2015). While the CDC’s grant programs are an important step toward combating racial disparities, the Government Accountability Office (GAO) has directed DHHS to streamline MAI funding into one core service program (Johnson & Heisler, 2015). It remains to be seen whether or not MAI will become an independently-funded program, but it would help address one of the recommended actions of President Obama’s 2020 National HIV/AIDS Strategy (NHAS), which is to “expand services to reduce HIV-related disparities experienced by gay and bisexual men (especially young Black gay and bisexual men), Black women, and persons living in the Southern United States” (White House, 2015, p.39).

*Beneficiaries.* Although the RWHAP does not have eligibility criteria based on minimum income, residency, work status, or any of the other factors typically associated with the receipt of safety-net services, it does require grantees to document certain client information on a semi-annual basis (HRSA, 2013). This (minimum) six-month recertification requirement is due to the fact that client insurance statuses may change, and since the RWHAP is a payer of last resort, agencies must “[check] for the availability of all other third party payers” (HRSA, 2013, p. 2).

The most current publicly-available data on RWHAP client demographics is found in the 2014 RWHAP Services Report (RSR), which is HRSA’s annual publication that provides an overview of RWHAP clients and program expenditures over the past year (HRSA, 2015). According to the 2014 RSR, 512,214 clients received one or more of the program’s services. More than half (64.2%) of RWHAP clients were living at or below the FPL, and 76.3% of clients had income levels below 138% FPL, which qualified them for Medicaid in expansion states (HRSA, 2015). Nearly 75% of clients identified as belonging to a racial or ethnic minority group, and among these clients, 47% identified as Black or African American. Most (70.6%) were male.

While the racial and gender breakdown has remained largely stable for the past six years, the average age of RWHAP clients has increased. In 2014, over 40% of clients were aged 50 or older (HRSA, 2015), which demonstrates just how successful ART treatment has become. However, even as some PLWH begin to reach older age, the rate of new HIV infections remains steady. Although rates have declined overall since 2004, the number of new annual infections has remained fairly constant at around 45,000 (CDC, 2016a).

Even under the ACA, a quarter of RWHAP clients lack health insurance, a percentage that has remained unchanged since 2010 (HRSA, 2015). For the three-quarters of RWHAP clients who do have health insurance, they still rely on RWHAP to help pay for needed HIV/AIDS services (KFF, 2013c). Further, since most RWHAP clients are low-income, the ACA has not made an appreciable difference in the percentage of PLWH who have private insurance, and Medicaid enrollment has increased only in expansion states (Berry et al., 2016). In fact, data released by NASTAD in 2015 indicated that 68,000 ADAP clients (48.5% of total) had private or public insurance in addition to RWHAP funding (KFF, 2016b; Robinson, 2015).

Thus, even if the ACA were to remain intact and Medicaid were to be expanded in all 50 states, most HIV providers agree that the RWHAP will remain invaluable for low-income PLWH (Abara & Heiman, 2014; Cahill et al., 2015; Crowley, Feirman, Collins, & Holtgrave, 2015; Martin, Meehan, & Schackman, 2013; Martin et al., 2013; Sood et al., 2014). Moreover, HIV providers have voiced widespread that the RWHAP funding will decrease or even disappear entirely if policymakers falsely assume that the ACA has supplanted the need for specialized HIV programs such as state ADAPs (Goldman, Juday, Linthicum, & Seekins, 2014; Martin et al., 2013a; Martin et al., 2013b). Since funding for the RWHAP relies on annual discretionary

spending and Congress has not reauthorized the program since 2009, there is legitimate uncertainty surrounding the program's future. Given the uncertainty that also surrounds the ACA, however, the role of the RWHAP is perhaps more vital than ever.

*Medicaid.* In 1965 under the Johnson Administration, Medicaid was created alongside Medicare in Title XIX of the Social Security Act (Moore & Smith, 2005-2006). Medicaid is jointly funded and administered by states and the federal government (Almgren, 2007). This gives states some discretion in setting eligibility requirements. It was originally conceived as a health insurance program for the poor, which is one reason why prejudice against Medicaid users continues (Almgren, 2007). Moore and Smith described it in this way: "Medicaid's heritage has clearly shaped a program steeped in public assistance and welfare mentality, seen by most observers as a tremendous weakness" (2005-2006, p. 51). Medicaid was created, therefore, to provide services to populations most in need of governmental assistance.

*Services and delivery systems.* Under the provisions of Medicaid's state/federal agreement, the federal government provides states with matching funds using the federal medical assistance percentage (FMAP), which is adjusted based on a state's average income relative to the national average (Snyder & Rudowitz, 2015). Outside of certain "mandatory services," which require states to insure all persons who fulfill the respective eligibility criteria, states have the choice to provide "optional services" (KFF, 2013a). While mandated Medicaid services like inpatient hospital stays and X-ray and laboratory services mostly target families and children, the services that PLWH most often need are optionally-funded. These non-mandated services include essential benefits like dental care for those 21 years of age and younger, home healthcare, and prescription drug services (KFF, 2013a).

In one sense, the flexibility of Medicaid’s financing system may seem sensible, in that it seems to allow states to respond to local issues; yet, this flexibility can be detrimental when states set benefit levels that are appreciably lower than those in other states or opt-out of subsidizing non-mandatory services. For PLWH, this flexibility is largely detrimental and causes state-level disparities in medical care access. For example, the federal government mandates that all states reimburse persons for “medically-necessary” HIV testing, which refers to cases in which a medical provider believes that either the patient is displaying possible symptoms of HIV or has been exposed to the HIV virus (KFF, 2013b). However, states have the option to reimburse for routine, patient-initiated HIV testing, and only 33 states do so (KFF, 2013b). States also have the discretion to cap the number of primary care visits, prescriptions, and inpatient days for PLWH (KFF, 2013a).

*Beneficiaries.* One of the greatest sources of disparate outcomes for PLWH today in recent years has been the unequal expansion of Medicaid across states. In expanded states, adults are eligible for Medicaid if they are childless, non-disabled, between ages 19 and 65, and have incomes at or below 138% FPL (KFF, 2016c). However, in non-expansion states, adults without children or disabilities, even with the lowest incomes—below 100% FPL—are not eligible for either Medicaid or subsidized private health insurance (KFF, 2016c). These individuals are said to fall in the “coverage gap,” as they are perversely *too poor* to fulfill enrollment eligibility criteria in a health policy act that was designed to enroll all individuals in Medicaid who had incomes less than 138% FPL. Individuals who fall into the coverage gap are disproportionately found in one of several states: Texas (26%), Florida (20%), Georgia (11%), and North Carolina (8%) (Garfield & Damico, 2016). Moreover, the coverage gap unduly affects PLWH because

infection rates are especially high in the Southeastern region of the US, which accounted for over half of new HIV diagnoses in 2014 (CDC, 2016b). Further, the states with the highest numbers of adults living in the coverage gap are also among states with the top 10 highest HIV diagnosis rates. Georgia has the second-highest HIV diagnosis rate in the U.S., Florida the third, Texas the sixth, and North Carolina the tenth-highest (CDC, 2016b).

PLWH who live in non-expansion states have the same eligibility requirements for Medicaid that existed before the ACA (Centers for Medicare & Medicaid Services [CMS], n.d.). Eligible enrollees are referred to as “mandatory eligibility groups” and include children, persons receiving supplemental security income (SSI), and pregnant women (CMS, n.d.). Historically, Medicaid’s eligibility standards have somewhat discouraged PLWH against maintaining HIV health. Before the passage of the ACA, PLWH without dependent children were only eligible for Medicaid if they could demonstrate disabled status, meaning that their HIV disease had progressed to AIDS (Kates et al., 2014). This was both a humanitarian and a public health nightmare, since HIV is a manageable and non-transmissible disease when addressed with regular medical treatment (Cahill, Mayer, & Boswell, 2015; Kates et al., 2014). For PLWH who reside in expansion states, disability status is no longer a prerequisite for Medicaid eligibility; however, it remains to be seen how Medicaid eligibility criteria will be affected by upcoming changes in US healthcare policy.

Medicaid beneficiaries who enroll due to Medicaid expansion qualify based on their “modified adjusted gross income (MAGI),” and are thus referred to as a “MAGI group” (CMS, 2013). Since annual income levels can fluctuate, MAGI group beneficiaries must re-enroll each year in order maintain continuous coverage (CMS, 2013). This creates a barrier to some PLWH

who are not used to the constant recertification requirements for continuation of coverage (Dawson, Kates, Perry, & Perry, 2016). It is worth highlighting here that Medicare beneficiaries do not have the annual recertification requirement that is mandated for Medicaid beneficiaries because all persons who are 65 years of age and older who qualify are all eligible for Medicare, regardless of income. Almgren (2007) considers this one of the fundamental differences between the two programs that encapsulates the political attitude toward working-age adults. In contrast to Medicare, Medicaid is “burdened with extreme state-to-state variations in eligibility criteria and coverage, a financial structure that is completely based on tax revenues, and the stigma of demonstrable poverty as the essential precondition for eligibility” (Almgren, 2007, p. 70). Certainly, the Medicaid health delivery system stigmatizes Medicaid providers as well, who were reimbursed, on average, at rates 44% lower than Medicare providers (KFF, 2014d).

No publicly-available data reporting system currently exists for the estimated 230,000 PLWH who receive Medicaid coverage, as PLWH represent less than .01% of all Medicaid beneficiaries (KFF, 2013a). Thus, the best source of coverage information is through RWHAP’s yearly client reports, even though this naturally excludes PLWH without RWHAP benefits from measurement. Data from the 2014 RSR indicated that among RWHAP clients who lived at or below the FPL, 42.9% had Medicaid coverage (HRSA, 2015). Although other states have expanded Medicaid in the two years since this analysis was conducted, in 2014, it was estimated that an additional 60,000 PLWH could obtain Medicaid coverage if all states expanded Medicaid (Snider et al., 2014).

Perhaps the most salient point regarding Medicaid and the financing of HIV care is that, even in Medicaid expansion states, HRSA does not anticipate that Medicaid will replace any

RWHAP-funded service except for ART treatment reimbursement through ADAP (Johnson & Heisler, 2015). This is due, in large part, to the fact that the RWHAP provides services that Medicaid in most states does not, including case management, substance abuse counseling, dental care, and hospice services (Johnson & Heisler, 2015). As such, it is unlikely that any Medicaid beneficiaries living with HIV would cease to need RWHAP services. Further, the state income eligibility requirements for ADAP, which range from 200%-500% FPL (KFF, 2014a), are much more generous than Medicaid's. In fact, in an economic analysis of state ADAPs, Snider and colleagues (2016) estimated that if ADAP income eligibility limits were decreased by 50 percentage points in each state, 4,626 PLWH nationwide would lose access to affordable HIV medication, even when controlling for other funding sources. This sizeable figure illustrates that all of the RWHAP's services are likely to remain invaluable for PLWH in the foreseeable future, regardless of any policy changes made to the ACA.

**The Private Health Financing System.** Traditionally, PLWH have had limited access to private health insurance coverage. In the US, private health insurance is typically available either through employer-sponsored or individual coverage. Prior to the ACA, individual coverage was typically reserved for people who were unemployed or who worked less than full-time, and who were, therefore, ineligible for employer-based insurance (Scofea, 1994). This is because for most of the nation's history, health insurance has been closely tied to employment (Scofea, 1994). During World War II when demand for cheap labor was high, employers realized that they could incentivize employees to work for them by offering health insurance benefits (Almgren, 2007; Blumberg & Davidson, 2009). Then, in 1954 when the Internal Revenue System (IRS) made employer-sponsored insurance tax-exempt, it wasn't long before health insurance coverage as a

function of employment was considered the norm (Blumberg & Davidson, 2009). The evolution of health insurance policy in the first half of the 20<sup>th</sup> century also solidified “the dominance of provider interests over the public interest in the financing and delivery of healthcare (Almgren, 2007, p. 49). This historical attitude towards employee insurance has created the American notion that healthcare is not an assumed right; rather, it is a reward for responsibility and work ethic.

However, President Obama challenged this public conception when drafting the ACA, which was signed into law on March 23, 2010 and fully implemented on January 1, 2014 (DHHS, 2015). Under the ACA, all documented US residents who do not qualify for public or employer-sponsored insurance and whose annual incomes are between 100% and 400% FPL may purchase private health insurance coverage with premium tax credits (IRS, 2016a). The amount of the tax credit varies depending on the individual’s or family’s income level, but it essentially functions as a partial subsidy. Enrollees can either receive this credit in monthly advances or in one refundable credit after filing taxes (IRS, 2016a). Under the ACA, every eligible individual and family member must receive minimal essential health coverage or pay a tax penalty (IRS, 2016b). Certain populations are exempt from purchasing health coverage, including individuals who are in the Medicaid coverage gap, members of Native American tribes, and individuals who are incarcerated, among others (IRS, 2016b). The next section describes the services and delivery systems and beneficiaries under the ACA, with a focus on private health insurance.

***Affordable Care Act (ACA).***

*Services and delivery systems.* The ACA created health insurance exchanges, or Marketplaces, in each state “where individuals and small businesses can shop for and purchase private health insurance coverage” (Crowley & Kates, 2013; Mach, 2013). Enrollees have the option to purchase Marketplace insurance online, by phone, with in-person assistance, or by paper application (ACA, 2010). States may either elect to have a state-run or a federally-run Marketplace (Mach, 2013). While insurance companies can sell their healthcare packages through the Marketplace, the ACA dictated that all insurance packages must meet specific qualified health plan (QHP) benefits (ACA, 2010). The ACA legislation lists the following services as mandatory for QHPs: Ambulatory patient services; emergency services; hospitalization; maternity and newborn care; mental health and substance use disorder services; prescription drugs; rehabilitative and habilitative services and devices; laboratory services; preventive and wellness services; chronic disease management; and pediatric services, including oral and vision care (ACA, 2010). The ACA Marketplace system is therefore a compromise of sorts between commercial and consumer interests.

The ACA’s official document opens with the statement that the Act “puts individuals, families and small business owners in control of their healthcare” (ACA, 2010). This clearly addresses the previous health insurance system that favored employees and larger business organizations. However, the ACA’s language also explicitly addresses some insurance practices that the new healthcare system sought to redress: “[The ACA] keeps insurance companies honest by setting clear rules that rein in the worst insurance industry abuses” (ACA, 2010). One of the significant “abuses” that the ACA rescinded are insurance companies’ denial of coverage based

on pre-existing conditions (ACA, 2010).

Even so, investigation into Marketplace drug pricing reveals that insurance companies have already implemented strategies to keep PLWH and other individuals with chronic illnesses from enrolling. In order to maintain HIV viral suppression, PLWH must follow a lifetime of expensive, daily medicinal regimens. The CDC (2015b) estimates that the lifetime cost of ART treatment for PLWH is \$379,668 (in 2010 dollars). To avoid paying these high drug prices, some state insurance Marketplaces have priced HIV medications at the highest cost-sharing tier (Dickson, 2016; Jacobs & Summers, 2014). Known as “adverse tiering,” this is a technique insurance companies employ to prevent individuals with chronic medical conditions from enrolling (Jacobs & Summers, 2014). In fact, NASTAD’s report on this insurance tactic sheds light on additional cost-containment measures that private insurers have employed, including failure to provide coverage for the newer ART regimens that have fewer side effects (Dickson, 2016).

### ***Beneficiaries.***

*Pre-existing conditions.* The ACA effectively revoked insurance companies’ ability to deny coverage based on individuals’ pre-existing health conditions. The ACA “...prohibits not just an exclusion of coverage of specific benefits associated with a preexisting condition in the case of an enrollee, but a complete exclusion from such plan or coverage, if that exclusion is based on a preexisting condition” (ACA, 2010). This legislative change has tremendous consequence for PLWH, who were historically excluded from health insurance plans. In 2013, just a year before the ACA was fully implemented, a mere 13% of PLWH had private insurance coverage (Cahill et al., 2015). Just as it was difficult to obtain numbers for PLWH who are

newly-enrolled in Medicaid, it is also difficult to estimate how many PLWH have obtained private health insurance as a result of the ACA. An estimate reported by the CDC (2015d) suggests that fewer than 17% of PLWH in the US have private health insurance, while the RSR reported that 11.8% of patients in 2014 had private health insurance (HRSA, 2015). While the role of private health insurance for PLWH has historically been minimal, more PLWH are now able to obtain private health insurance with the pre-existing health condition barrier removed.

*Eligibility standards.* The ACA has expanded private health insurance options for millions of Americans. During 2015's open enrollment period, 11.7 million individuals purchased insurance through the Marketplace (Levitt, Cox, & Claxton, 2015). However, low-to-mid-income PLWH are able to purchase subsidized private coverage only if their annual income is between 100% and 400% of the FPL in non-expansion states; in expansion states, the eligible income bracket is between 138% and 400% of the FPL (Cahill et al., 2015; Johnson & Heisler, 2015). In fact, a team of Kaiser Family Foundation and CDC researchers has estimated that 15,460 PLWH who live in non-expansion states have incomes below the FPL and are ineligible for subsidized private health insurance (Kates et al., 2014).

*Groups who remain uninsured.* As originally written, the ACA intended to provide states with matching funds to expand their Medicaid eligibility levels to 138% of the FPL, beginning with a 100% matching rate in 2014 and phasing out to a 90% matching rate in 2020 and beyond (ACA, 2010). As originally drafted, ACA legislation was meant to ensure that no one was left without an affordable coverage option. However, on June 28, 2012, the Supreme Court ruled in the *National Federation of Independent Business v. Sebelius* that a Medicaid expansion mandate for states was unduly "coercive" on the part of the federal government. As a result of that

legislative amendment, adults who do not belong to a mandatory eligibility group are unable to qualify for Medicaid coverage in non-expansion states.

However, some groups are unaffected by insurance changes under the ACA as they have always been illegible for health insurance in the US and continue to be so. Groups who are ineligible for public health insurance include both undocumented immigrants and “lawfully present” immigrants who have held legal status for less than five years (Johnson & Heisler, 2015; Mach, 2013). However, lawfully present immigrants do have the option to purchase private health insurance without the imposition of a five-year ban, which undocumented immigrants do not (Mach, 2013). For immigrants with HIV who are ineligible for both private and public health insurance, the RWHAP, which has never required proof of legal residence, will continue to be their only source of healthcare.

### **Healthcare Programs and HIV Clinical Outcomes**

**Ryan White HIV/AIDS Program (RWHAP).** The RWHAP model of care treats the complex issues that often accompany HIV infection (Gallant et al., 2011). To accomplish this, RWHAP provides many essential wraparound services to PLWH that no other health payer subsidizes (Cahill et al., 2015). The RWHAP also provides clients with access to board-certified infectious disease specialists, which have been shown to be more effective in treating PLWH than generalist care providers (Gallant et al., 2011; Landon et al., 2005). According to HRSA’s RWHAP guidelines, the following comprehensive list of services may be provided to clients under the RWHAP (HRSA, 2016b): ADAP treatments; AIDS pharmaceutical assistance; child care services; early intervention services; emergency financial assistance; food bank/home delivered meals; health education/risk reduction; health insurance premium and cost sharing

assistance for low-income individuals; home and community-based health services; home healthcare; hospice services; housing; legal services; linguistic services; medical case management, including treatment adherence services; medical nutrition therapy; medical transportation; mental health services; non-medical case management services; oral healthcare; outpatient/ambulatory health services; outreach services; permanency planning; psychosocial support services; referral for healthcare and support services; rehabilitation services; respite care; substance abuse outpatient care; and substance abuse services residential care. As this lengthy list shows, the range of services that the RWHAP provides is essentially unparalleled in scope.

One of the reasons HIV requires comprehensive care is that it is often accompanied by health conditions and comorbidities that complicate treatment. These complications create the need for providers who have received HIV-specific medical training (Beane, Culyba, DeMayo, & Armstrong, 2014; Cahill et al., 2015). For example, in cases where ART treatment is delayed or taken irregularly, HIV viral replication can lead to a chronic inflammatory state (Thompson et al., 2010). Chronic inflammation is the underlying cause of many diseases related to organ failure, such as renal disease, liver disease, and cardiovascular disease (Thompson et al., 2010). HIV also weakens the immune system if medicinal regimens are not taken exactly as prescribed which increases the risk for opportunistic infections, such as tuberculosis, that most first-world physicians do not typically encounter (Thompson et al., 2010). Thus, PLWH often benefit from HIV specialist care, especially when they have other health conditions in addition to HIV (Gallant et al., 2011).

The RWHAP's wraparound approach is a likely contributor to positive health outcomes, and several retrospective medical record reviews have come to this assumption. In one such

study that analyzed data from the nationally-representative Medical Monitoring Project (MMP), Bradley and colleagues (2016) surveilled interview and medical record data collected between 2009 and 2013 for 18,095 PLWH. Participants were included in analysis if they had at least one recorded HIV medical care visit for each of the four years, though only the most recent visit was used in the cross-sectional analysis. The two primary outcomes were prescription of ART, defined as having a documented ART prescription during the 12 months prior to interview, and viral suppression, which used data from the patient's most recent visit. Payer type, which was the independent variable of interest, included all possible payer combinations: RWHAP only, private health insurance only, Medicaid only, Medicare only, Medicaid and Medicare, private insurance and RWHAP, Medicaid and RWHAP, Medicare and RWHAP, and Medicaid, Medicare, and RWHAP. The results of the authors' multivariable analysis revealed that PLWH who were covered only through Medicaid were 12% less likely to achieve viral suppression than PLWH who were covered only through RWHAP, and PLWH who were covered through both Medicaid and RWHAP were 5% less likely to be virally suppressed than PLWH with just RWHAP coverage (Bradley et al., 2016). Further, PLWH covered only through private insurance were 5% less likely to achieve viral suppression than PLWH who were covered only through RWHAP (Bradley et al., 2016). After a careful examination of the literature, Bradley and colleagues' study appears to be the only one to date that has examined payer type combinations that include both health insurance and RWHAP with such detail.

Although payer type was not the independent variable of interest, another study conducted by Colasanti and colleagues' (2016) analyzed medical records from an urban Southeastern HIV clinic, which revealed that patients with RWHAP as their primary payer

source had significantly higher rates of both viral suppression and retention in care, as measured by “attendance at two provider visits  $\geq 90$  days apart within a 12-month period,” than patients with public or private health insurance. Since the authors analyzed continuous retention and viral suppression rates for a three-year period, the significance of payer type was shown to be salient over time. In their conclusion, the authors suggested that this outcome was likely due, in part, to RWHAP’s provision of comprehensive care services (Colasanti et al., 2016).

Another HIV clinical outcome study that used MMP data focused on facility funding type, rather than patient health payer type, and found interesting results (Weiser et al., 2015). In their analysis of 2009-2011 data for 8,038 PLWH, Weiser and colleagues (2015) examined the relationship between RWHAP-funded and non-RWHAP-funded facilities for two outcome measures: prescription of ART during the 12 months prior to interview and the most recent viral load measurement. There were no significant findings for ART prescription; however, for viral load the authors found that several subgroups of patients were more likely to be virally suppressed if they received care at RWHAP-funded facilities. These subgroups included PLWH whose income was below the FPL and PLWH aged 30-39. In their conclusion, Weiser and colleagues (2015) speculated that these differences emerged because RWHAP is specifically designed to serve low-income patients who are most likely to benefit from the wraparound services that RWHAP provides, like transportation and housing assistance.

**Medicaid and private insurance.** Studies have shown that PLWH who are Medicaid beneficiaries have poorer health outcomes than PLWH who receive care either partially or fully through the RWHAP (Bradley et al., 2016) or at RWHAP-funded facilities (Weiser et al., 2015). Similarly, the literature indicates that Medicaid recipients have poorer health outcomes than

private health insurance users and that this phenomenon extends across multiple health conditions (Amini et al., 2016; Chang et al., 2013; DeVoe, Wallace, Selph, Westfall, & Crocker, 2011; Fedewa, Lerro, Chase, & Ward, 2011; Short et al., 2013; Weyh, Lunday, & McClure, 2015). One reason for this discrepancy may be the social stigma associated with Medicaid (Allen, Wright, Harding, & Broffman, 2014). For example, Xinxin, Call, Pintor, Alarcon-Espinoza, and Simon (2015) found that patients with public insurance (either Medicaid or Medicare) were over four times more likely than private insurance users to experience insurance-based discrimination from medical providers. Another reason for the discrepancy may be that Medicaid users have more difficulty accessing specialty care providers than private insurance users (Nguyen & Sommers, 2016). In the case of HIV, experiencing barriers to accessing specialty services would prove especially problematic.

Other studies have demonstrated that disparate Medicaid-user outcomes may partly be a consequence of engaging in care only after disease advancement. This is a phenomenon that has been found in multiple groups, including women with cervical cancer (Churilla et al., 2016), adults with visual impairment (Lipton & Decker, 2015), and adults with melanoma (Amini et al., 2016). For PLWH trying to access medical care prior to Medicaid expansion under ACA, this was certainly the case since they were not eligible for Medicaid unless they could qualify for disability status. A study that reviewed medical records from 1997-2009 found that Medicaid users were significantly more likely to present for HIV care with lower CD4 counts (which indicate increased disease severity) than patients with other payer types, although one potential limitation in this analysis was that the RWHAP was not included among payer types (Schneider et al., 2013).

Interestingly, Medicaid's treatment of the hepatitis C virus (HCV), which is a chronic viral infection that primarily attacks the liver, requires eligibility criteria that are similar to those previously associated with HIV. Currently, only individuals with advanced liver disease are able to receive reimbursement for HCV treatment due to cost-containment measures enacted by states to offset high drug costs (Chidi et al., 2016). According to Chidi and colleagues (2016), these Medicaid eligibility requirements are responsible for between 4.5 and 7.5 fewer quality-adjusted life-years (QALYs) in adults with HCV, the loss of which could be prevented by initiating treatment sooner.

**Measuring HIV clinical health.** Compared to other diseases, HIV is easily and inexpensively measured in laboratory settings, a virtue that is “envied in other disease research” (Voldberding, 2011, p. vii51). In fact, the relative ease and accuracy with which HIV biomarkers can be quantified has made an invaluable contribution towards global monitoring of HIV (Voldberding, 2011). There are two primary biomarkers for HIV that are used to monitor infection: Viral load and CD4 count (DHHS, 2016). Viral load measures the number of HIV RNA virus particles (copies) per milliliter (mL) of blood, and viral loads that are less than 200 copies/mL are generally considered suppressed (CDC, 2016f). This is a distinctly important cutoff, as viral suppression is the ultimate goal of HIV treatment: PLWH with suppressed viral loads have an extremely low transmissibility risk as well as optimal person health (CDC, 2016f). Current medical guidelines advise physicians to monitor viral load every three to six months (CDC, 2016e).

The other primary HIV clinical indicator is CD4 count, which is an indicator of immune system health that measures the number of CD4 T lymphocytes (CD4 cells) per microliter ( $\mu\text{L}$ )

of blood (DHHS, 2016). Historically, although CD4 count tests were recommended in conjunction with viral load tests, the Department of Health and Human Services (DHHS) now considers this test more appropriate for patients who are new to antiretroviral treatment, since CD4 count allows physicians to gauge disease progression (DHHS, 2016). Owing to advances in HIV treatment regimens that have made CD4 count less significant in monitoring HIV health for clinically-established patients, CD4 count will not be used as an outcome measure in this study.

**Measuring retention in care (RiC).** One of the national indicators used to measure HIV health outcomes is RiC, which refers to continuous HIV care over time (NHAS, 2015). It is usually measured retrospectively over a specified time interval using patient-level data abstracted from medical records (Mugavero, Davila, Nevin, & Giordano, 2010). Retention is one of the crucial steps in the HIV care continuum, an internationally-recognized framework used to depict the population-level progression among PLWH from initial diagnosis to viral suppression (CDC, 2016f). RiC is crucial for maintaining viral suppression, since consistent, lifelong medical care is a prerequisite for optimal HIV health and also reduces the likelihood of inadvertently transmitting the virus to others (Gardner et al., 2011). The updated NHAS has set a goal for 2020 that increases the percentage of PLWH who are retained in care to 90%, matching the international goal set forth by the World Health Organization [WHO]'s Joint United Nations Programme on HIV/AIDS (UNAIDS) to reach the “90-90-90 target” (WHO, 2014). Countries and cities that are participating in this initiative have agreed to work towards achieving rates of 90% diagnosis, adherence, and viral suppression, respectively, among PLWH by 2020 (WHO, 2014).

RiC is defined by the CDC (2016f) and the IOM (2012) as having two or more HIV-related primary care visits during a 12-month period that are at least three months (90 days) apart. This measure, commonly referred to as the “HRSA HAB” measure, may be referred to as a “hybrid” RiC indicator since it captures both “visit consistency” and “gaps in care” (Mugavero et al., 2010). That is, it measures both frequency of visits and the time interval between visits.

Prior studies have used primary care appointments to measure retention rather than including all types of medical visits. Mugavero and colleagues (2010, p. 608) concisely state the reason for this: “...Because survival with HIV infection is so dependent on access to antiretroviral therapy (ART), ‘care’ has typically been conceptualized as a scheduled visit with a healthcare provider (whether physician, advanced practice nurse, or physician’s assistant) who can prescribe or manage ART.”

In addition to the CDC/IOM indicator described above, other retention measures have received recent attention in the literature due to their ability to illuminate additional demographic and behavioral correlates of RiC (e.g., Mugavero et al., 2014; Zinski et al., 2015). In fact, Mugavero, Amico, Horn, and Thompson (2013) recommend that researchers use at least two different measures for RiC: one for *kept visits* and one for *missed visits*. Most RiC measures, including the national CDC/IOM measure, account for kept (i.e., attended) visits. These measures are generally preferred in administrative settings because they do not rely on record-keeping for missed or rescheduled visits—just attended visits (Mugavero et al., 2010). However, kept-visit measures do not reflect the increased mortality risk that is associated with missing scheduled visits. In Mugavero and colleagues’ (2014) seminal survival analysis, they found that

patients who missed more than two scheduled visits over a 24-month observation window had a significantly greater mortality risk than patients who were otherwise classified as “retained” using two different “kept-visit” indicators. This demonstrates the importance of using multiple retention indicators in order to identify at-risk patients who may otherwise become misclassified. Thus, this study will utilize both a kept- and missed-visit outcome variable to more comprehensively represent HIV health outcomes.

**Other correlates of viral suppression and retention in care.** This study focuses on the relationship between healthcare payer type and HIV health outcomes, which represents an important research gap; however, it is worth summarizing the current state of knowledge on other associated factors. Prior research has found several socioeconomic and behavioral factors to be significant barriers to viral suppression, including alcohol (Kalichman et al., 2013) and substance use, especially intravenous drug use (Barash, Hanson, Buskin, & Teshale, 2007; Lima et al., 2014; Sacamano & Farley, 2016), lower self-efficacy regarding medication adherence (Brown, Littlewood, & Vanable, 2013; Lee et al., 2016; Turan et al., 2016), experiencing symptoms of depression (Pecoraro et al., 2015; Shacham, Nurutdinova, Onen, Stamm, & Overton, 2010), and having less than a high school education (Kahana et al., 2016; Kalichman et al., 2010).

Depression (Zuniga, Yoo-Jeong, Dai, Guo, & Waldrop-Valverde, 2016) and current or prior substance use (Dombrowski, Simoni, Katz, & Golden, 2014; Marx, Malka, Ravishankar, & Schwartz, 2011) has also been found to predict poor RiC. Additional associated factors reflect that retention is an ongoing, lifelong health behavior that may be influenced by patients’ familial and social relationships. Significant barriers reported in the literature include nondisclosure of

one's positive status to friends or family (Elopre et al., 2015), perceived lack of social support (Kelly, Hartman, Graham, Kallen, & Giordano, 2014; Smith, Fisher, Cunningham, & Amico, 2012) and experiencing stigma (Kempf et al., 2010; Valenzuela et al., 2015). Structural-level barriers, including food insecurity (Colasanti, Stahl, Farber, del Rio, & Armstrong, 2017) and lack of reliable transportation (Yehia et al., 2015), may also impede RiC.

**Managing HIV health.** Any study examining HIV health should include an overview of ART treatment, since it is the primary means by which PLWH manage their condition. According to guidelines from the International Association of Providers of AIDS Care (IAPAC) (2015) and the DDHS (2016), all PLWH should be started on an ART treatment regimen immediately following diagnosis of HIV, regardless of CD4 count threshold that indicates how far (or not) the disease has progressed. An exception is for PLWH who reside in low-resource countries, where limited availability of ART treatment must be considered (IAPAC, 2015).

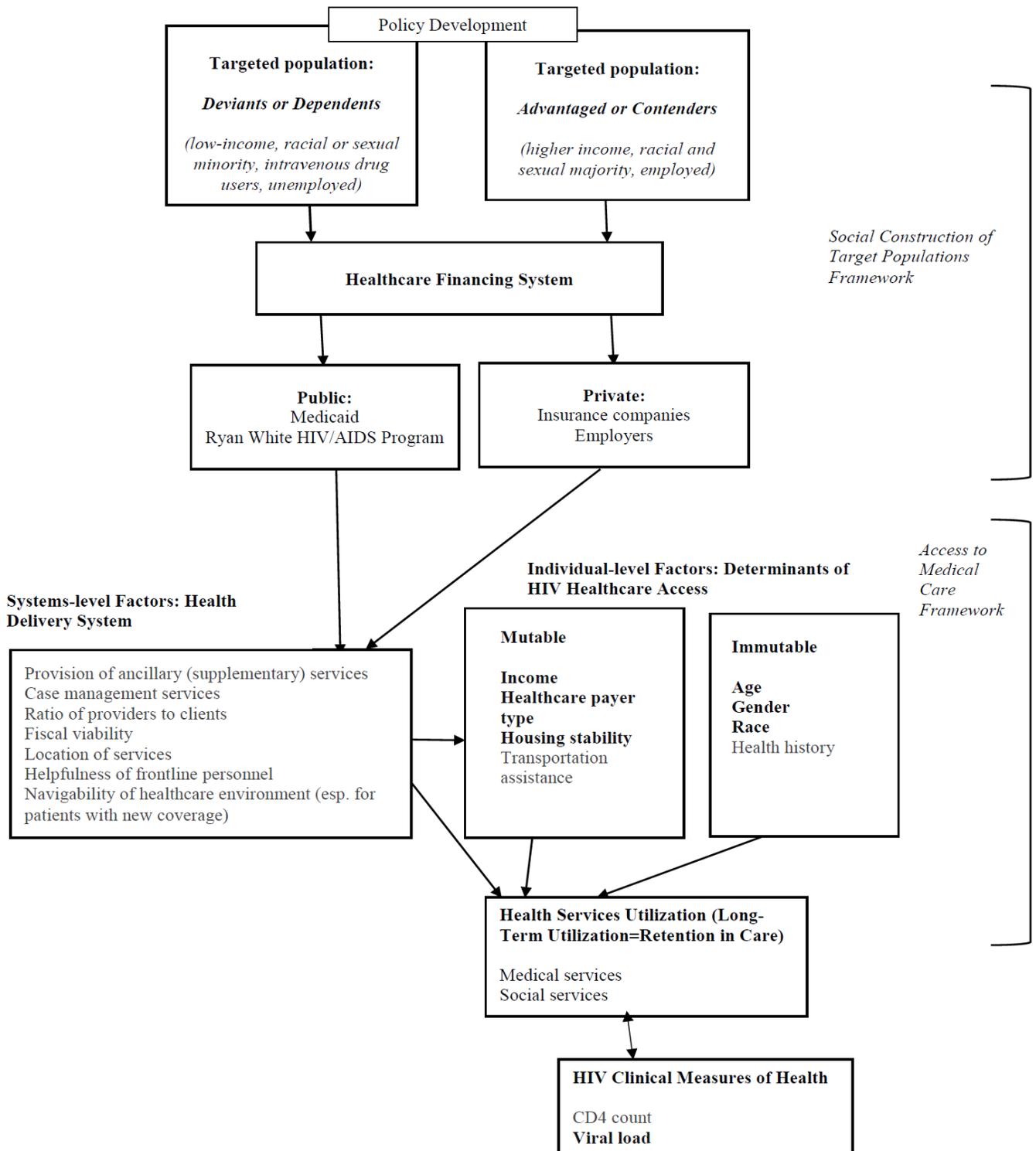
Several randomized controlled trials have linked early ART treatment initiation has been linked to decreased mortality risk (Severe et al., 2010; Zolopa et al., 2009). In fact, research has shown that HIV prognosis is positively correlated with the CD4 count threshold at diagnosis; PLWH with higher CD4 counts are more likely to achieve VS and prevent early mortality (IAPAC, 2015). There is also evidence that consistent adherence to ART treatment reduces transmission to sexual partners, which has led to an international push for “treatment as prevention” (TasP) (Cohen et al., 2013; WHO, 2012). The TasP intervention strategy has become increasingly popular in recent years, since it has the dual benefit of both improving the health of PLWH and preventing unintended transmission of HIV to others.

HIV healthcare policy's role in achieving ART treatment recommendations cannot be overstated. As previously mentioned, prior to the ACA PLWH had to have an AIDS diagnosis in order to qualify for Medicaid (KFF, 2013a). Given that early ART treatment reduces HIV morbidity and mortality (Thompson et al. 2010), it is imperative that PLWH have access to affordable ART treatment as soon as they are diagnosed. If the gains in ART treatment affordability under the ACA were to be reversed, it would have disastrous implications for PLWH and could even lead to increased transmission.

### **Relevant Theoretical Frameworks**

My hypothesis draws on an integrative framework that combines two models: the social construction of target populations (Schneider & Ingram, 1993) and the medical care access frameworks (Aday & Andersen, 1974; Andersen & Newman, 1973). At the macro level, the social construction of target populations framework informs the development of health policies and programs. At the mezzo and micro levels, the healthcare access model explores the structural and individual-level factors that shape the means by which PLWH are able to access care. In sum, this study's conceptual framework (see Figure 2) demonstrates the pathway leading from public policy formation to HIV clinical health. The theoretical foundation for this study's conceptual model is discussed in detail in the following subsection.

Figure 2  
**Conceptual Model for Determinants of HIV Health**



*Social construction of target populations.* The social construction of target populations theory informs the entry point for pathway of this conceptual model. Originally developed by Schneider and Ingram (1993) and applied specifically to PLWH by Donovan (1993), this theoretical framework helps explain how the social construction of a population for whom a public policy is intended—the target population—informs policy development. Social constructions, also referred to as “stereotypes,” are the characteristics that the public typically applies to a certain group of people (Schneider & Ingram, 1993, p. 335). Also key in this theoretical framework is the degree of political clout, or “power,” that populations hold (p. 335). The convergence of a target population’s social construction and power is what informs the development of policies that affect them. Schneider and Ingram depict this convergence of social construction and power on a two-by-two matrix that creates four categories of people.

At the top, left-hand side of the matrix are the *advantaged* who hold power and have a positive social construction. Advantaged populations include groups like physicians and, in our modern celebrity culture, even some celebrities. Policies directed at the advantaged are apt to be beneficial to the point that that they may provide resources that exceed the level warranted. To the right of the advantaged are the *contenders* who hold power but have a negative social construction. Policies created for contenders are generally positive, but, due to their negative construction, might not be politically emphasized. Populations in this group include wealthy individuals and corporations, as well as Congressional members. Neither of these groups would include PLWH, who generally lack political power. However, Donovan (1993) suggests that people who work in the HIV/AIDS sector, like pharmaceutical companies and research

institutions, belong on the power continuum, as the former has power if not a positive construction, and the latter holds both power and a positive construction.

The left-hand, bottom side of the matrix includes the *dependents* who lack power but who have a positive social construction. While these populations receive sympathetic coverage, Schneider and Ingram note that they are more likely to be the beneficiaries of symbolic, rather than actual, power. Women, youth, and persons with intellectual or physical disabilities are in relegated to this group, as they are more apt than other groups living with HIV to receive public compassion as being “victims” of HIV rather than “carriers” of HIV (Donovan, 1993, p. 9). This construction is expertly demonstrated, in fact, by the existence of the small and underfunded (yet aptly-titled) “Part D” of the RWHAP, which was specifically developed for women, infants, children, and youth (Human Resources and Services Administration [HRSA], 2014d).

*Deviants*, who comprise the final category, are found at the intersection of minimal power and negative social construction. Most PLWH are placed in this category as it includes groups who are most at risk for HIV: the incarcerated, men who have sex with men (MSM), sex workers, and intravenous drug users (IDUs). Not only do policymakers withhold beneficial policies from deviant populations, but, in the case of the incarcerated and IDUs, they are also apt to develop punitive policies that are disproportionately more severe than the crime. In some cases, the criminal punishment has little bearing on the actual risk to society that the punishable acts impose. For example, 33 US states penalize people living with HIV if they do not disclose their status prior to engaging in sexual activity or shared IDU (Lehman et al., 2014). In 20 of these states, the legal focus is on disclosure alone, regardless of whether condoms are used (Lehman et al., 2014). Given that public health scientists and medical providers consider

condoms an excellent form of protection against HIV, one can only assume that HIV criminalization laws punish the person rather than the crime.

Additional support for this political framework is reflected in the US' federal ban on needle exchange programs (NEP), which are programs that facilitate the disposal of used needles and the free procurement of clean needles in safe, nonjudgmental environments (Wodak & Cooney, 2004). Congress recently lifted this ban in early 2016 in response to a 2015 HIV outbreak in Indiana (Weinmeyer, 2016). After having traced the source of the outbreak to intravenous (IV) opiate drug users in Scott County, then-Governor Mike Pence declared a state of emergency that garnered substantial public attention (Briggs, 2015).

Even though the WHO has compiled extensive evidence demonstrating that NEPs significantly curb infectious diseases transmission while also being cost-effective and unassociated with any rise in drug use (Wodak & Cooney, 2004), the US has a long and complicated history with funding NEPs (Weinmeyer, 2016). The first ban, enacted in 1988, was based on reasoning that NEPs “undercut the credibility of society’s message that drug use is illegal and morally wrong” (Rick & Adashi, 2015; Weinmeyer, 2016). Twenty-two years later, the Obama Administration repealed the ban, only to have Congress reinstate it again in 2012 (Rich & Adashi, 2015). In the first year since the most recent ban was lifted, it remains to be seen how long the current climate will last, as IDUs and PLWH are still regularly cast as deviants in political discourse.

Of note is that these political categorizations for PLWH have only minimally changed since Donovan (1993) applied this framework to the early 1990’s AIDS epidemic. The US’ recent response towards NEPs is an excellent demonstration of this fact. Thus, while one virtue

of the social construction of target populations theory is that it is flexible to changes in public perceptions over time, it can also provide a stark reminder of how some perceptions remain stable in the face of social change and medical advances.

*Access to medical care.* In 1974, Aday and Andersen proposed a framework for access to medical care that has become one of the models most frequently adapted to health research. Although it has been adapted over the years to follow changes in healthcare policy and medical and technological advances, the utility of its central components endures. In this study, the medical care access model is integrated with the social construction of target populations model, described in the previous subsection, to help depict the pathway from policy development to HIV health.

Aday and Andersen view health policy as the first step in the model, as “it is the effect of health policy in altering access to medical care that health planners and policy makers are often concerned with evaluating” (p. 212). Aday and Andersen’s (1974) access model expands on Andersen and Newman’s (1973) medical care utilization model, first developed by Andersen (1968), which provides more detail on determinants of utilization of care. When appropriate, Andersen and Newman’s contribution will be cited; otherwise, the following description refers specifically to the model that Aday and Andersen introduced in 1974.

Health policy has several components, including financing, education, staffing resources, and organization (Aday & Andersen, 1974). This study will focus directly on the financing aspect of health policy as it relates to HIV healthcare financing system. Health policy directly affects the “characteristics of the health delivery system” and the “characteristics of the population at risk” (Aday & Andersen, 1974, pp. 212-213). The health delivery system includes

the institutions and programs that are involved in direct provision of medical care, such as hospitals, community health centers, and dentists' offices. The nature of the health delivery system is shaped by two main characteristics: resources and organization. Aday and Andersen (1974) define resources as "the labor and capital devoted to healthcare" (p. 213), which include both the personnel-to-patient ratio and the quality of the health care facility. Organization refers to the structural components that facilitate entry and passage through the delivery system.

The characteristics of the population at risk are grouped into three different kinds of components: predisposing, enabling, and need. Predisposing components are the factors that inherently predispose individuals to access healthcare. These include characteristics such as age, race, and gender. Enabling components are the factors that facilitate healthcare access, like transportation, health insurance, and income. Finally, need components refer to an individual's degree and type of illness, which may be either officially diagnosed or individually perceived. Aday and Andersen note that predisposing and enabling components can be either mutable or immutable to changes in the delivery system.

Utilization of healthcare services is influenced both by the delivery system itself and the users of the delivery system. Ultimately, Aday and Andersen consider utilization a kind of litmus test for the predictive validity of the medical access model, since utilization is not possible without access. They characterize utilization as the service provided and who provided it, where the service was provided, the reason for the medical visit and whether the services were preventative, curative, or palliative, and the amount of time it takes for patients to access the health delivery system on both a single and routine visit basis. Utilization affects consumer satisfaction, which is the final step in Aday and Andersen's model; however, it will not be

examined in this study. Instead, a modified version of Aday and Andersen’s medical care access model will be applied to this study’s theoretical framework. In this version, consumer satisfaction will be replaced by key indicators for HIV health, which, indirectly, are indicative of consumer satisfaction. An overview of the conceptual framework that underpins this study’s research design is described in the following section.

### **Conceptual Framework**

The first step in this study’s conceptual framework is policy development, which draws on the social construction of target populations framework (Schneider & Ingram, 1993). This framework informs the degree to which health policies confer either burdens or benefits, and the resultant healthcare policies reflect the stereotypes of the targeted population. Viewing healthcare policy development through the lens of this model, the public RWHAP and Medicaid programs are intended for *deviant* or *dependent* populations, while private group or individual health insurance plans are available to the employed and higher-income *advantaged* and *contender* populations. In fact, the extreme pushback that the federal government has faced from conservative states in the post-ACA era of US healthcare policy—and most recently, the resistance voiced by President Trump— demonstrates just how powerful social constructions are in classifying who deserves healthcare. As Watkins-Hayes and Kovalsky concisely remarked (2016), “State lawmakers’ resistance to the [Medicaid] expansion suggests that for many of these politicians, these newly eligible individuals represent the undeserving poor” (p. 208). Indeed, in a country where health insurance eligibility has traditionally been tied to wealth and employment—arguably the two most espoused American values—it is not surprising that questions surrounding who deserves healthcare coverage pervade current political dialogues.

To briefly review, certain low-income populations, such as children, parents with dependent children, pregnant women, seniors, and individuals with disabilities, have always qualified for Medicaid (Centers for Medicare & Medicaid Services, n.d.). Following the 2014 implementation of the ACA, all adults under the age of 65 who live in expansion states are eligible for Medicaid if their income level is at or below 138% of the FPL (Centers for Medicare & Medicaid Services, n.d.). As has been the case since the program's inception in 1990, all low-income PLWH who are uninsured or underinsured are eligible for services through RWHAP, even PLWH who are not legal residents of the US or who are unemployed.

While it might not be immediately apparent how the social construction of target populations framework applies to the RWHAP, especially when compared to Medicaid and its transparent stigmatization of program beneficiaries, Donovan (1993) provides elegant clarification on this point:

Fearful of the electoral consequences of conferring benefits on a negatively constructed population, yet mindful of the scope of the epidemic and the inability to rationally sustain a policy which would provide treatment for women and children but not for gays, supporters of the [Ryan White] act focused on the benefits targeted at positively constructed groups and downplayed the obvious benefits to be received by negatively constructed populations. (p. 18)

The name of the program, too, reflects the virtues lawmakers hoped to emphasize: Ryan White was a 13-year-old boy who became infected with HIV in 1984 as a result of an infected blood transfusion (HRSA, 2016). When he died in April of 1990, it created a perfect platform for crafting a palatable HIV/AIDS-specific federal program (Donovan, 1993).

Thus, while the original rhetoric surrounding the RWHAP is reminiscent of the social construction of target populations framework, it should also be emphasized here that actual resources and burdens conferred by the RWHAP aberrates somewhat from what might be

expected from a program developed for negatively-constructed populations with minimal power and deservingness. There are three primary reasons for this: (1) The RWHAP arose out of a national public health crisis, where it could be argued that it was in everyone's self-interest to curb the spread of the epidemic—at least once it became apparent that HIV was not limited to MSM and IDUs; (2) as originally conceived, the RWHAP was a palliative care model, and no one expected in 1990 that HIV would become a chronic, rather than fatal, disease; and (3) the RWHAP has historically received an uncommon level of bipartisan support that other healthcare programs have not. These unique political determinants that shaped the RWHAP model of care have resulted in program eligibility criteria and benefits for its beneficiaries that are much more generous than Medicaid's. Thus, although the RWHAP and Medicaid programs are similarly funded, their models of care are vastly different.

The next step in this study's conceptual model, "health policy," is also the starting point of Aday and Andersen's healthcare access model. As previously discussed, health policy is shaped by the interplay of target populations' social construction and political clout. The financing component of health policy influences the following step in the model, healthcare access, which is determined by a host of individual and structural factors. This study employs the Institute of Medicine (IOM)'s definition of "access," which is "a shorthand term used for a broad set of concerns that center on the degree to which individuals and groups are able to obtain needed services from the medical care system" (IOM, 1993, p. 32). In this case, the healthcare financing system for PLWH may be provided either through public sources, which chiefly include the RWHAP and Medicaid, or private insurers. These financing systems, in turn, determine access to healthcare services for PLWH.

This study's conceptual framework depends on a variety of individual-level factors, which the authors define as "characteristics of the population at risk," and systems-level factors, defined by Aday and Andersen (1974) as the "health delivery system." Andersen and Newman (1973) describe individual-level factors as "individual determinants." This definition is a more appropriate one for this study, as individual determinants may confer either risks or benefits, and will be applied hereafter. Health delivery systems-level factors may influence mutable, individual-level determinants directly, like income, healthcare payer type, housing stability, and transportation assistance, by either facilitating or hindering patients with these factors. An example of a facilitating factor would be if the health system provided transportation vouchers to low-income patients. Health service delivery systems may also hinder patients' access to services if, for example, they do not accept certain health insurance types. Immutable determinants, like age, gender, and race, affect health services utilization and subsequent HIV clinical outcomes without the health services delivery system intermediary. Whereas utilization certainly affects HIV clinical health, HIV clinical health may also affect utilization, depending on perceived (e.g., patient feels sick) or evaluated need (e.g., clinical data). Thus, service utilization and health outcome may be bidirectional.

### **Statement of the Problem**

The principal purpose of the study was to identify the relationship between healthcare payer type and two key HIV health outcomes—specifically, viral suppression (VS) and retention in care (RiC). Since PLWH who have either public or private health insurance may also receive supplementary RWHAP services to cover what their insurer does not pay, RWHAP would not be the "primary" care provider in this instance, as it is a payer of last resort, and would qualify

instead as RWHAP “supplementary” care. Some PLWH will not have any health payer at all—including RWHAP—and would qualify only as “uninsured.” This is because RWHAP-funded agencies will typically subsidize healthcare services for patients who may not have applied for RWHAP services, completed recertification, or who may be “between” healthcare insurers. In this way, the RWHAP’s care policy is akin to that of hospital emergency rooms, in that no patient may be refused services. While this policy is not codified by law as it is for hospitals, it is generally interpreted at the agency level as such (Collins, 2016).

It should also be emphasized that although patients with RWHAP primary medical care are nearly always classified as “uninsured” in HIV research literature, this study considers such characterization to be an oversimplification: It obscures the fact that not all uninsured patients automatically receive RWHAP-funded care. For example, patients may be eligible for RWHAP services but be unaware of their eligibility, or they may have lapsed in RWHAP recertification. In this study, only those patients who lack both insurance and primary RWHAP coverage will be defined as *uninsured*. This ensures that patients are not inadvertently categorized as having a health payer, when, in reality, they may actually represent a group with unique barriers to the access or receipt of care.

In order to account for RWHAP’s versatility to function as either a primary or supplementary care provider, both of RWHAP’s possible payer roles were examined separately. This differentiation, as well as the delineation between patients without any payer type versus those with a RWHAP primary payer type, is a novel addition to existing research and contributes additional granularity to the payer type variable.

This study’s research questions and hypotheses are as follows:

1) What is the relationship between supplementary RWHAP service provision and RiC?

H<sub>1</sub>: PLWH who receive RWHAP supplementary services are *more likely* to be *retained in care* than PLWH who do not receive RWHAP supplementary services.

2) Among PLWH, what is the relationship between primary health care payer type and RiC?

H<sub>2.1</sub>: PLWH who are uninsured are *less likely* to be *retained in care* than PLWH who have a public, private, or RWHAP PPT.

H<sub>2.2</sub>: PLWH with a private or public PPT are *less likely* to be *retained in care* than PLWH with a RWHAP PPT.

H<sub>2.3</sub>: PLWH with a public (non-RWHAP) PPT are *less likely* to be *retained in care* than PLWH with a private PPT.

3) What is the relationship between supplementary RWHAP service provision and VS?

H<sub>3</sub>: PLWH who receive RWHAP supplementary services are more likely to be *virally suppressed* than PLWH who do not receive RWHAP supplementary services.

4) Among PLWH, what is the relationship between primary health care payer type and VS?

H<sub>4.1</sub>: PLWH who are uninsured are *less likely* to be *virally suppressed* than PLWH who have a public, private, or RWHAP PPT.

H<sub>4.2</sub>: PLWH with a private or public PPT are *less likely* to be *virally suppressed* than patients with a RWHAP PPT.

H<sub>4.3</sub>: PLWH with a public (non-RWHAP) PPT are less likely to be *virally suppressed* than PLWH with a private PPT.

5) What is the relationship between combination payer type and RiC?

H<sub>5.1</sub>: PLWH with private insurance plus RWHAP supplementary services are more likely to be *retained in care* than patients with any other single or combination payer type.

6) What is the relationship between combination payer type and VS?

H<sub>6.1</sub>: PLWH with private insurance plus RWHAP supplementary services are more likely to be *virally suppressed* than patients with any other single or combination payer type.

Drawing from the literature previously described that illuminates the importance of healthcare programs' ability to shape quality and accessibility of care, this study applies a novel social construction of target populations and access to medical care framework to develop hypotheses about the association between healthcare payer type and HIV health outcomes. Since prior studies have shown that RWHAP supplementary care services are associated with optimal health outcomes for PLWH, it was hypothesized that patients receiving supplementary RWHAP services are more likely to be retained in care (H<sub>1</sub>) and have a suppressed VL (H<sub>3</sub>) than patients who do not receive supplementary services, regardless of primary payer type. For the purposes of this study, supplementary services were broadly defined as “non-medical wraparound, enabling and coordinative services designed to address health and human service needs that fall outside the normal purview of medical care” (Messeri et al., 2002, p. S15). Supplementary services are the key differentiating factor that set the RWHAP apart from other healthcare programs, which is its subsidization of social and mental health services in addition to medical care.

Prior studies have found that the receipt of supplementary care, including services like case management, transportation assistance, substance abuse treatment, and housing assistance, is positively associated with RiC (Ashman, Conviser, & Pounds, 2002; Sagrestano, Clay, Finerman, Gooch, & Rapino, 2014; Messeri et al., 2002; Terzian et al., 2015; Yehia et al., 2015) and VS (Sacamono & Farley, 2016; Shacham et al., 2010) among PLWH. Recently, Diepstra and colleagues (2017) found that PLWH who received ADAP services as well as RWHAP core and supplementary services (defined as “comprehensive care assistance”) were almost three times more likely to be RiC than PLWH who only received some RWHAP services. Additionally, PLWH who received comprehensive care assistance through RWHAP were over 20 times more likely to be RiC than PLWH who did not receive any RWHAP services (Diepstra et al., 2017). Moreover, Tobias and colleagues (2007) found that PLWH who were aware of their positive serostatus but were not retained in care were more likely to identify barriers to accessing case management and mental health services as primary reasons why they had fallen out of care.

Hypotheses 2.3 and 4.3 compare outcomes between publicly and privately insured PLWH (this does not include patients with a RWHAP primary payer, which is examined in Hypotheses 2.2 and 4.2). These hypotheses are supported by this study’s theoretical framework, which posits that individuals with private insurance have access to better healthcare as a result of their positive social construction (e.g., being employed, higher income) than individuals with public insurance. Similarly, research indicates that uninsured adults consistently face worse health outcomes, regardless of their health status (IOM, 2002; Nguyen & Sommers, 2016). Drawing from relevant literature as well as this study’s theoretical framework, it is, therefore, hypothesized that uninsured patients are less likely to be both retained in care (H<sub>2.1</sub>) and virally

suppressed (H<sub>4.1</sub>) than patients who have some form of primary health payer (which may include either RWHAP, private, or public).

It is also hypothesized that patients with a private or public PPT will be less likely to be retained in care (H<sub>2.2</sub>) and virally suppressed (H<sub>4.2</sub>) than patients with a RWHAP PPT. Though superficially it may seem more intuitive to reason that PLWH with private insurance would have the best HIV-related outcomes, available research indicates otherwise. For example, Colasanti and colleagues (2016) found that PLWH who had the RWHAP as their primary care provider were more likely to be retained in care and virally suppressed than PLWH who had a private or public insurance provider. These findings were echoed in a study conducted by Bradley and colleagues (2016), who found that patients with a RWHAP PPT (that is, their medical care was solely paid for by the RWHAP) were more likely to be virally suppressed than patients with a private or public insurance PPT.

Other available research on the association between payer type and RiC, though conducted over a decade ago, adds additional support to the hypothesis that PLWH with a RWHAP PPT are more likely to be retained in care (Ashman et al., 2002; Lo, MacGovern, & Bradford, 2002). In both of these studies, the authors suggested that these results might reflect the fact that the RWHAP is better positioned to provide services that address and attenuate barriers to care than insurance programs, especially since HIV is both a complex and chronic disease and one that most often affects already-marginalized populations. When this key quality of the RWHAP and the nature of HIV are kept in mind, it becomes clearer how RWHAP primary care might be associated with better health outcomes than health insurance payer types, even private insurance. That is, while private insurance may confer the most positive social

construction, the RWHAP provides the most comprehensive set of services and aids in continued access to care for PLWH who are likely to experience multiple structural barriers.

Drawing on this intersection of positive social construction and comprehensive care, it is further anticipated that patients with both private insurance and supplementary RWHAP services will have the best health outcomes of any single or combination payer type. There is also empirical support for this hypothesis, as Bradley and colleagues (2016) found that PLWH with public or private insurance plus RWHAP assistance were significantly more likely to be virally suppressed than PLWH with public or private insurance only. It is therefore hypothesized that patients with private insurance plus RWHAP supplementary services are more likely to be retained in care (H<sub>5</sub>) and virally suppressed (H<sub>6</sub>) than patients who have any of the other following payer types: (1) public insurance plus RWHAP supplementary services, (2) public insurance only, (3) private insurance only, (4) uninsured, and (5) RWHAP only.

In sum, extant literature lends support to this study's overall hypothesis that PLWH who have some form of RWHAP care, whether primary or supplementary, will have better health outcomes, as measured by VS and RiC, than PLWH who do not receive any type of RWHAP-funded care. This is because the RWHAP provides the most comprehensive set of services for HIV and aids in continued access to care for PLWH who are likely to experience multiple structural barriers.

In answering Research Questions 1-6, analyses were adjusted for individual-level determinants that have been found to be associated with access to HIV care. In choosing to control for individual-level factors, this study adheres to its central hypothesis, which is that policy shapes the very level and quality of care that PLWH are able to receive. Other

determinants may moderate the policy effect; however, without addressing the outermost level of healthcare determinism, efforts to improve levels of access underneath the policy umbrella will be limited in their ability to effect change. As a whole, this study's findings should help highlight any significant patient/payer type associations and may provide a guide for HIV providers, advocates, and policymakers in an era of uncertain healthcare policy.

## CHAPTER THREE

### METHODOLOGY

#### **Research Setting**

As discussed previously, this study assesses two principal outcomes with six central research questions. These questions are as follows:

- (1) *What is the relationship between supplementary RWHAP service provision and RiC?*
- (2) *What is the relationship between primary healthcare payer type and RiC?*
- (3) *What is the relationship between supplementary RWHAP service provision and VS?*
- (4) *What is the relationship between primary healthcare payer type and VS?*
- (5) *What is the relationship between combination payer type and RiC?*
- (6) *What is the relationship between combination payer type and VS?*

In order to answer these questions, patient-level clinical records data from the University of Alabama at Birmingham (UAB's) 1917 Clinic were obtained. First established 27 years ago, the 1917 Clinic receives RWHAP Part B and C funding and provides a variety of medical and supplementary services onsite, including dental, endocrine, neurological, dermatological,

hepatology, palliative, and psychiatric services (1917 Clinic, n.d.). In fact, the Clinic identifies with the goal of becoming “a one-stop shop for HIV care” (1917 Clinic, n.d.) in order to facilitate patients’ use of the full range of services required for optimal health. The clinic treats all patients, regardless of ability to pay: “Patients are not denied service based on inability to pay copays, sliding scale fees or other payments” (1917 Clinic, n.d., para. 10).

The 1917 Clinic maintains an extensive, continuously-updated electronic medical record (EMR) system for its patients that includes demographic, administrative, and clinical data (UAB 1917 Clinic Cohort, n.d.). All 1917 Clinic patients who belong to the prospective Cohort have previously provided consent for use of their protected health information (PHI) for the purposes of current and future research (see Appendix A for a copy of the PHI form). Participation in the Cohort is voluntary and, since the 1917 Clinic collects Cohort data via standard medical visits, additional informed consent is not needed.

For patients at the 1917 Clinic, RWHAP eligibility is categorized as being in one or more of three different tiers: primary, specialty, and dental. Only uninsured patients are eligible for primary tier services through RWHAP, since this tier pays subsidizes primary medical care services via RWHAP’s payer-of-last-resort mechanism. However, insured patients may be still eligible for the specialty and dental tiers. In 2016, 1917 patients with incomes up to 300% FPL were eligible for one or more RWHAP services.

The specialty tier includes all of the social services that are provided at the Clinic, such as nutritional consultation, home health services, and support/counseling. Patients eligible for the dental tier are able to receive services onsite from dental students attending the UAB School of Dentistry. For the purpose of this study, the dental tier will not be included under the umbrella

term of “RWHAP supplementary services,” as it is unlikely to be meaningfully associated with the HIV health outcomes examined in the current research. Rather, this study’s RWHAP supplementary services will include only those services received through the Clinic’s specialty tier.

### **Sampling Methodology and Sample**

This study utilized purposive sampling, which is a non-probability sampling method that selects units with “purpose” rather than at random. First, de-identified, patient-level medical records data were obtained for PLWH who attended at least one scheduled HIV primary care appointment at the 1917 Clinic within the 2015 calendar year. A “primary care” visit is defined as one that relates to routine medical care and is scheduled in advance; this does not include emergency visits or appointments for specialty care. All scheduled primary care visits, including those attended, cancelled or rescheduled in advance, and missed (“no shows”), are recorded in patients’ electronic medical record (EMR) along with the appointment date. Thus, from medical records, it is possible to identify patients’ frequency and interval of attended primary care visits during a particular observation window. In the current study, the 2016 calendar year served as the observation window.

Clinical records data from 2015 were used to establish which patients were active in care prior to the 2016 observation window. Including previous clinic attendance as an inclusion criterion helped facilitate analyses that examine VS and RiC outcomes among patients who are established at the clinic, rather than those who are new-to-care. This sampling methodology also helps minimize any preexisting differences among patients that are unrelated to the primary independent variables of interest. A final inclusion criterion for the study sample was that

patients did not die during the study period. The reason for excluding patients who died during the study period is that (a) they may have missing data and (b) their cause of death will not be listed in their medical records (that is, they may have died from non-AIDS related causes).

Since the 1917 Clinic does not treat minors, all participants were at least 18 years old. It was anticipated that the sample would include approximately 3,200 participants, based on prior published research that has been conducted with 1917 Cohort data. In all, 3,146 patients were included in the final sample.

### **Procedures for Data Collection**

Procedures for data collection followed established protocols. To meet UAB's requirements for research involving human subjects, a human subjects protocol (HSP) was submitted via intra-campus mail to UAB's Office of Research Compliance. Simultaneously, a 1917 Clinic Data Request form was submitted to the 1917 Clinic Cohort Informatics Team at the HIV Research and Informatics Services Center (RISC) to obtain approval for accessing Clinic data. Procedures for accessing 1917 Clinic data are as follows: After patient-level variables are formally requested, a member of the 1917 Clinic Cohort Informatics Team will retrieve the data from the EMR database system. This individual will assign each patient a random identifier created solely for analysis purposes so that data cannot be linked to any individual or records system. This secure file can be retrieved by entering in a unique claim ID and passcode.

### **Research Design**

This study examined patient-level medical records data from the 2016 calendar year to assess outcomes of interest. Since it examined historical data from participants, this research design is called "retrospective" (Shadish et al., 2002). More specifically, this study used a

retrospective chart review, which is a secondary data research methodology that uses historical clinical data to answer person-level questions (Matt & Matthew, 2013). With the advent of EMR systems, retrospective chart reviews have become increasingly popular among health researchers as they allow for rich data analysis without requiring direct participant involvement or risking loss of confidentiality (Matt & Matthew, 2013).

## **Measures**

***Dependent variables.*** The first outcome variable is RiC, which is the primary indicator of continuous HIV care and provides a proxy for treatment adherence. Since retention is typically characterized as a dichotomous variable (i.e., retained=yes or retained=no), this variable will be dichotomized as either *retained* or *not retained* at the patient level during the observation window. Since extensive analyses have shown that different aspects of retention are differentially associated with key health outcomes, including viral suppression (Mugavero et al., 2012) and even mortality (Mugavero et al., 2014), two different retention components will be used: *missed visits* and *kept visits*. For RiC, two different binary measures were used in order to capture both scheduled visits that were *kept* and scheduled visits that were *missed*. For the *kept visits* measure, patients who are considered *retained* must have at least *two (2) primary care visits*, at least *90 days apart*, during a *12-month observation window*. For the *missed visits* measure, patients who are considered retained must have attended all scheduled primary care visits (this includes any visits that were rescheduled in advance by patient or provider) within the *12-month observation window*.

For example, a patient who attended at least two scheduled visits that were conducted 120 days apart would be considered retained under both RiC measures. If this patient instead

attended two visits within a single 90-day period and did not attend any more visits during the 12-month observation window, he would not be considered retained under the *kept visits* measure. However, if he attended both scheduled visits, he would be considered retained under the *missed visits* measure.

For both retention measures, a retained outcome was coded as *1*, while a *not retained* outcome was coded as *0*. In the Results section of this dissertation, the kept visits measure will be referred to as “HRSA HAB” and the missed visits measure will be referred to as “missed visits dichotomous,” in keeping with the terminology used in Mugavero and colleagues’ (2012) “Gold Standard” paper.

The study’s other dependent variable is VS, which is the ultimate goal of HIV treatment and the fundamental indicator of HIV health. Patients’ viral load (VL) measurement at the end of the 12-month observation window (i.e., the patients’ last recorded VL measurement of 2016) was assessed. Since VL can range from being undetectable (i.e., less than 20 copies per mL) to thousands of copies per mL, VL was natural log-transformed to account for an intrinsically skewed distribution, as is common practice in published clinical HIV research for this variable. The measure was dichotomized into *suppressed* (<200 copies/mL) and *unsuppressed* ( $\geq 200$  copies/mL). A *suppressed* VL indicates better health, as it means the patient has low or even undetectable levels of the virus, while an *unsuppressed* VL shows that the patient’s HIV infection is not well-controlled and, typically, indicates that the patient has not adhered to a prescribed ART treatment regimen. Since VS was dichotomized, outcomes were coded as *1* for *suppressed* or *0* for *unsuppressed*.

***Independent variables.***

***Variables of interest.*** Health payer type is the independent variable of interest. Since RWHAP can function as either a primary or supplementary provider, patients at the 1917 Clinic can receive one of three different “tiers” of service. For patients without health insurance, RWHAP is the only primary healthcare payer type for which they are eligible. These patients may receive what are referred to as “primary tier” RWHAP services at the 1917 Clinic, which includes all clinical care related to HIV as well as comorbid medical conditions, as well as the “dental” and “specialty” tiers, the latter of which include services like nutritional consultation, home health services, and counseling. Although patients with health insurance would not be eligible to receive primary care through RWHAP, they may still qualify for supplementary RWHAP services.

Again, it is worth clarifying that patients with either public or private insurance cannot, by definition, receive primary RWHAP. This is because RWHAP only functions as a primary service provider only if another payer source is unable to cover primary care; otherwise, RWHAP functions as the supplementary payer type. Further, though patients with a non-RWHAP primary payer type will *not necessarily* have RWHAP supplementary services, all patients with primary RWHAP are also eligible for RWHAP supplementary services. Since the 1917 Clinic is RWHAP-funded, it is expected that most patients will be eligible for either primary or supplemental RWHAP care; however, this does not mean that all patients will access the services for which they are eligible.

*Primary PT* has one of four possible categories, including *uninsured*, *primary RWHAP*, *public insurance*, and *private insurance*. The variable for *RWHAP supplementary services* refers

to whether or not patients receive services through the specialty or dental tiers. An additional variable, which will be referred to as *combination payer type*, combines the primary PPT and RWHAP supplementary services variable to capture the various payer combinations possible. The six, mutually exclusive categories of the combination payer type variable are as follows (and are coded sequentially from 1 to 6): (1) public (non-RWHAP) insurance and supplementary RWHAP, (2) private health insurance and supplementary RWHAP, (3) public insurance only, (4) private insurance only, (5) uninsured plus supplementary RWHAP, and (6) uninsured only (no PPT or supplementary RWHAP).

**Control variables.** Several demographic and socioeconomic measures included in patients' medical records served as the control variables, including *age, gender, race, housing status, monthly income, and education level*. These variables were provided by patients through self-report.

The demographic and socioeconomic factors included as control variables were chosen based on existing literature, which has indicated that younger age (Chakraborty et al., 2015; Doshi et al., 2015), female gender (Meditz et al., 2011; Meyer et al., 2014; Weiser et al., 2015), African American race (Ribaud et al., 2013; Zinski et al., 2015), unstable housing (Aidala et al., 2016; Fryling, Mazanec, & Rodriguez, 2015), lower income (Muthulingam, Chin, Hsu, Scheer, & Schwarcz, 2013), and having less than a high school education (Kahana et al., 2016; Kalichman et al., 2010; Katz et al., 2015) are all associated with poorer HIV-related health outcomes. Each of these variables also reflect either individual- or social-level determinants of access to care and are, therefore, expected to moderate the pathway from policy to outcome in this study's theoretical framework.

Patients' most recently-recorded age (in years) and monthly income (in US dollars) were continuous independent variables. Gender, race, housing status, and education level are all categorical. Although gender may be conceptualized outside of the traditional male/female dichotomy, it is coded as either *male* or *female* in Clinic records and was categorized thusly in this study. *Race* was categorized as *white*, *black/African American*, or *other* (the *other* category may include individuals who identify as biracial, in addition to patients who identify as Asian, Hispanic/Latino, "other," or "unknown").

Housing status was recorded as either *permanent* or *non-permanent* in Clinic records. *Permanent* housing was operationalized as having a "usual" place to live, while someone with a *non-permanent* housing status was considered "homeless" or "transient." The education level variable included the following categories: *less than high school*, *high school or GED*, *some college*, and *college and higher*.

With the exception of housing status (in which the much larger *permanent* group was chosen as the reference category), control variables were coded such that the reference category was the group expected to have the lower or lowest odds of attaining the outcome. For gender, the reference category was *female*; for race, the reference category was *black/African American*; and for education level, the reference category was *less than high school*.

All time-varying independent variable measures used in analyses (i.e., all variables except for gender and race) reflected the most recently-recorded value during the study's observation window. This is because, except for education level, these measures are updated approximately every six months and are updated accordingly in patients' charts. It should be noted, however, that none of the variables analyzed in this study were expected to fluctuate much

throughout the observation window. Most importantly, health payer source was unlikely to change within the space of the 12-month period unless a patient lost a job or failed to recertify for RWHAP. However, this assumption was tested in analyses to see if any patients changed primary payer type within the 2016 calendar year.

### **Data Analysis**

First, appropriate descriptive statistics (including frequencies, percentages, means/standard deviations, and minimum/maximum values) were calculated for all independent and dependent variables. After conducting descriptive analyses, bivariate analyses were conducted to examine associations between control variables and independent variables of interest and between control variables and dependent variables. Specifically, Pearson's chi-square tests were used to identify associations between categorical control variables and dependent variables. As for associations between categorical and continuous variables, normality tests were first conducted to determine whether the distributions are normal or non-normal. For non-normal data, a Mann-Whitney U test or Kruskal-Wallis test was used, and for normal data, independent samples t-tests or one-way ANOVAs were used.

Bivariate relationships between the independent variables of interest and dependent variables were also assessed using binary logistic regression models. After running these unadjusted analyses, a separate set of binary logistic regression models were conducted to adjust for all control variables. As *RWHAP supplementary services* is a dichotomous variable, it was coded as either 0 (RWHAP supplementary services=no) or 1 (RWHAP supplementary services=yes).

Since the PPT independent variable examined in Research Questions 2 and 4 has four categories and three contrasts are of theoretical importance to the study, the models including PPT were run three separate times with a different reference category each time. The *uninsured* category was used as the reference category first, followed by the *primary RWHAP* category and then the *private insurance* category. This sequence matches the order of the hypotheses in Research Questions 2 and 4. For Research Questions 5 and 6, the model was run just once with *private insurance plus RWHAP supplementary services* as the referent.

In Research Questions 1, 2, and 5, both measures of RiC were used as the dichotomous outcome. In Research Questions 3, 4, and 6, patients' most last-recorded VL measurement during the observation window (i.e., the 2016 calendar year) served as the outcome for VS.

Preliminary coding and data cleaning was conducted in IBM SPSS Statistics 24, and all descriptive, bivariate, and multivariable analyses were conducted in Stata 14.0 (StataCorp. 2015. *Stata Statistical Software: Release 14*. College Station, TX: StataCorp LP). A significance level ( $\alpha$ ) of  $p < .05$  was used.

### **Protection of Human Subjects**

As previously mentioned, there are several procedures in place at UAB to ensure that participant identity is protected to the greatest extent possible, all of which were followed in this study. After receipt of IRB approval from the UAB Office of Research Compliance, the 1917 Clinic Cohort Informatics Team processed the 1917 Clinic Data Request form. Following established procedures, Informatics team members created unique participant identifiers for the sole purpose of research; these identifiers are used only once per data request. This file was opened by entering in a unique claim ID and passcode. The file itself was stored in a password-

protected Excel spreadsheet format, which requires passcode entry each time it is opened. No patient identifiers were linked to the data.

Formal permission was also needed in order to access Clinic data. As Co-Director of the UAB Center for AIDS Research, Dr. Mugavero provided written permission to access 1917 Clinic data on May 2, 2017. A copy of this signed permission letter was included in the UAB IRB submission package and is also provided in Appendix B. After approval for the conduct of research was granted from UAB on May 31, 2017 (see Appendix C), an HSP was submitted to The University of Alabama (UA) Institutional Review Board (IRB) through UA's electronic online protocol submission and review system. Approval from UA's Office of Research Compliance was needed because the research is being conducted for the purposes of completing a dissertation study at the UA's School of Social Work. Approval from UA's Office of Research Compliance was granted on July 21, 2017 (copy provided in Appendix D).

## CHAPTER FOUR

### RESULTS

#### **Missing Data and Data Cleaning**

De-identified medical records data for 3,181 nonduplicated patients was obtained. First, all patients who died during 2016 were deleted from the sample (n=35), which resulted in 3,146 patients who met all stated inclusion criteria. Since this study utilizes clinical records data, it was expected that there would be missing data and that the missing data mechanism would be either missing at random (MAR) or missing completely at random (MCAR), rather than systematically (i.e., missing not at random [MNAR]) (Rubin, 1976). When a variable is MAR, it can be said that its “missingness” may predict the value of another variable, but its missingness is not determined by the nature of the missing variable itself.

To illustrate this point with a hypothetical example, if education level is found to be MAR, then bivariate analysis could show that patients who are uninsured are more likely to be missing information about their education level than patients with private or public insurance. However, the fact that a patient has missing information about their education level in this example is not contingent on the actual value of that variable (e.g., patients with lower education levels are not less likely to report this information than patients with higher education levels). If it did occur that patients with lower education levels are less likely to report on their education level, then this variable would be MNAR. Missing data can be said to be “ignorable” if it is

either MCAR or MAR, but not MNAR (Allison, 2003). This ignorability means that the missing data mechanism may be disregarded, or “ignored,” when the researcher is conducting analyses (Allison, 2003). For data that is MCAR, the researcher can confidently assume that deleting any cases with missing data from the analytic sample (“listwise” deletion) will not introduce bias into analyses (Allison, 2002). However, in his *Statistical Horizons* blog, Allison (2014) cautions researchers that the MAR mechanism is not actually a “testable assumption,” since “the MAR assumption does allow missingness to depend on anything that you observe, it just can’t depend on things that you don’t observe.” In other words, the mechanism behind missing data cannot ever be definitively assessed in lieu of identifying those missing values. For this reason, Pigott (2001) notes that the best strategy for handling missing data is to compare the results of complete case analysis with the results from another method see whether results differ based on the modeling approach employed. Called a “sensitivity analysis,” this may help assess the impact of unmeasured variables on the association(s) hypothesized in one’s research (Groenwold, Nelson, Nichol, Hoes, & Hak, 2010).

With this background information in mind, all independent and dependent variables were assessed for missing data. The frequency of missing data for each variable is included in Table 1.

***Outcome measures.*** First, missing data for VS was assessed. This was not done for either RiC measure, as retention is, by design, intended to capture missed and/or kept visits as differential aspects of participation in HIV care (Mugavero et al., 2012). Thus, any patient with “missing” visits are considered not retained in care.

As for VS, preliminary analyses found that 280 (8.9%) of the patients in the total sample who met sample inclusion criteria did not have recorded VL values for 2016. Since there is no

way to definitively determine whether the 280 patients in the total sample dropped out of care in 2016 or merely transferred to another clinic (and became lost-to-follow-up), assumptions should not be made about their VL measures for the calendar year. Instead, two different approaches to missing data were used in multivariable analyses in which viral suppression was the outcome. In Method 1, patients with missing VL data were dropped from analysis and, in Method 2, multiple imputation was used.

The first approach is a “complete-case analysis,” which restricts analysis to patients with complete outcome data (Liao & Stack, 2017; Little et al., 2012). Patients with missing values on one or more variables are dropped from the analytic sample in what is called “listwise deletion” (IBM, 2016). Most software packages, including SPSS and Stata, utilize listwise deletion in multivariable models unless the researcher specifies otherwise.

The second approach, which may be handled by statistical software packages such as Stata, assumes that the data is either MAR or MCAR (UCLA, 2017). While single imputation methods generate just one estimate per missing value, multiple imputation provides multiple estimates for each missing value based on existing values; then, these values are pooled into one dataset for the analysis stage (Sterne et al., 2009). Subsequent analysis produces an average of the results, rather than the average of the imputed values (van Ginkel & Kroonenberg, 2014). As an example, if a researcher created a pooled dataset with 10 imputations, a series of 10 regression analyses (or whatever analysis is specified) would then be run for each imputed dataset. Then, the mean of these regression coefficients and corresponding standard errors is used to produce just one set of results (van Ginkel & Kroonenberg, 2014). As a result of this pooling, multiple imputation produces bias estimates that are more reliable than they would be if cases with

missing data were deleted (UCLA, 2017). It is also generally considered to produce more reliable results than single imputation methods (Sterne et al., 2009).

*Independent variables.* Demographic information related to age, gender, and payer type was available for each patient. Though not all patients had RWHAP supplementary services, this variable was not considered to have missing data since not every patient was eligible.

Information on patient race/ethnicity was available for most, but not all, of the patients. Out of the 3,146 patients in the total sample, one patient “refused” to provide this information, and for 18 patients this information was “unknown.”

For the education, housing, and income variables, the magnitude of missing data was much greater and warranted further examination. First, patients were divided into two groups using dummy coding: patients with recorded information on the independent variable of interest were coded as “1”, and patients with missing information for that variable were coded as “0.” Then, these two groups were compared to see whether missingness was differentially associated with any of the independent or dependent variables.

*Education variable.* Among the total analytic sample (n=3,146), more than half (52.5%) of the patients were missing education data. This was not surprising because education level is a variable that is not consistently measured. In fact, it is only assessed for patients who are new-to-care at Clinic orientation or who have been out of care for more than 12 months at Clinic re-linkage. This assessment is part of the “Client-Oriented New Patient Navigation to Encourage Connection to Treatment,” or Project CONNECT, which was established at the Clinic on January 1, 2007. Thus, patients who initiated services prior to 2007 do not have information on education level available in their records.

Pearson's chi-square tests using the dummy-coded variables were then conducted. Patients who were missing education data were more likely to be black/African American ( $p < .001$ ), to have a private PPT rather than a public, RWHAP, or no PPT [ $\chi^2 (3, n=3,146) = 29.61, p < .001$ ], and to be virally suppressed [ $\chi^2 (1, n=2,886) = 9.24, p = .002$ ]. Since the distribution was found to be normal, an independent sample t-test was used to assess whether patients with missing education data were more likely to be older or younger than patients without missing education data. The results of the independent sample t-test showed older patients ( $M=48.8, SD=10.84$ ) were more likely to have missing education data than younger patients ( $M=43.7, SD=12.46$ ) [ $t (2,977.71) = -12.34, p < .001$ ]. Gender was not found to be significantly associated with missing education data [ $\chi^2 (1, n=3,146) = 2.75, p = .10$ ]. Based on these findings, it appeared that education was MAR rather than MCAR. Therefore, missing values were imputed for education level in multiple imputation analyses (described in a later section).

*Housing variable.* Two-thirds of all patients had missing housing data (69%), so information about housing was available for just 985 patients. Given the amount of missing data for the housing variable (as well as for the education variable), preliminary multivariable logistic regression analyses were conducted to estimate total analytic sample size when all independent variables were included. These preliminary analyses showed that the inclusion of all variables would result in a drastic reduction of total sample size ( $n=369$ ). When all variables except education were included in preliminary models, the analytic sample size was slightly larger ( $n=803$ ). Yet, when all variables except housing were included, the final analytic sample was larger ( $n=1159$ ). Therefore, it was determined that the housing variable would not serve as a

control variable in multivariable analyses as was previously planned, as its inclusion would have dramatically decreased power in multivariable analyses. This was not expected to have much of an impact on overall findings for two main reasons. One, 94.4% of patients with available housing data were listed as having permanent housing, indicating little variability. Two, data was available for patients' monthly income and education level, which provided good proxies for socioeconomic level.

Pearson's chi-square test results showed that gender [ $\chi^2 (1, n=3,146) = 0.10, p=0.75$ ], race [ $\chi^2 (2, n=3,146) = 1.56, p=.46$ ], and VS [ $\chi^2 (1, n=2,866) = 1.41, p=.24$ ] were not significantly associated with missing housing data in chi-square tests. However, after confirming normality for the distribution, results of an independent samples t-test showed that older patients were more likely to be missing housing data [ $t (3,144) = -2.64, p=.008$ ]. Primary payer type also had a significant association, as results of chi-square tests suggested. Patients with a private PPT were significantly more likely to be missing housing data than patients with a public PPT, no PPT, or RWHAP PPT [ $\chi^2 (3, n=3,146) = 21.64, p<.001$ ].

*Income variable.* Approximately one-fourth of patients ( $n=858; 27.3\%$ ) were missing information related to monthly income. After confirming that the dummy-coded income variable was normally distributed with age, an independent samples t-test was conducted to compare the association between the two variables, and results showed that it was not significant [ $t (3144) = -1.04, p=.30$ ]. Chi-square test results indicated that there was not a statistically significant difference in VS between patients who were and were not missing data for monthly income [ $\chi^2 (2, N=2,886) = 31.67, p=.12$ ]. However, patients with a private PPT [ $\chi^2 (3, n=3,146) = 128.82, p<.001$ ], who were male, [ $\chi^2 (1, n=3,146) = 33.37, p<.001$ ] and who were black/African

American [ $\chi^2$  (2, n=3,146) =103.58, p<.001] were also more likely to be missing income data. Therefore, income data appeared to be MAR. As with the education variable, missing values for income were imputed in multiple imputation analyses.

### **Descriptive Statistics**

First, all independent variables were assessed for multicollinearity, or correlation among independent variables. Since models with multicollinearity can produce biased standard errors for the coefficients, it is an important diagnostic test for linear or logistic regression analyses (Menard, 2002).

Two different diagnostic approaches to assess multicollinearity were used. First, pairwise correlations were obtained to identify the strength of association between each independent variable of interest and the control variables. The pairwise correlation coefficients, which ranged from -0.22 to 0.19, indicated that associations were weak and did not indicate multicollinearity. Then, Stata's postestimation *vif* command was used to detect the variance inflation factor, or VIF. The VIF is equal to  $(1/1-R_x^2)$ , and it provides an estimate of the variance in each independent variable that is explained by the other independent variables (Menard, 2002). While Stata does not recognize the *vif* command after running a logistic regression analysis, it can be used after linear regression in order to detect potential multicollinearity issues among the independent variables. Therefore, to obtain the VIFs in this study, each multivariable model for was run as a linear instead of logistic regression using VS as the outcome. In all models, VIF values ranged from 1.01 to 1.10. Since VIF values above 10 are generally considered indicative of multicollinearity (Midi, Sarkar, & Rana, 2010), it was determined that multicollinearity among the independent variables in this study would not be a problem.

Table 1. Characteristics for Patients Receiving HIV Primary Care Services in 2016

Characteristic	n (Total)	n (Complete Cases)	Total %	Complete Cases %	Mean (SD) Min.- Max.
<b>Healthcare Payer Type</b>	3,146	3,146	100		
PPT	3,146	3,146	100		
Public Insurance	960		30.5		
Private Insurance	1,890		60.1		
RWHAP Primary	78		2.5		
Uninsured (No PPT)	218		6.9		
RWHAP Supp.	3,146		100		
Yes	995		31.6		
No	2,151		68.4		
Combination PT	3,146	3,146	100		
Public Insur + RWHAP Supp	341		10.8		
Private Insur +RWHAP Supp	484		15.4		
Public Insur Only	619		19.7		
Private Insur Only	1,406		44.7		
RWHAP Only	170		5.4		
No PPT (Uninsured)	126		4.0		
<b>Gender</b>	3,146	3,146	100		
Male	2,384		75.8		
Female	762		24.2		
<b>Race/Eth.</b>	3,146	3,146	100		
Black/AA	2,002		63.8		
White	1,063		33.8		
Other	81		2.6		
<b>Monthly Income</b>	3,146	2,288	100		1,025.36 (843.50) 0-8,000
<b>Age (in years)</b>	3,146	3,146	100		46.4 (11.9) 20-83
<b>Highest Ed. Level</b>	3,146	1,495	100		
Less than HS	317		10.1	21.2	
HS or GED	761		24.2	50.9	
Some College	246		7.8	16.5	
College or Higher	171		5.4	11.4	
Missing	1,651		52.5		
<b>Viral Suppression</b>	3,146	2,866	100		
Yes	2,660		84.6	92.8	
No	206		6.5	7.2	
Missing	280		8.9		
<b>RiC-HRSA HAB</b>	3,146	3,146	100		
Yes	2,429		77.2		
No	717		22.8		
<b>RiC-Missed Vis. Dich.</b>	3,146	3,146	100		
Yes	2,067		65.7		
No	1,079		34.3		

Descriptive statistics for all independent and dependent variables were conducted for all patients (Table 1). First, descriptive statistics for the outcome variables were conducted. Most patients were virally suppressed (n=2,660; 92.8%). Also, while over three-fourths of patients (n=2,429; 77.2%) were considered RiC using the HRSA HAB measure, just 65.7% (n=2,067) were considered RiC using the missed visits dichotomous measure.

Patients ranged in age from 20 years old to 83 years old. The median age was 47.5 and the mean age was 46.38 (*SD*=11.9). Among patients with available data on housing, 910 (94.4%) had permanent housing, and 54 (5.6%) had non-permanent housing. Approximately three-quarters (75.8% were male). More than half (63.6%) identified as black or African American and 33.8% identified as white. The remaining 7.6% identified as either American Indian or Alaska Native (n=2), Asian (n=6), Hispanic/Latino (n=46), multiracial (n=4), other (n=4), “refused” (n=1), or “unknown” (n=18).

For the highest education level obtained, half (n=761; 50.9%) had a high school diploma or GED and 21.2% (n=317) had less than a high school education. 16.5% (n=246) had completed less than four years of college, and 11.4% had an undergraduate degree or higher (n=171). Monthly income (based on a self-report) ranged from 0 to 8,000 US dollars. The median income was \$843.50 per month, and the mean income was \$1,025.36 per month (*SD*=\$834.74).

The payer type variable was assessed using the last-recorded payer type of 2016. More than half (n=1,890; 60.1%) had a private health insurance PPT. Slightly over one-quarter of patients (n=960; 30.5%) had a public PPT, and the remaining patients were uninsured (n=296; 9.4%). About a third of patients (n=995; 31.6%) had either primary RWHAP, supplementary

RWHAP, or both. Although dental tier services do not relate to this study's research questions, it may be noted that 819 of the 3,146 patients (26%) received dental services through RWHAP.

Since all attended primary care visits have a corresponding record of the primary payer type that was used to reimburse that visit, it was possible to determine whether any patients changed primary payer type during the year. The exception to this was the RWHAP PPT, as visit-level data did not show whether patients who were listed as uninsured also received RWHAP coverage. Rather, RWHAP-specific information was recorded every six months at assessment for RWHAP eligibility. Thus, the three PPT categories that were listed for each patient's record of an attended visit included the categories of uninsured, private insurance, or public insurance.

Using SPSS's *aggregate* command, two datasets were created using patient's "minimum" and "maximum" recorded payer type value for 2016 ("1" =uninsured, "2" =public insurance, "3" =private insurance"). These datasets were merged into a new dataset so that a new variable could be computed by comparing these two values. If the minimum and maximum values for patients' PPT did not match (i.e., the patient changed primary payer type during 2016), the new variable was coded "1," and if the two values did match (i.e., the patient kept the same primary payer type during 2016), the new value was coded "0." From this, it was determined that 287 patients changed primary insurance type during the 2016 calendar year. Specifically, 158 patients went from being uninsured (no RWHAP) to having private insurance, 40 patients went from having primary RWHAP to having private insurance, 55 patients changed from public to private insurance, 29 patients went from being uninsured to having public insurance (9 of these previously had primary RWHAP), and 5 patients went from having public

insurance to being uninsured. In sum, a total of 287 (9.1%) patients changed PPT during the observation window.

Frequencies were then obtained for the combination payer type variable. Slightly under half (n=1406; 44.7%) had private insurance only, 19.7% (n=619) had public insurance only, 15.4% (n=484) had both private insurance and supplementary RWHAP services, 10.8% (n=341) had public insurance and supplementary RWHAP services, 4.0% (n=126) had neither a PPT nor supplementary RWHAP services, 2.9% (n=92) had supplementary RWHAP services but no PPT listed, and 2.5% (n=78) had both a RWHAP PPT and supplementary RWHAP services. Given that the percentages of the latter two categories were so small and all patients with primary RWHAP also had supplementary RWHAP, these were collapsed into a category called “RWHAP only.” These included patients who either had supplementary RWHAP services but no PPT listed and patients who had both a RWHAP PPT and supplementary RWHAP services. (As a reminder, all patients with primary RWHAP also had supplementary RWHAP; thus, a category for primary RWHAP only did not exist.) The fact that 92 patients received supplementary RWHAP but did not have a primary PPT listed (RWHAP or otherwise) seems to either indicate administrative error, or that some patients who are eligible for primary RWHAP or another PPT are not accessing it. In any case, these descriptive statistics provide just a cursory glance into the reasons why granularity is warranted when describing patients who are uninsured.

The frequencies for the primary payer type and combination payer type variables do not align perfectly. This is a result of coding decisions that were made for the 92 patients were recorded as having supplementary RWHAP services but no primary payer type. For the PPT variable, these 92 patients were included along with the 126 patients that were consistently coded

as “uninsured” (n=219). However, in creating the combination payer type variable, these 92 patients were combined with the 78 patients who were listed as having primary RWHAP to create a category for “RWHAP only” (n=170). This decision was made to differentiate patients who truly had no payer type listed from those who had at least supplementary RWHAP listed. Though there is no way to definitively confirm whether these 92 patients were uninsured or had primary RWHAP, after meeting the Coordinator of Social Services at the Clinic, it seems most likely that these patients received primary RWHAP services and that this information was not updated in their records. Since RWHAP information is recorded separately from the visit-level data, which only lists RWHAP patients as “uninsured,” visit-level records had to be cross-referenced with the social work notes. The social work notes provide record of RWHAP eligibility and RWHAP services received. The separate recording systems for RWHAP and insurance payer types at the Clinic may have led to the slight discrepancy in records.

After the ACA was implemented, some RWHAP patients at the Clinic were able to enroll in a private insurance plan on the Marketplace Exchange using funds provided by the Alabama AIDS Drug Assistance Program (ADAP), which is administered by the Alabama Department of Public Health. This is because it is less expensive for ADAP to purchase individual insurance plans than it is to pay direct drug costs for ART (NASTAD, 2016). Some 1917 Clinic patients with primary RWHAP care were able to purchase private insurance plans after the ACA was implemented. In the current analysis, these included the 198 patients who went from being uninsured to having private insurance. [These patients are differentially examined in supplementary analyses (see Supplement 1 in Appendix E) as distinct primary payer type category called “ADAP private insurance”]. Since these supplementary analyses differ from the

primary analyses only through the addition of one primary payer type category, they are not discussed in the Results section. However, they are compared with and interpreted alongside primary results in the Discussion section.

Since about half (n=1,651; 52.5%) of all patients in the current sample did not have a record of their education level, a separate set of analyses were conducted without controlling for education level (refer to Appendix F, Supplement 2). These analyses are included as supplements to show results with the full sample. However, since education level is an important control variable and may be a proxy for socioeconomic status, analyses that do not control for education level are not as rigorous as the primary analyses examined in subsequent sections of this dissertation.

### **Bivariate Analyses**

Bivariate relationships between control variables and independent variables of interest and between control variables and dependent variables were assessed prior to conducting multivariable analyses. Pearson's chi-square tests were conducted to determine relationships between categorical variables, and independent samples t-tests, one-way ANOVAs, Kruskal-Wallis, or Mann-Whitney U tests were used to assess relationships between categorical and continuous variables. Bivariate relationships between independent variables of interest and dependent variables were also assessed, but these are discussed separately in the subsequent section on *unadjusted and adjusted binary logistic regression analyses*.

#### **Associations between categorical control variables/ independent variables of interest and dependent variables.**

***Race.*** Race was found to be significantly associated with primary payer type (Table 2).

Table 2. Bivariate Associations between Categorical Independent Variables

Characteristic <sup>†</sup>	PPT				RW Supp.					
	Pub	Pri	RW	None	$\chi^2$	<i>p</i>	Yes	No	$\chi^2$	<i>p</i>
<b>Gender</b>					45.34	<.001			3.39	.07
Male										
n	656	1,481	65	182			759	1,625		
%	27.5	62.1	2.7	7.6			31.8	68.2		
Female										
n	304	409	13	36			270	492		
%	39.9	53.7	1.7	4.7			35.4	64.6		
<b>Race/Eth.</b>					258.98	<.001			31.75	<.001
Black/AA										
n	671	1,135	47	149			697	1,305		
%	33.5	56.7	2.3	7.4			34.8	65.2		
White										
n	278	725	11	49			290	773		
%	26.2	68.2	1.0	4.6			27.3	72.7		
Other										
n	11	30	20	20			42	39		
%	13.6	37.0	24.7	24.7			51.9	48.1		
<b>Highest Ed.</b>					35.70	<.001			11.91	.01
Less than HS										
n	153	120	10	34			132	185		
%	48.3	37.9	3.2	10.7			41.6	58.4		
HS or GED										
n	213	447	25	76			293	468		
%	28.0	58.7	3.3	10.0			38.5	61.5		
Some College										
n	54	169	6	17			74	172		
%	22.0	68.7	2.4	6.9			30.1	69.9		
College or Higher										
n	26	129	3	13			52	119		
%	15.2	75.4	1.8	7.6			30.4	69.6		

Note. Percentages may exceed 100 due to rounding.

<sup>†</sup> Complete cases only

Over half of white patients (68.2) and black/African American patients (56.7) had private insurance. However, patients with an “other” race were equally likely to either have a RWHAP PPT or be uninsured, only slightly over one-fourth (37%) had private insurance. White patients were the least likely to have a RWHAP PPT as just 1% total had primary RWHAP. Race was also significantly associated with having supplementary RWHAP. While just over half (51.9%) of patients with an “other” race had supplementary RWHAP, just 27.3% of white and 34.8% of black/African American patients had supplementary RWHAP [ $\chi^2$  (2, n=3,146) =31.75, p<.001].

Additional significant associations were found with the dependent variables (Table 3). White patients were most likely to be virally suppressed, and black/African American patients were least likely to be virally suppressed [ $\chi^2$  (2, n=2,886) =31.66, p<.001]. Although the relationship between race and the HRSA HAB RiC measure was not significant, the relationship between race and the missed visits dichotomous RiC measure was significant. For this measure, white patients were most likely to be RiC, and black/African American patients were least likely to be RiC [ $\chi^2$  (2, n=3,146) =84.09, p<.001].

Table 3. Bivariate Associations between Categorical Independent Variables and Dependent Variables

Charact. †	VS		HRSA HAB				Missed Visits					
	Yes	No	$\chi^2$	<i>p</i>	RiC	Not RiC	$\chi^2$	<i>p</i>	RiC	Not RiC	$\chi^2$	<i>p</i>
<b>Gender</b>			9.67	.002			7.53	.01			2.13	.14
Male												
n	2,015	136			1,813	571			1,583	801		
%	93.7	6.3			76.0	24.0			66.4	33.6		
Female												
n	645	70			616	146			484	278		
%	90.2	9.8			80.8	19.2			63.5	36.5		
<b>Race/Eth</b>			31.66	<.001			1.19	.55			84.09	<.001
Black/ AA												
n	1,667	169			1,556	446			1,198	804		
%	90.8	9.2			77.7	22.3			59.8	40.2		
White												
n	927	33			809	254			806	257		
%	96.6	3.4			76.1	23.9			75.8	24.2		
Other												
n	66	4			64	17			63	18		
%	94.3	5.7			79.0	21.0			77.8	22.2		
<b>Highest Ed.</b>			7.37	.06			0.66	.88			37.66	<.001
Less than HS												
n	253	33			244	73			169	148		
%	88.5	11.5			77.0	23.0			53.3	46.7		
HS or GED												
n	612	62			580	181			453	308		
%	90.8	9.2			76.2	23.8			59.5	40.5		
Some College												
n	210	15			192	54			163	83		
%	93.3	6.7			78.0	22.0			66.3	33.7		
College or Higher												
n	144	7			128	43			137	34		
%	95.4	4.6			74.9	25.1			80.1	19.9		

Note. Percentages may exceed 100 due to rounding. † Complete cases only

**Gender.** As shown in Table 2, women were more likely to have a public PPT than men [ $\chi^2$  (3, n=3,146) =45.34, p<.001], but gender was not significantly associated with receipt of RWHAP supplementary services [ $\chi^2$  (1, n=3,146) =3.39, p=.07]. As for VS, men were significantly more likely than women to be virally suppressed [ $\chi^2$  (1, n=2,886) =9.67, p=.002] (Table 3). Among the RiC outcomes, only the HRSA HAB measure was significantly associated with gender, as women were more likely to be RiC [ $\chi^2$  (2, n=3,146) =7.53, p=.01] (Table 3).

**Education.** A significant association [ $\chi^2$  (2, n=3,146) =21.49, p<.001] was found between the highest education level attained and patients' PPT (Table 2). Patients who had less than a high school education were most likely to have public insurance. Patients with a high school education or higher were most likely to have private insurance.

Supplementary RWHAP services was also significantly associated with education level [ $\chi^2$  (3, n=1,495) =11.91, p=.01] (Table 2). Patients with less than a high school education were most likely to receive supplementary RWHAP services.

Education level was not significantly associated with VS or the HRSA HAB RiC measure (Table 3). However, the missed visits dichotomous measure was significantly associated with education level: patients with less than a high school education were least likely to be retained in care [ $\chi^2$  (3, n=1,495) =37.66, p<.001].

**Associations between continuous control variables/ independent variables of interest and dependent variables.**

**Monthly Income.** Income was found to have a non-normal distribution; thus, a series of nonparametric tests were conducted to assess the relationships. Since PPT has four categories, a Kruskal-Wallis test was conducted (Table 4). Results revealed that the association between PPT and income is significant (H=96.55, p<.001). Unsurprisingly, income was lowest for patients

who were uninsured (mean income=\$736.40), followed by RWHAP (mean income=\$768.83) and public insurance (mean income=\$1,107.83). Patients with private insurance reported the highest monthly income (mean income=\$1,228.78).

For supplementary RWHAP services, which has just two (yes/no) categories, a Mann-Whitney U test was conducted (Table 4). Patients without supplementary RWHAP services had a significantly higher mean income of \$1,072.22 versus \$1,104.16 for patients with supplementary RWHAP services (U=594,302, p=.02).

Table 4. Bivariate Associations between Continuous Independent Variables and Categorical Independent Variables of Interest

Characteristic <sup>†</sup>	RWHAP Supp		PPT			
	Yes	No	Pub	Pri	RWHAP	None
<b>Monthly Income</b>						
n	932	1,356	797	1,290	78	123
Mean	\$1,104.16	\$1,072.22	\$1,107.83	\$1,228.78	\$768.83	\$736.4
Test Statistic	U=594,302		H=96.55			
p	.02		<.001			
<b>Age</b>						
n	1,029	2,117	1,890	960	78	218
Mean	45.9	46.6	50.9	45.4	38.8	38.0
Test Statistic	t = -1.68		F=108.25			
p	.09		<.001			

Note. The U test statistic indicates a Mann-Whitney U test; the t statistic indicates an independent samples t-test; the F statistic indicates a one-way ANOVA; and the H statistic indicates Kruskal-Wallis test.

<sup>†</sup> Complete cases only

Both RiC measures were also non-normally distributed and, since both measures have just two categories each, Mann-Whitney U tests were used (Table 5). When the HRSA HAB measure was used, results showed that patients with higher incomes (mean =\$1,156.71) were

significantly more likely to be RiC, while patients with lower incomes (mean = \$1,063.27) were less likely to be RiC ( $U=594,302$ ,  $p=.02$ ). A similar association was found with the missed visits dichotomous measure, with a mean income of \$1,240.80 for patients who were RiC versus a mean income of \$980.05 for patients who were not RiC ( $p<.001$ ).

For VS, an additional Mann-Whitney U test was conducted (Table 5) since it had a non-normal distribution. Patients with higher incomes were significantly more likely to be suppressed, with a mean income of \$1,158.15 versus \$878.61 for patients who were unsuppressed ( $U=470,711$ ,  $p<.001$ ).

Table 5. Bivariate Associations between Continuous Independent Variables and Dependent Variables

Characteristic†	HRSA HAB			Missed Visits		VS	
	None	RiC	Not RiC	RiC	Not RiC	Yes	No
<b>Monthly Income</b>							
n	123	1,989	299	1,443	845	2,101	172
Mean	\$736.4	\$1,156.71	\$1,063.27	\$1,240.80	\$980.05	\$1,158.15	\$878.61
Test Statistic		$U= 273,068$		$U=470,711$		$U=136,243$	
$p$		.02		<.001		<.001	
<b>Age</b>							
n	218			2,067	1,079	2,660	206
Mean	38.0			48.1	43.03	47.1	42.3
Test Statistic		$t=-5.35$		$t=-11.55$		$t=-5.83$	
$p$		<.001		<.001		<.001	

Note. The  $U$  test statistic indicates a Mann-Whitney U test, and the  $t$  statistic indicates an independent samples t-test.

† Complete cases only

**Age.** Age was found to be normally distributed with all dependent variables and independent variables of interest. Therefore, a one-way ANOVA was conducted to assess the relationship with PPT, since PPT has more than two categories (Table 4). Results were significant [ $F= (3, 108.25)$ ,  $p<.001$ ] and indicated that patients with a higher mean age ( $M=51$ )

were more likely to have a public PPT, while younger patients were most likely to have a RWHAP PPT or be uninsured (M=38). As for the supplementary RWHAP services variable, results of an independent samples t-test indicated that the relationship with age was not significant ( $p=.09$ ) (Table 4).

However, older patients (M=47) were significantly more likely to be virally suppressed ( $p<.001$ ) than younger patients (M=42) (Table 5). Older patients (M=48) were also more likely than younger patients (M=43) to be retained using the missed visits dichotomous RiC measure [ $t(2149) = -11.55, p<.001$ ]. The same was found with the HRSA HAB measure: older patients (M=47) were more likely to be retained than younger patients (M=44) [ $t(2865) = -5.35, p<.001$ ].

### **Unadjusted and Adjusted Binary Logistic Regression Analyses**

Binary logistic regression analyses were conducted to assess relationships between dependent variables and independent variables of interest. Unadjusted odds ratios (ORs) that excluded all control variables and adjusted odds ratios (AORs) that included all control variables were obtained. These results are categorized by each respective research question/hypothesis. For analyses in which VS is the outcome variable, all patients with missing VL values ( $n=280$ ) were dropped listwise. The results of the VS sensitivity analysis will be discussed separately in the multiple imputation section.

**Hypothesis 1.** To restate, Research Question 1 investigates the relationship between supplementary RWHAP service provision and RiC (using two different measures: HRSA HAB and missed visits dichotomous). Hypothesis 1 states that PLWH who receive RWHAP supplementary services are more likely to be retained in care than PLWH who do not receive RWHAP supplementary services.

For the HRSA HAB measure, unadjusted models indicated that patients with RWHAP supplementary services were significantly more likely to be RiC than patients without RWHAP supplementary services (OR= 5.59,  $p<.001$ ). This relationship was found in the adjusted model, as well, though the effect was not as large (AOR=2.48,  $p<.001$ ). Results are presented in Table 6.

When the missed visits dichotomous measure was used (see Table 7), results from the adjusted model demonstrated that patients with RWHAP supplementary services were significantly more likely to be RiC (AOR=1.49,  $p=.002$ ). This relationship was not found in the unadjusted model (OR=1.03,  $p=.67$ ). Potential reasons for this are suggested in the Discussion section.

Table 6. Adjusted and Unadjusted Odds Ratios for being Retained in Care (HRSA HAB Measure) by Receipt of Ryan White HIV/AIDS Program Supplementary Services among Patients Receiving HIV Primary Care Services in 2016

Characteristic	AOR (95% CI) n=1169	<i>p</i>	OR (95% CI) n=3146	<i>p</i>
<b>RWHAP Supp.</b>				
Yes	<b>2.48</b> (1.68-3.67)	<.001	<b>5.59</b> (4.31-7.23)	<.001
No	Ref.		Ref.	
<b>Gender</b>				
Male	0.80 (0.52-1.23)	.30		
Female	Ref.			
<b>Race/Eth.</b>				
Black/AA	Ref.			
White	0.80 (0.51-1.24)	.31		
Other	1.46 (0.43-4.96)	.55		
<b>Monthly Income</b> (Per 100 Dollars)	1.02 (0.99-1.04)	.09		
<b>Age (in years)</b>	<b>1.03</b> <b>(1.02-1.05)</b>	<b>&lt;.001</b>		
<b>Highest Ed. Level</b>				
Less than HS	Ref.			
HS or GED	0.95 (0.60-1.50)	.83		
Some College	1.25 (0.68-2.28)	.47		
College or Higher	0.80 (0.39-1.65)	.55		

Table 7. Adjusted and Unadjusted Odds Ratios for being Retained in Care (Missed Visits Dichotomous Measure) by Receipt of Ryan White HIV/AIDS Program Supplementary Services among Patients Receiving HIV Primary Care Services in 2016

Characteristic	AOR (95% CI) n=1169	<i>p</i>	OR (95% CI) n=3146	<i>p</i>
<b>RWHAP Supp.</b>				
Yes	<b>1.49</b> (1.16-1.92)	.002	1.03 (0.88-1.21)	.67
No	Ref		Ref	
<b>Gender</b>				
Male	0.94 (0.71-1.25)	.67		
Female	Ref			
<b>Race/Eth.</b>				
Black/AA	Ref			
White	1.29 (0.92-1.79)	.15		
Other	<b>2.39</b> (1.13-5.03)	.02		
<b>Monthly Income</b> (Per 100 Dollars)	<b>1.04</b> (1.02-1.06)	<.001		
<b>Age</b> (in years)	<b>1.03</b> (1.02-1.04)	<.001		
<b>Highest Ed. Level</b>				
Less than HS	Ref.			
HS or GED	<b>1.38</b> (1.02-1.87)	.04		
Some College	<b>1.92</b> (1.28-2.89)	.002		
College or Higher	<b>3.20</b> (1.79-5.72)	<.001		

**Hypothesis 2.** Research Question 2 investigates the relationship between primary healthcare payer type and RiC. Hypothesis 2.1 is that PLWH who are uninsured are less likely to be retained in care than PLWH who have a public, private, or RWHAP PPT. Hypothesis 2.2 states that PLWH with a private or public PPT are less likely to be retained in care than PLWH with a RWHAP PPT. Finally, Hypothesis 2.3 states that PLWH with a public (non-RWHAP) PPT are less likely to be retained in care than PLWH with a private PPT. Since two distinct RiC outcomes are assessed, these are discussed in separate subsections for HRSA HAB and missed visits dichotomous, respectively.

***HRSA HAB.***

*Unadjusted Models.* Results of unadjusted logistic regression analyses between PPT and the HRSA HAB measure of RiC are presented in Table 8. For Hypothesis 2.1, results showed that patients with a private PPT (OR= 4.99,  $p<.001$ ), public PPT (OR=5.14,  $p<.001$ ), or RWHAP PPT (OR=50.13,  $p<.001$ ) were all significantly more likely to be RiC than patients who were uninsured. Thus, the null hypothesis could be rejected: patients with a RWHAP PPT were most likely to be retained in care.

The null hypothesis for Hypothesis 2.2 could be rejected as well: compared to patients with a RWHAP PPT, patients with a public (OR=0.10,  $p=.002$ ) or private (OR=0.10,  $p=.001$ ) PPT were less likely to be RiC. For Hypothesis 2.3, however, the null hypothesis could not be rejected. Patients with a public PPT were not less likely to be RiC than patients with a private PPT (OR=1.03,  $p=.76$ ).

Table 8. Unadjusted Odds Ratios for being Retained in Care (HRSA HAB Measure) by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=3146)

Characteristic	Mod 1	OR (95% CI)	<i>p</i>	Mod 2	OR (95% CI)	<i>p</i>	Mod 3	OR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		<b>5.14</b> (3.77-7.01)	<.001		<b>0.10</b> (0.02-0.42)	.002		1.03 (0.85-1.25)	.76
Private Insurance		<b>4.99</b> (3.74-6.67)	<.001		<b>0.10</b> (0.02-0.41)	.001		Ref	
RWHAP Primary		<b>50.13</b> (12.0-209.34)	<.001		Ref			<b>10.04</b> (2.46-41.06)	.001
Uninsured (No PPT)		Ref			<b>0.02</b> (0.005-0.08)	<.001		<b>0.20</b> (0.15-0.27)	<.001

*Adjusted Models.* As shown in Table 9, there was not sufficient evidence to reject all aspects of the null hypothesis for Hypothesis 2.1. Although patients with a RWHAP PPT (AOR=14.0, p=.01) and private PPT (AOR=1.92, p=.03) were significantly more likely to be RiC than patients who were uninsured, patients with a public PPT were not significantly more likely to be RiC than patients who were uninsured (AOR=1.64, p=.14).

There was not sufficient evidence to reject all aspects of the null hypothesis for Hypothesis 2.2, as patients with a RWHAP PPT did not have significantly better outcomes than all other PPTs. Compared to patients with a RWHAP PPT, patients with a public PPT had 0.12 times the odds of being RiC (AOR=0.12, p=.04). However, even though patients with a private PPT had 0.14 times the odds of being RiC when compared to patients with a RWHAP PPT, the difference was just shy of significance (AOR=0.14, p=.06). As in the unadjusted model, the null

hypothesis for Hypothesis 2.3 could not be rejected in the adjusted model: patients with a private PPT were not significantly less likely to be RiC than patients with public (non-RWHAP) PPT (AOR=0.85, p=.47). None of the control variables were associated with RiC with the exception of age: older patients were more likely to be retained in care.

Table 9. Adjusted Odds Ratios for being Retained in Care (HRSA HAB Measure) by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=1169)

Characteristic	Mod 1	AOR (95% CI)	<i>p</i>	Mod 2	AOR (95% CI)	<i>p</i>	Mod 3	AOR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		1.64 (0.85-3.17)	.14		<b>0.12</b> (0.02-0.91)	.04		0.85 (0.56-1.31)	.47
Private Insurance		<b>1.92</b> (1.06-3.50)	.03		0.14 (0.02-1.04)	.06		Ref	
RWHAP Primary		<b>14.0</b> (1.78-110.45)	.01		Ref			7.28 (0.96-55.25)	.06
Uninsured (No PPT)		Ref			<b>0.07</b> (0.009-0.56)	.01		<b>0.52</b> (0.29-0.94)	.03
<b>Gender</b>									
Male		0.80 (0.52-1.23)	.30						
Female		Ref							
<b>Race/Eth.</b>									
Black/AA		Ref							
White		0.77 (0.49-1.20)	.25						
Other		1.47 (0.42-5.15)	.55						
Monthly Income (Per 100 Dollars)		1.01 (0.99-1.03)	.26						
Age (in years)		<b>1.03</b> (1.02-1.05)	<.001						
<b>Highest Ed.</b>									
Less than HS		Ref.							
HS or GED		0.90 (0.57-1.43)	.66						
Some College		1.07 (0.59-1.976)	.82						
College or Higher		0.75 (0.36-1.55)	.44						

**Missed Visits Dichotomous.**

*Unadjusted Models.* When unadjusted for control variables (Table 10), logistic regression models showed that there was not a significant difference in odds of being retained in care according to the missed visits measure between patients who had a RWHAP PPT and patients who were uninsured (OR=1.66, p=.06). However, patients with a public or private PPT were significantly more likely to be RiC than patients who were uninsured (OR=1.66, p=.001 and OR=2.20, p<.001, respectively). The null hypothesis for Hypothesis 2.2 could also not be rejected: patients with private or public PPT were not significantly less likely to be RiC than patients with a RWHAP PPT. For Hypothesis 2.3, however, the null hypothesis could be rejected, as patients with a public PPT were significantly less likely to be RiC than patients with a private PPT (OR= 0.76, p=.001).

Table 10. Unadjusted Odds Ratios for being Retained in Care (Missed Visits Dichotomous Measure) by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=3146)

Charact.	Mod 1	OR (95% CI)	p	Mod 2	OR (95% CI)	p	Mod 3	OR (95% CI)	p
<b>PPT</b>									
Public Insurance		<b>1.66</b> (0.68-2.73)	.001	1.0	(0.62-1.60)	.98	<b>0.76</b> (0.64-0.89)		.001
Private Insurance		<b>2.20</b> (1.65-2.91)	<.001	1.32	(0.83-2.12)	.24	Ref.		
RWHAP Primary		1.66 (0.98-2.82)	.06	Ref.			0.76 (0.47-1.21)		.24
Uninsured (No PPT)		Ref.		0.60	(0.35-1.02)	.06	<b>0.46</b> (0.34-0.60)		<.001

*Adjusted Models.* All findings from the unadjusted models for the missed visits dichotomous RiC measure were retained in the adjusted models (Table 11). For Hypothesis 2.1, as in the unadjusted model, there was insufficient evidence when control variables were added to conclude that uninsured patients were significantly different from patients who had a RWHAP, public, or private PPT. Though patients with a private PPT were significantly more likely to be RiC than uninsured patients (AOR=1.78, p=.03), significant associations were not found for patients with a public (AOR=1.22, p=.48) or RWHAP PPT (AOR=1.60, p=.25).

Similarly, as was the case for the unadjusted model, the null hypothesis for Hypothesis 2.2 could not be rejected in the adjusted model. Neither patients with a public PPT (AOR=0.76, p=.46) nor patients with a private PPT were less likely to be RiC (using the missed visits measure) than patients with a RWHAP PPT (AOR=0.90, p=.76).

There was, however, sufficient evidence to reject the null hypothesis for Hypothesis 2.3, even when adjusted for all control variables. Patients with a public (non-RWHAP) PPT were found to be significantly less likely to be RiC than patients with a private PPT (AOR=0.68, p=.01). As for the control variables, older age, higher income, “other” race, and having at least some college education were all associated with increased odds of RiC.

Table 11. Adjusted Odds Ratios for being Retained in Care (Missed Visits Dich.) by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=1169)

Charact.	Mod.1	AOR (95% CI)	<i>p</i>	Mod. 2	AOR (95% CI)	<i>p</i>	Mod. 3	AOR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		1.22 (0.71-2.10)	.48		0.76 (0.37-1.56)	.46		<b>0.68</b> (0.51-0.91)	.01
Private Insurance		<b>1.78</b> (1.06-2.98)	.03		1.12 (0.56-2.23)	.76		Ref.	
RWHAP Primary		1.60 (0.72-3.54)	.25		Ref.			0.90 (0.45-1.79)	.76
Uninsured (No PPT)		Ref.			0.63 (0.28-1.39)	.25		<b>0.56</b> (0.34-0.94)	.03
<b>Gender</b>									
Male		0.94 (0.71-1.24)	.65						
Female		Ref.							
<b>Race/Eth.</b>									
Black/AA		Ref.							
White		1.21 (0.87-1.69)	.26						
Other		<b>2.64</b> (1.20-5.80)	.02						
<b>Monthly Income</b> (Per 100 Dollars)		<b>1.04</b> (1.02-1.05)	<.001						
<b>Age</b> (in years)		<b>1.03</b> (1.02-1.04)	<.001						
<b>Highest Ed.</b>									
Less than HS		Ref.							
HS or GED		1.30 (0.96-1.77)	.10						
Some College		<b>1.70</b> (1.13-2.56)	.01						
College or Higher		<b>2.86</b> (1.59-5.12)	<.001						

**Hypothesis 3.** Research Question 3 investigates the relationship between supplementary RWHAP service provision and VS. Hypothesis 3 stated that PLWH who receive RWHAP supplementary services are more likely to be virally suppressed than PLWH who do not receive RWHAP supplementary services. As in Research Question 1 (in which the missed visits dichotomous RiC measure was the outcome), although the null hypothesis was able to be rejected in the adjusted models, it was not able to be rejected in unadjusted models. In the unadjusted model, results showed that patients who received supplementary RWHAP services were not significantly more likely to be virally suppressed than patients who did not receive supplementary RWHAP services (OR=1.19, p=.26). In the adjusted model, patients who received RWHAP supplementary services had over 1.5 times the odds of being virally suppressed (AOR=1.64, p=.03). Also, older age, higher income, and white race were associated with increased odds of viral suppression. Results from unadjusted and unadjusted models are presented in Table 12.

Table 12. Unadjusted and Adjusted Odds Ratios for being Virally Suppressed by Ryan White HIV/AIDS Program Supplementary Services among Patients Receiving HIV Primary Care Services in 2016

Characteristic	AOR (95% CI) (n=1159)	<i>p</i>	OR (95% CI) (n=2886)	<i>p</i>
<b>RWHAP Supp.</b>				
Yes	<b>1.64</b> (1.06-2.54)	.03	1.19 (0.88-1.62)	.26
No	Ref.			
<b>Gender</b>				
Male	1.30 (0.81-2.06)	.28		
Female	Ref.			
<b>Race/Eth.</b>				
Black/AA	Ref.			
White	<b>2.05</b> (1.03-4.09)	.04		
Other	2.24 (0.51-9.75)	.28		
<b>Monthly Income</b> (Per 100 Dollars)	<b>1.07</b> (1.03-1.11)	<.001		
<b>Age (in years)</b>	<b>1.03</b> (1.01-1.05)	.002		
<b>Highest Ed. Level</b>				
Less than HS	Ref.			
HS or GED	1.13 (0.69-1.86)	.63		
Some College	1.88 (0.89-3.97)	.10		
College or Higher	1.17 (0.42-3.25)	.77		

**Hypothesis 4.** Research Question 4 investigates the relationship between primary healthcare payer type and VS. Hypothesis 4.1 states that PLWH who are uninsured are less likely to be virally suppressed than PLWH who have a public, private, or RWHAP PPT. Hypothesis 4.2 states that PLWH with a private or public PPT are less likely to be virally suppressed than PLWH with a RWHAP PPT. Finally, Hypothesis 4.3 states that PLWH with a public (non-RWHAP) PPT are less likely to be virally suppressed than PLWH with a private PPT.

***Unadjusted Models.*** In unadjusted models (see Table 13), the null hypothesis for Hypothesis 4.1 was able to be rejected. Patients with a public (OR=2.95,  $p<.001$ ), private (OR=6.62,  $p<.001$ ), or RWHAP PPT (OR=3.17,  $p=.009$ ) were significantly more likely to be VS than patient who were uninsured. The null hypothesis for Hypothesis 4.2 was not able to be rejected: even though uninsured patients were less likely to be VS than patients with RWHAP (OR=0.32,  $p=.009$ ), neither patients with a public PPT nor patients with a private PPT were significantly less likely to be VS than patients with a RWHAP PPT. However, the null hypothesis for Hypothesis 4.3 was able to be rejected: compared to patients with a private PPT, patients with a public PPT had 0.45 times the odds of viral suppression (OR=0.45,  $p<.001$ ). Patients who were uninsured had 0.15 the odds of viral suppression as compared to patients with a private PPT (OR=0.15,  $p<.001$ ). The RWHAP PPT and private PPT were not differentially associated with VS.

Table 13. Unadjusted Odds Ratios for being Virally Suppressed by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=2886)

Charact.	Mod. 1	OR (95% CI)	<i>p</i>	Mod. 2	OR (95% CI)	<i>p</i>	Mod. 3	OR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		<b>2.95</b> (1.90-4.59)	<.001		0.93 (0.42-2.09)	.86		<b>0.45</b> (0.32-0.61)	<.001
Private Insurance		<b>6.62</b> (4.26-10.30)	<.001		2.09 (0.93-4.69)	.07		Ref.	
RWHAP Primary		<b>3.17</b> (1.34-7.52)	.009		Ref.			0.48 (0.21-1.07)	.07
Uninsured (No PPT)		Ref.			<b>0.32</b> (0.13-0.75)	.009		<b>0.15</b> (0.10-0.237)	<.001

**Adjusted Models.** Not all significant results in unadjusted models were retained in adjusted models (Table 14). There was insufficient evidence to fully reject the null hypothesis for Hypothesis 4.1: although patients with private insurance were significantly more likely to be VS than patients who were uninsured (AOR=3.45,  $p<.001$ ), patients with a public or RWHAP PPT were not significantly more likely to be VS than patients who were uninsured (AOR=1.36,  $p=.39$  and AOR=2.44,  $p=.15$ , respectively).

As in the unadjusted model, the null hypothesis for Hypothesis 4.2 was not able to be rejected in the adjusted model, either. Patients with a private PPT were not less likely to be VS than patients with a RWHAP PPT (AOR=1.41,  $p=.56$ ), and, although patients with a public PPT had 0.56 the odds of viral suppression as compared to patients with a RWHAP PPT, this difference was not statistically significant (AOR=0.56,  $p=.33$ ).

As for Hypothesis 4.3, there was sufficient evidence to conclude that private and public PPTs were differentially associated with VS. Patients with a public PPT were significantly less likely to be VS than patients with a private PPT (AOR=0.39,  $p<.001$ ). As in the unadjusted model, patients with RWHAP were not significantly different from patients with private insurance. This again illustrates the importance of RWHAP as a primary payer type for PLWH, as it provides a quality of care that is equitable to that of private insurance.

Patients who were older (AOR=1.04,  $p<.001$ ) and who had higher monthly incomes (AOR=1.06,  $p=.001$ ) were also significantly more likely to be virally suppressed.

**Hypothesis 5.** Research Question 5 investigates the relationship between combination payer type and RiC. Hypothesis 5.1 states that PLWH who have private insurance plus RWHAP supplementary services are more likely to be retained in care than patients who have any other single or combination payer type.

Table 14. Adjusted Odds Ratios for being Virally Suppressed by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=1159)

Characteristic	Mod 1	AOR (95% CI)	<i>p</i>	Mod 2	AOR (95% CI)	<i>p</i>	Mod 3	AOR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		1.36 (0.68-2.73)	.39		0.56 (0.17-1.79)	.33		<b>0.39</b> (0.24-0.65)	<.001
Private Insurance		<b>3.45</b> (1.77-6.74)	<.001		1.41 (0.45-4.44)	.56		Ref.	
RWHAP Primary		2.44 (0.73-8.14)	.15		Ref.			0.71 (0.23-2.23)	.56
Uninsured (No PPT)		Ref.			0.41 (0.13-1.36)	.15		<b>0.29</b> (0.15-0.57)	<.001
<b>Gender</b>									
Male		1.24 (0.77-2.0)	.37						
Female		Ref.							
<b>Race/Eth.</b>									
Black/AA		Ref.							
White		1.89 (0.94-3.81)	.07						
Other		2.92 (0.64-13.41)	.17						
<b>Monthly Income</b> (Per 100 Dollars)		<b>1.06</b> (1.02-1.09)	.001						
<b>Age</b> (in years)		<b>1.04</b> (1.02-1.06)	<.001						
<b>Highest Ed.</b>									
Less than HS		Ref.							
HS or GED		0.95 (0.57-1.59)	.85						
Some College		1.37 (0.64-2.92)	.41						
College or Higher		0.90 (0.32-2.54)	.84						

**HRSA HAB.**

*Unadjusted Models.* The unadjusted model examined the relationship between combination payer type and the HRSA HAB measure of RiC (Table 15). Patients with private insurance plus RWHAP supplementary services were significantly more likely to be RiC than patients with any other single or combination payer type, with the exception of patients with public insurance plus RWHAP supplementary services. PLWH with public insurance plus RWHAP supplementary services had almost three times the odds of being retained in care as compared to PLWH with private insurance plus RWHAP supplementary services (OR=2.79, p=.007).

Table 15. Unadjusted Odds Ratios for being Retained in Care (HRSA HAB Measure) by Combination Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=3146)

Combination Payer Type	OR (95% CI)	<i>p</i>
Public Insur. + RWHAP Supp.	<b>2.79</b> (1.32-5.89)	.007
Private Insur. + RWHAP Supp.	Ref.	
Public Insur. Only	<b>0.17</b> (0.12-0.26)	<.001
Private Insur. Only	<b>0.22</b> (0.15-0.32)	<.001
Uninsured	<b>0.02</b> (0.01-0.04)	<.001
RWHAP Only	<b>0.38</b> (0.22-0.65)	<.001

*Adjusted Models.* When control variables were added to the model (Table 16), patients with public insurance plus RWHAP supplementary services were still more likely to be RiC than patients in the reference group; however, this difference was no longer statistically significant (AOR=2.78, p=.07). With the exception of patients who had RWHAP only, patients with all

other payer type categories were less likely to be RiC than patients who had private insurance plus supplementary RWHAP services. Thus, having supplementary RWHAP is more likely to be associated with retention in care than having public or private insurance only.

Table 16. Adjusted Odds Ratios for being Retained in Care (HRSA HAB Measure) by Combination Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=1169)

Characteristic	AOR (95% CI)	<i>p</i>
<b>Combination Payer Type</b>		
Public Insur. + RWHAP Supp.	2.78 (0.93-8.29)	.07
Private Insur. + RWHAP Supp	Ref.	
Public Insur. Only	<b>0.35</b> (0.20-0.62)	<.001
Private Insur. Only	<b>0.53</b> (0.31-0.88)	.02
Uninsured	<b>0.24</b> (0.08-0.70)	.01
RWHAP Only	0.70 (0.33-1.48)	.35
<b>Gender</b>		
Male	0.81 (0.52-1.25)	.34
Female	Ref.	
<b>Race/Eth.</b>		
Black/AA	Ref.	
White	0.78 (0.50-1.22)	0.28
Other	1.74 (0.49-6.21)	0.39
<b>Monthly Income</b> (Per 100 Dollars)	1.01 (0.99-1.04)	.28
<b>Age</b> (in years)	<b>1.03</b> (1.02-1.05)	<.001
<b>Highest Ed. Level</b>		
Less than HS	Ref.	
HS or GED	0.96 (0.60-1.53)	.87
Some College	1.18 (0.64-2.18)	.60
College or Higher	0.76 (0.37-1.59)	.47

***Missed Visits Dichotomous.***

*Unadjusted Models.* In unadjusted models (see Table 17), estimated odds of RiC were lower for all payer types compared to private insurance plus RWHAP supplementary services. Three of the five contrasts were statistically significant: public insurance only (OR=0.63,  $p<.001$ ), RWHAP only (OR=0.44,  $p<.001$ ), and uninsured (OR=0.62,  $p=.02$ ).

Table 17. Unadjusted Odds Ratios for being Retained in Care (Missed Visits Dichotomous Measure) by Combination Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=3146)

Combination Payer Type	OR (95% CI)	<i>p</i>
Public Insur. + RWHAP Supp.	<b>0.99</b> (0.74-1.34)	.97
Private Insur. + RWHAP Supp	Ref.	
Public Insur. Only	<b>0.63</b> (0.49-0.81)	<.001
Private Insur. Only	0.97 (0.77-1.21)	.77
Uninsured	<b>0.62</b> (0.41-0.93)	.02
RWHAP Only	<b>0.44</b> (0.31-0.62)	<.001

*Adjusted Models.* Two of the three contrasts that were significant in the unadjusted models were also significant in the adjusted models (see Table 18). Patients with public insurance only (AOR=0.42,  $p<.001$ ) and patients with RWHAP only (AOR=0.57,  $p=.04$ ) were significantly less likely to be RiC than patients who had private insurance plus RWHAP supplementary services. A number of control variables retained statistical significance as well. Older age, higher income, “other” race, and having at least some college education were associated with RiC.

Table 18. Adjusted Odds Ratios for being Retained in Care (Missed Visits Dichotomous Measure) by Combination Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=1169)

Characteristic	AOR (95% CI)	<i>p</i>
<b>Combination Payer Type</b>		
Public Insur. + RWHAP Supp.	0.97 (0.61-1.52)	.88
Private Insur. + RWHAP Supp	Ref.	
Public Insur. Only	<b>0.42</b> (0.29-0.62)	<.001
Private Insur. Only	0.76 (0.54-1.07)	.11
Uninsured	0.51 (0.19-1.35)	.18
RWHAP Only	<b>0.57</b> (0.34-0.96)	.04
<b>Gender</b>		
Male	0.93 (0.70-1.24)	.63
Female	Ref.	
<b>Race/Eth.</b>		
Black/AA	Ref.	
White	1.24 (0.89-1.73)	0.21
Other	<b>2.78</b> (1.25-6.19)	0.01
<b>Monthly Income</b> (Per 100 Dollars)	<b>1.04</b> (1.02-1.05)	<.001
<b>Age (in years)</b>	<b>1.03</b> (1.02-1.04)	<.001
<b>Highest Ed. Level</b>		
Less than HS	Ref.	
HS or GED	1.34 (0.98-1.83)	.06
Some College	<b>1.79</b> (1.18-2.70)	.006
College or Higher	<b>2.91</b> (1.62-5.23)	<.001

**Hypothesis 6.** Research Question 6 investigates the relationship between combination payer type and VS. Hypothesis 6.1 states that PLWH with private insurance plus RWHAP supplementary services are more likely to be virally suppressed than patients with any other single or combination payer type.

*Unadjusted Models.* Results from unadjusted analyses indicated that patients with private insurance plus RWHAP supplementary services were significantly more likely to be virally suppressed (Table 19). As expected, estimated odds ratios were lower for all other payer types compared to private insurance plus RWHAP supplementary services (though the association with private insurance was marginal at p-value of .05), providing ample evidence for the null hypothesis to be rejected.

*Adjusted Models.* When control variables were added (Table 20), adjusted odds ratios indicated that patients with the private insurance plus RWHAP supplementary services payer type had greater estimated odds of VS in all five contrasts; however, only two associations were statistically significant. Specifically, patients with public insurance only (AOR=0.20,  $p<.001$ ) and patients with RWHAP only (AOR=0.24,  $p=.001$ ) were significantly less likely to be virally suppressed than patients who had private insurance plus RWHAP supplementary services. Also, patients who were white were significantly more likely to virally suppressed than patients who were black/African American (AOR=2.07,  $p=.04$ ).

Table 19. Unadjusted Odds Ratios for being Virally Suppressed by Combination Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=1159)

Combination Payer Type	AOR (95% CI)	<i>p</i>
Public Insur. + RWHAP Supp.	<b>0.48</b> (0.24-0.96)	.04
Private Insur. + RWHAP Supp	Ref.	
Public Insur. Only	<b>0.22</b> (0.12-0.40)	<.001
Private Insur. Only	0.56 (0.31-1.00)	0.05
Uninsured	<b>0.11</b> (0.05-0.25)	<.001
RWHAP Only	<b>0.14</b> (0.07-0.27)	<.001

Table 20. Adjusted Odds Ratios for being Virally Suppressed by Combination Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=1159)

Characteristic	AOR (95% CI)	<i>p</i>
<b>Combination Payer Type</b>		
Public Insur. + RWHAP Supp.	0.83 (0.31-2.21)	.71
Private Insur. + RWHAP Supp	Ref.	
Public Insur. Only	<b>0.20</b> (0.10-0.41)	<.001
Private Insur. Only	0.63 (0.30-1.31)	.22
Uninsured	0.53 (0.11-2.65)	.44
RWHAP Only	<b>0.24</b> (0.11-0.55)	.001
<b>Gender</b>		
Male	1.24 (0.77-1.99)	.39
Female	Ref.	
<b>Race/ Eth.</b>		
Black/AA	Ref.	
White	<b>2.07</b> (1.02-4.17)	.04
Other	4.07 (0.88-18.83)	.07
<b>Monthly Income</b> (Per 100 Dollars)	<b>1.06</b> (1.02-1.10)	.001
<b>Age</b> (in years)	<b>1.03</b> (1.01-1.06)	.001
<b>Highest Ed. Level</b>		
Less than HS	Ref.	
HS or GED	1.06 (0.63-1.77)	.83
Some College	1.56 (0.73-3.35)	.26
College or Higher	0.91 (0.32-2.58)	.85

## Multiple Imputation Models

Multiple imputation (MI) was used for Research Questions 3, 4, and 6 since these are the research questions in which VS is the dependent variable. To restate, MI is the second of two approaches that was used in this study to address the fact that 280 patients did not have any VL measures for the 2016 calendar year. The first approach, which was discussed in the previous section, was complete case analysis. Although missing values for the education and income control variables were imputed in all MI models as well, the analysis and discussion that follows is focused on VS since it is an important and internationally-recognized indicator of HIV health.

While there is no general consensus for how many imputations should be performed, Stuart and colleagues suggest that 10 imputations are sufficient for large samples (Stuart, Azur, Frangakis, & Leaf, 2009). In the current study, 10 imputations were specified using Stata's *mi impute chained* command. This Stata command, sometimes referred to by its acronym, MICE (Multiple Imputation using Chained Equations), is appropriate for models where there are multiple imputed values with different distributions, and it allows for multiple imputations to be conducted in just one command (UCLA, 2017). Thus, following the initial MICE command, a multinomial regression (*mlogit*) was specified for imputing the four-category education variable; regression (*regress*) was specified for imputing the continuous income variable; and for the binary VS variable, a *logit* command was specified. All independent variables with complete data (age, race, gender, primary payer type, and RWHAP specialty services) were included as auxiliary variables, which are variables that are used to "predict" missing values (UCLA, 2017). As a reminder, the odds ratios produced in these MI analyses are derived from the means of the

regression coefficients in the pooled dataset. Descriptive statistics for the three imputed variables are presented in Table 21.

Table 21. Descriptive Statistics for Patients Receiving HIV Primary Care Services in 2016: Multiple Imputation Method

Characteristic	n Pre-MI	n Post-MI	Category % Pre-MI	Category % Post-MI	Mean (SD) Pre-MI	Mean (SD) Post-MI
<b>Viral Suppression</b>	2,866	3,146				
Yes			92.8	92.4		
No			7.2	7.6		
<b>Highest Education Level</b>	1,495	3,146				
Less than HS			21.2	19.4		
HS or GED			50.9	47.8		
Some College			16.5	16.9		
College or Higher			11.4	16.9		
<b>Monthly Income</b>	2,288	3,146			1,025.36 (843.50)	1108.82 (851.82)

*Note.* Percentages may exceed 100 due to rounding.

**Research Question 3.** First, the association between supplementary RWHAP service provision and VS was assessed. As shown in Table 22, adjusted results were nearly indistinguishable from the non-imputed model shown in Table 11. In both models, the AOR was 1.64. As for the unadjusted model, having supplementary RWHAP services was associated with statistically greater odds of VS ( $p=.04$ ). To restate, the unadjusted association between supplementary RWHAP and VS was not statistically significant in the non-imputed model. As a whole, these findings indicate that supplementary RWHAP is associated with greater odds of viral suppression.

Table 22. Adjusted Odds Ratios for being Virally Suppressed by Ryan White HIV/AIDS Program Supplementary Services among Patients Receiving HIV Primary Care Services in 2016 (n=3146): Multiple Imputation Method

Characteristic	OR (95% CI)	<i>p</i>	AOR (95% CI)	<i>p</i>
<b>RWHAP Supp.</b>				
Yes	<b>1.38</b> (1.02-1.88)	.04	<b>1.64</b> (1.19-2.25)	.002
No			Ref.	
<b>Gender</b>				
Male			1.48 (1.06-2.07)	.01
Female			Ref.	
<b>Race/Eth.</b>				
Black/AA			Ref.	
White			<b>2.05</b> (1.38-3.04)	<.001
Other			1.59 (0.52-4.87)	.41
<b>Monthly Income</b> (Per 100 Dollars)				
			<b>1.03</b> (1.03-1.04)	<.001
<b>Age (in years)</b>				
			<b>1.03</b> (1.02-1.05)	.004
<b>Highest Ed. Level</b>				
Less than HS			Ref.	
HS or GED			1.19 (0.74-1.90)	.46
Some College			1.87 (1.01-3.45)	.05
College or Higher			1.44 (0.69-3.02)	.33

**Research Question 4.** Research Question 4 investigates the relationship between primary healthcare payer type and VS (Tables 23 and 24).

Compared to the non-imputed adjusted and unadjusted models, results from multiple imputation models for Hypothesis 4.1-4.3 were similar. The only notable difference was that gender gained statistical significance in adjusted models, as males were about 1.5 times more likely to be virally suppressed than females.

**Research Question 6.** Finally, the relationship between combination payer type and VS was investigated and compared between the multiple imputed (Table 25) and non-imputed models (Tables 19 and 20). Although the results for the imputed model were fairly similar to that of the non-imputed model, there were some differences between the imputed and non-imputed adjusted models. Likely as a result of increased sample size, all combination payer types were significantly less likely to be associated with VS when compared to the referent group. However, in the non-imputed model, just two payer types (public insurance only and uninsured) were significantly less likely to be associated with viral suppression. Thus, the null hypothesis was able to be fully rejected in the multiple imputed model, but not the non-imputed model. In addition, male gender and white race were significantly associated with increased odds of viral suppression. While multiple imputation cannot fully estimate model parameters, it considerably strengthens results. Furthermore, it increases the power that is lost in complete case analysis (Stuart et al., 2009). Thus, it is important to consider both imputed and non-imputed models when interpreting the practical significance of the results which, in the current analysis, suggest that there is a significant association between receipt of a combination of private insurance and RWHAP supplementary services and viral suppression.

Table 23. Unadjusted Odds Ratios for being Virally Suppressed by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=3146): Multiple Imputation Method

Characteristic	Mod. 1	OR (95% CI)	<i>p</i>	Mod. 2	OR (95% CI)	<i>p</i>	Mod. 3	OR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		<b>3.08</b> (1.90-5.0)	<.001		0.89 (0.40-2.0)	.98		<b>0.47</b> (0.35-0.64)	<.001
Private Insurance		<b>6.58</b> (4.17-10.38)	<.001		1.91 (0.85-4.26)	.12		Ref.	
RWHAP Primary		<b>3.45</b> (1.44-8.28)	.006		Ref.			0.52 (0.23-1.17)	.12
Uninsured (No PPT)		Ref.			<b>0.29</b> (0.12-0.69)	.006		<b>0.15</b> (0.10-0.24)	<.001

Table 24. Adjusted Odds Ratios for being Virally Suppressed by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=3146): Multiple Imputation Method

Characteristic	Mod 1	AOR (95% CI)	<i>p</i>	Mod 2	AOR (95% CI)	<i>p</i>	Mod. 3	AOR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		<b>2.09</b> (1.19-3.66)	.01		0.67 (0.28-1.60)	.37		<b>0.46</b> (0.33-0.64)	<.001
Private Insurance		<b>4.58</b> (2.78-7.51)	<.001		1.47 (0.63-3.44)	.37		Ref.	
RWHAP Primary		<b>3.11</b> (1.26-7.67)	.01		Ref.			0.68 (0.29-1.59)	.37
Uninsured (No PPT)		Ref.			<b>0.32</b> (0.13-0.79)	.01		<b>0.22</b> (0.13-0.36)	<.001
<b>Gender</b>									
Male		<b>1.48</b> (1.04-2.10)	.03						
Female		Ref.							
<b>Race/Eth.</b>									
Black/AA		Ref.							
White		<b>1.88</b> (1.26-2.79)	.002						
Other		2.40 (0.76-7.58)	.14						
<b>Monthly Income</b> (Per 100 Dollars)		<b>1.02</b> (1.02-1.03)	.001						
<b>Age</b> (in years)		<b>1.03</b> (1.02-1.05)	<.001						
<b>Highest Ed.</b>									
Less than HS		Ref.							
HS or GED		1.01 (0.62-1.65)	.95						
Some College		1.41 (0.77-2.58)	.27						
College or Higher		1.06 (0.49-2.30)	.89						

Table 25. Adjusted Odds Ratios for being Virally Suppressed by Combination Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=3146): Multiple Imputation Method

Characteristic	OR (95% CI)	<i>p</i>	AOR (95% CI)	<i>p</i>
<b>Combination Payer Type</b>				
Public Insur. + RWHAP Supp.	<b>0.48 (0.24-0.96)</b>	.04	<b>0.41 (0.20-0.85)</b>	.02
Private Insur. + RWHAP Supp			Ref.	
Public Insur. Only	<b>0.21 (0.12-0.39)</b>	<.001	<b>0.19 (0.10-0.35)</b>	<.001
Private Insur. Only	<b>0.50 (0.28-0.90)</b>	.02	<b>0.41 (0.23-0.75)</b>	.003
Uninsured	<b>0.09 (0.04-0.20)</b>	<.001	<b>0.12 (0.06-0.24)</b>	<.001
RWHAP Only	<b>0.14 (0.7-0.27)</b>	<.001	<b>0.17 (0.08-0.33)</b>	<.001
<b>Gender</b>				
Male			<b>1.51 (1.07-2.12)</b>	.02
Female			Ref.	
<b>Race/Eth.</b>				
Black/AA			Ref.	
White			<b>1.95 (1.31-2.91)</b>	.001
Other			2.78 (0.85-9.12)	.09
<b>Monthly Income</b> (Per 100 Dollars)			<b>1.02 (1.02-1.03)</b>	.01
<b>Age (in years)</b>			<b>1.03 (1.02-1.05)</b>	<.001
<b>Highest Ed. Level</b>				
Less than HS			Ref.	
HS or GED			1.10 (0.64-1.89)	.72
Some College			1.59 (0.85-2.96)	.14
College or Higher			1.18 (0.52-2.70)	.68

## CHAPTER FIVE

### DISCUSSION

#### **Significant Findings and Conclusions**

Findings from this study suggest that there is a meaningful and significant relationship between healthcare payer type and HIV health outcomes. In particular, receiving RWHAP supplementary services is associated with optimal health outcomes for PLWH, including viral suppression (Research Question 3) and two different measures of retention in care (Research Question 1), even when controlling for multiple sociodemographic characteristics. This corresponds with existing literature, which has demonstrated that PLWH who receive RWHAP assistance are more likely to attain viral suppression (Bradley et al., 2016, Colasanti et al., 2016; Doshi et al., 2015) and retention in care (Diepstra et al., 2017).

This study also contributes novel findings to the literature. It is one of the first studies to use patient-level data collected after the implementation of the ACA to examine the relationship between healthcare payer type and HIV health outcomes. It is also the first study, to this researcher's knowledge, to examine the relationship between healthcare payer type and RiC using the missed visits dichotomous measure, rather than using the HRSA HAB measure alone. Moreover, this study differentiated among different tiers of RWHAP and public and private insurance payer types. While some studies exploring the health payer type/HIV health outcome relationship have differentiated among RWHAP service types (Diepstra et al., 2017; Doshi et al.,

2015) and another examined PLWH with RWHAP and non-RWHAP payer types (Bradley et al., 2016), no previous study has investigated both. In order to comprehensively assess the relationship between healthcare payer type and HIV health outcomes, it is important to include all payer types available to PLWH. A comprehensive assessment would therefore incorporate RWHAP's primary and supplementary roles.

***Significant Findings from Research Question 1.*** As hypothesized, patients who had RWHAP supplementary services were significantly more likely to be retained in care. The strength of this association was higher for the HRSA HAB than the missed visits dichotomous measure. Age was positively and significantly associated both RiC outcomes, even when controlling for other factors. In fact, this was the case in every multivariable model tested in the current study. This finding has been echoed in the literature, which suggests that older age is positively and significantly correlated with better HIV health outcomes (Chakraborty et al., 2015; Doshi et al., 2015; Torian, Xia, & Weiwei, 2014). However, Doshi and colleagues (2015) have posited that survivorship bias may be a salient factor with age, in which older PLWH who have been retained in care and virally suppressed over time are less likely to succumb to premature mortality.

Income had a slight association with the missed visits dichotomous measure, but not the HRSA HAB measure. Since monthly income was measured in 100-dollar increments, for every 100-dollar increase in income, the probability of HRSA HAB retention in care increased by 0.4%. This suggests that healthcare payer type is not a proxy for income but that, rather, healthcare has a unique association with HIV health that warrants investigation beyond just income level and socioeconomic status.

Interestingly, there was some variability in these models as regards education level and race. While race was not significantly associated with the HRSA HAB measure in adjusted models, when the missed visits dichotomous measure was used, patients of an “other” race were over twice as likely to be RiC than patients who were black/African American. White patients were not significantly more likely to be RiC than black/African American patients. Although some of the patients grouped in the “other” category did not have a record at the Clinic of their race/ethnicity, it is still worth noting that patients who were neither white nor black were more likely to be retained when using the missed visits measure.

Education level was not significantly associated with RiC when using the HRSA HAB measure. However, when using the other missed visits measure, all patients who had attained a high school education or above were significantly more likely to be RiC than patients who had not completed high school.

When considering (1) the weaker association between RWHAP supplementary services and RiC when using the missed visits instead of HRSA HAB measure and (2) the significant associations between race and education level that were found for the missed visits but not the HRSA HAB measure, a possible explanation for the differences in models emerges. Taken together, the RiC models demonstrate that race and education are stronger predictors of missed visits-based RiC than receipt of RWHAP supplementary services. This may also help explain why the association between supplementary RWHAP and the missed visits dichotomous measure of RiC was not significant in the unadjusted model. In sum, supplementary RWHAP may be a more important contributor to RiC as measured by HRSA HAB rather than missed visits, possibly because wraparound RWHAP services facilitate regular attendance in care. That

is because the HRSA HAB outcome captures regular attendance in care, while the missed visits outcome relates to the “no show” phenomenon.

***Significant Findings from Research Question 2.*** The association between primary healthcare payer type and RiC (for both measures) was investigated in Research Question 2. The HRSA HAB measure is discussed first.

*HRSA HAB.* Patients with private insurance were significantly more likely to be RiC than patients with a public PPT or who were uninsured. The strongest associations were found with the RWHAP PPT, though. In fact, when compared to patients who were uninsured, patients with primary RWHAP had approximately 14 times the odds of being retained in the adjusted model, and 50 times the odds in the unadjusted model. When compared to patients with a private PPT, patients with primary RWHAP had marginally greater odds of being retained. Furthermore, patients with a public PPT had significantly lower odds of retention when compared to a RWHAP PPT, but statistically significant differences were not found between the public and private PPT. The fact that public and private insurance were not differentially associated with RiC helps to illustrate the importance of public insurance, especially in an era in which the role of Medicaid is under debate. None of the control variables were statistically significant in the adjusted models, except for age.

When an additional category was added for patients who obtained private insurance through ADAP (and who therefore went from being uninsured to being privately insured during the observation window), some interesting findings were discovered. Patients with RWHAP only were still most likely to be retained in care by HRSA HAB standards. However, patients with ADAP-funded private insurance were significantly more likely to be RiC than patients with

regular private insurance in the unadjusted model, and there were no significant differences between the two payer types in the adjusted model (see Tables S1.1 and S1.4, respectively, in Appendix E). This is a noteworthy and meaningful finding, since it provides excellent support for this study's central hypothesis: having a primary payer type has an unmistakable impact on retention in care, even for the 158 patients who went from being uninsured (without primary RWHAP) to having private insurance during the observation window.

While the exact magnitude of RiC's relationship with primary RWHAP care should be interpreted with caution due to very wide confidence intervals, these results still provide strong support for RWHAP's role in facilitating regular attendance in care (as measured by the HRSA HAB measure), especially in light of similar findings for supplementary RWHAP in Research Question 1.

*Missed Visits Dichotomous.* The RWHAP PPT was not significantly associated with the missed visits dichotomous measure in either the unadjusted or adjusted models. However, as expected, patients with a private PPT were more likely to be RiC than patients with a public PPT or who were uninsured. Control variables that were significantly associated with the missed visits outcome in Research Question 1 (when supplementary RWHAP services was the independent variable of interest) retained significance in the current models. Similar findings were found when the special ADAP-funded group was added to the model (Table S1.5). However, one important difference was that patients with ADAP-funded private insurance were significantly less likely to be retained in care than patients with regular private insurance. This was not expected, especially since ADAP-funded patients were more likely to be retained than other patients with private insurance (in the unadjusted model) when the HRSA HAB measure

was used. A potential reason for this could be due to the fact that changes in payer type might have caused short-term disruption in patients' attendance in care. This potential disruption would be more apparent when using one or more missed visits as the defining mechanism for retention in care.

***Significant Findings from Research Question 3.*** Research Question 3 investigated the relationship between RWHAP supplementary services and viral suppression. Results showed that even when controlling for sociodemographic characteristics, patients who received supplementary RWHAP were over 1.5 times more likely to be virally suppressed than patients without supplementary RWHAP services. Older age, higher monthly income, and white race (as compared to black/African American race) were also significantly associated with VS in the adjusted model.

As was the case with Research Question 1, significant findings from the adjusted model were not found for the unadjusted model. This means that without the inclusion of control variables, there was not a significant association between supplementary RWHAP services and viral suppression. Since bivariate analyses indicated that all of the control variables were significantly associated with viral suppression, their inclusion may have affected the relationship between supplementary RWHAP and VS.

It is also possible that one or more of the added control variables acted as a “suppressor,” which is a variable that, when added to a model, serves to increase the chance of finding a statistically significant association between the independent variable of interest and the dependent variable (Pandey & Elliott, 2010). To dispel any negative connotation, suppressor variables are also sometimes called “enhancer variables” (McFatter, 1979; Pandey & Elliott,

2010). In the current study, it is possible that one or more of the control variables “un-suppressed” the association between supplementary RWHAP services and viral suppression, which would account for the significant effect found in adjusted models. Sensitivity analyses (not shown) suggest that income most likely acted as a suppressor for the relationship between RWHAP supplementary services and the missed visits dichotomous and VS outcomes. This is because income was the only control variable whose addition to the original unadjusted model resulted in a significant association between RWHAP supplementary services and the two missed visits dichotomous RiC and VS outcomes.

It should also be noted that a significant association between supplementary RWHAP and VS was found in both the unadjusted and adjusted analyses when missing values for education, income, and VS were multiply imputed. Thus, expected results were found in the unadjusted multiple imputation model, but not the unadjusted non-imputed model.

***Significant Findings from Research Question 4.*** In Research Question 4, viral suppression served as the outcome and primary payer type was the independent variable of interest. Except for age and income, none of the control variables were significantly associated with VS in adjusted models. When compared to patients who were uninsured, patients with a private PPT had 3.5 times the odds of being virally suppressed; however, patients with a RWHAP or public PPT were not significantly more likely to be virally suppressed than patients who were uninsured. A public PPT, but not a RWHAP PPT, had lower estimated odds of viral suppression when compared to a private PPT.

In the supplementary analyses that examined patients who gained private insurance through ADAP during the observation window, patients with “regular” private insurance

remained most likely to be virally suppressed (Table S1.6, Appendix E). However, patients with ADAP-funded private insurance did not differ significantly from the other patients with private insurance. Furthermore, when compared to patients who were uninsured, patients with this payer type had 2.47 times the odds of being virally suppressed, with marginal significance. Again, it is notable that these patients had health outcomes that were nearly on par with patients who had private insurance all year long.

One possible interpretation of these results is that healthcare payer type is not as strongly associated with viral suppression as it is with retention in care. In particular, primary RWHAP care lacked the strong association with VS that it had for HRSA HAB measure of RiC. Also, since more patients in this sample achieved viral suppression (92.8%) than they did retention in care (77.2% and 65.7% for HRSA HAB and missed visits dichotomous measures, respectively), there may be additional factors that contribute to RiC outcomes that were not captured in this study.

Indeed, Diepstra and colleagues (2017) found similar results when investigating the relationship between health payer type and HIV health. In their study of PLWH in the US, patients who received RWHAP assistance were over 20 times more likely to be retained in care and four times more likely to be virally suppressed than patients who did not receive RWHAP assistance. Thus, it may be that the primary RWHAP payer type has a stronger association with RiC than with VS. In fact, as findings for Research Question 3 suggested, RWHAP care may have a stronger association with viral suppression in its supplementary capacity rather than through its primary care role.

*Significant Findings from Research Question 5.* Research Question 5 examined the association between combination payer type and RiC. The combination payer type variable was created in order to explore all possible payer type combinations and examine whether specific combinations were differentially associated with the outcome variables.

*HRSA HAB.* As it was hypothesized that the private insurance/supplementary RWHAP would be most likely to be associated with retention in care, this category served as the referent in analyses. In unadjusted models, patients in this category were significantly more likely to be retained in care than patients with any other single or combination payer type, except for patients with public insurance plus RWHAP supplementary services. Though not expected, patients with this payer type had over 2.5 times the odds of being RiC when compared to patients with the referent payer type.

Results from adjusted models were mostly similar. However, there was no longer a statistically significant difference between patients with RWHAP only and patients with private insurance and supplementary RWHAP; additionally, patients with public insurance plus RWHAP supplementary services were no longer significantly more likely to be RiC than patients in the referent group.

In unpacking these results, one possible explanation for the unanticipated outcomes associated with the public insurance plus RWHAP supplementary services payer type relates to healthcare changes experienced after the implementation of the ACA. Since nearly 200 patients gained private insurance in 2016 alone, it may be that some of the patients in the private insurance/supplementary RWHAP group experienced disruption in their regular appointment

schedule. Though this did not have a negative effect on viral suppression, as the results from Research Question 6 demonstrated, it may have still affected RiC, at least temporarily.

*Missed Visits Dichotomous.* When the missed visits dichotomous rather than HRSA HAB measure was used, there were fewer significant differences between payer type categories. In unadjusted models, patients with RWHAP only, public insurance alone, or those who were uninsured were significantly less likely to be retained in care than patients with private insurance plus RWHAP supplementary services. Almost no difference was found between patients with public insurance/supplementary RWHAP and patients with private insurance/supplementary RWHAP, which suggests that supplementary RWHAP, rather than the insurance type, is more strongly associated with retention in care. This is important, since these findings highlight RWHAP's role as a key supplementary provider to health insurance of all types.

In the adjusted model, there was no longer a significant difference between RWHAP only and private insurance plus supplementary RWHAP. As for the control variables, patients of an “other” race and those with higher monthly incomes were significantly more likely to be retained (as was found in the model in which primary payer type was the independent variable of interest). In some addition, patients whose education level was some college or higher were significantly more likely to be retained in care.

Altogether, the results from Research Question 5 seem to indicate that payer type has a stronger association with the HRSA HAB RiC outcome than with the missed visits dichotomous outcome.

***Significant Findings from Research Question 6.*** Research Question 6 explored the association between combination payer type and viral suppression. In the unadjusted model, the

private insurance plus RWHAP supplementary services payer type was significantly more likely to be associated with viral suppression than any of the other possible payer types, though the association with patients with private insurance was only marginally significant. The payer types for uninsured, private insurance only, and public insurance/supplementary RWHAP were no longer statistically significant in the adjusted model, however. Thus, findings in the current analysis do not reflect those previously found by Bradley and colleagues (2016), whose results indicated that patients with private insurance plus RWHAP supplementary services were significantly more likely to be virally suppressed than patients with private insurance only. While this may be due in part to the nature of the difference in samples (Bradley and colleagues used a more representative sample of PLWH in the US), these results may also provide further evidence that the relationship between payer type—whether single or combination—and viral suppression is not as strong as was predicted.

Even though patients with a combination of private insurance and supplementary RWHAP did not perform as well as expected, patients with public insurance and supplementary RWHAP performed much better than expected. Considering the suboptimal outcomes found when examining public insurance alone, these results are actually encouraging: supplementing insurance coverage with RWHAP, regardless of whether the insurance is public or private, is more important than the insurance type. Using this framing mechanism, results that at first seemed disparate actually serve to further the overarching conclusion of this study, which is that PLWH are optimally served by having both insurance and supplementary RWHAP care. Moreover, as was posited earlier, RWHAP may have a greater effect on HIV health outcomes in its supplementary rather than primary care role.

## **Synthesized Findings**

In sum, these findings suggest that RWHAP contributes to optimal HIV outcomes through its supplementary service role, more so than through its primary payer role.

Supplementary RWHAP services were associated with increased odds of viral suppression and both measures of retention in care. Furthermore, these findings suggest that healthcare payer type has a stronger association with retention in care than viral suppression, which may be due to the nature of these HIV health indicators: viral suppression reflects laboratory measures only, while retention indicators depend on appointment attendance and consistent involvement in care.

The services that RWHAP provides may be more fundamental in facilitating regular attendance to care for vulnerable or disadvantaged PLWH than for socially or economically advantaged PLWH. As Feller and Agins (2016) have discussed, PLWH with more resources may require fewer clinic visits and may maintain viral suppression even when they are not considered retained in care by HRSA HAB standards. The unique set of comprehensive services that RWHAP provides are likely more essential for PLWH who experience barriers to care than they are for PLWH who receive social and economic support outside of a clinic setting. Indeed, Castel and colleagues (2015) suggest the importance of comparing clinical RiC indicators with patients' own perceived level of engagement in HIV primary care, as PLWH are sometimes unaware that they would qualify as unretained in care by HRSA HAB or other standards, especially if they feel healthy.

## **Limitations**

This study has several limitations. First, the study sample is derived from preexisting clinical records data and, therefore, relies on secondary data. Some patients had missing

measures in their medical records and, although care was taken to fully assess the magnitude and mechanism of missing data, it still creates the possibility for bias. The housing variable, which was originally intended to be included in multivariable analyses as a control variable, was missing data for nearly 70% of patients and was, therefore, not included. Some patients were also missing VL data, and even though sensitivity analyses were conducted, it would have strengthened results to have had definitive values for these patients or to be able to confirm that they were, indeed, out of care as opposed to transferred to another clinic. Similarly, 35 patients who died during the observation window were excluded from the analytic sample based on an inability to determine whether they died from AIDS-related causes. This is a limitation that is intrinsic to all studies that rely on medical records data.

Two, the study sample comes from one HIV/AIDS clinic in one Southeastern state, and its findings may not be generalizable to PLWH at other clinics or in other states. One future research goal is to address potential interstate differences in HIV health outcomes with a multisite, multi-cohort design; however, it was outside the scope of the present study.

Three, all RiC-focused research is plagued by the fact that patients who are not in care cannot be measured. These patients are typically referred to as “lost-to follow-up” (LTFU) and may include patients who changed providers as well as patients who dropped out of care altogether (Dombrowski et al., 2017; Mugavero, Amico, Horn, & Thompson, 2013). As recommended by the IOM report (2012), one way that the field can address this vexing research conundrum is by increasing data interoperability (i.e., using equivalent or similar clinical measures and database systems) among disparate HIV surveillance systems. Another strategy used among some HIV researchers is the CDC’s (2015a) “Data to Care” intervention, which uses

a confidential code-based system to link clinic data to state public health department surveillance systems to ensure that patients who have fallen out of care can be contacted and re-linked to care and patients who have never received HIV care are shepherded through the linkage process. The Data to Care (D2C) strategy also facilitates appropriate description of patients who may have changed health providers rather than left care altogether, which is important because LTFU figures are often overestimated (Dombrowski et al., 2017). Although D2C will not be used in this dissertation study, it is an area of interest for future RiC research since it attends to the problem of patients who are LTFU.

Four, the independent variable of interest in this study, healthcare payer type, was observed over just one 12-month observation window. Therefore, this study design more closely reflects a cross-sectional rather than a longitudinal design. While approximately 9% of patients changed primary payer type within this 12-month period, it is likely that a longer observation window would have revealed additional changes in payer type and may have captured important relationships. A longitudinal study employing multiple observation windows might reveal important temporal trends not apparent in this study.

Five, the number of patients with a RWHAP primary care provider was considerably small: just 78 patients (2.5% of total sample) were in this category. Since this category was central to several of the study's research questions, it would not have made sense to regroup these patients. As a result, though the odds ratios (and accompanying confidence intervals) are quite large for the HRSA HAB retention in care outcome, it is likely that the actual effect size is smaller.

Finally, the study design was observational rather than causal, so only correlation-based conclusions are possible. Also, while several key patient-level characteristics were controlled for in analyses, there may be unexplained, uncaptured variance related to unmeasured characteristics. For example, housing type was excluded as a control variable in analyses due to a large percentage of missing data.

It should also be noted that although the public insurance primary payer type was not associated with optimal HIV health outcomes (which aligned with this study's hypotheses), the results may have been different had the data come from PLWH who lived in a Medicaid expansion state. Most patients with public insurance in the current study had Medicare via SSDI due to permanent disability and were, therefore, probably less healthy to begin with. Indeed, the study sample would have been more heterogeneous if PLWH who were newly-insured with Medicaid had been included. Although little has been published on how PLWH have reacted to Medicaid coverage eligibility in expansion states, findings from post-ACA implementation Kaiser Family Foundation brief suggest that the experience has been positive, especially for PLWH who have chronic health conditions in addition to HIV (Dawson, Kates, Udem, & Perry, 2015).

Despite its limitations, this study helps contribute to the still-nascent body of knowledge that explores how healthcare payer type is related to HIV health outcomes. In a time where RWHAP policy workgroups are preparing RWHAP reauthorization statements for Congress and the future of the ACA hangs in the balance, it is important that all stakeholders have access to data that help inform these policy decisions. Although the future of US healthcare policy and its impact on HIV access to care and health outcomes is uncertain, analyses can potentially shed

some light on how insurance programs and RWHAP can best complement each other in providing PLWH with the best possible care. Results from this study can also inform intervention strategies for social workers who assist PLWH in healthcare services enrollment and access.

### **Relevance to Social Work**

The results of this study have immense significance to social work. The National Association of Social Workers (NASW) lists healthcare reform as one of its primary policy advocacy issues and urges social workers to participate in advocacy efforts for Medicaid expansion (NASW, 2016). Health equity is one of the most important issues in the current political landscape and, judging from the hurdles encountered thus far in implementing affordable healthcare policy, it will continue to be an area where social workers are needed to fill advocacy roles. Even for PLWH who may be eligible for health insurance, lack of knowledge about how to enroll or other structural barriers may require social workers' expertise to help them navigate these barriers.

Without federal funding for HIV/AIDS care, a substantial segment of the US population stands to lose affordable access to care. Although the ACA showed initial promise in providing subsidized HIV care—if fully implemented—some states' continued resistance to Medicaid expansion limited the utility of the ACA in defraying costs for PLWH. Further, the very future of the ACA is also in doubt under the current administration. Since the populations most at risk for contracting HIV are also the ones least likely to have health insurance, the RWHAP has provided a critical bridge to care for uninsured and underinsured PLWH for over 30 years.

Moreover, social workers have been integral to the provision of RWHAP wraparound services since the program's inception, and their expertise in working with marginalized and/or vulnerable populations is as important now as ever. Indeed, the services that the RWHAP alone provides are perhaps most indispensable in facilitating access to and receipt of HIV care, which highlights the importance of research that investigates RWHAP's continued HIV healthcare payer role. By attending to the association between healthcare payer type and capturing RWHAP's versatility to fulfill either a primary or supplementary healthcare payer role, this study intends to elucidate the program's contribution to optimal healthcare outcomes. Further, since current discussion around RWHAP's reauthorization centers on its ability to effectively interface with other healthcare payers, current research that assesses whether RWHAP remains vital for both uninsured and underinsured PLWH will augment discussion on its future.

### **Future Directions**

The results of this study provide timely insight into the criticality of health payer type in contributing to HIV health outcomes. In particular, these findings strongly suggest that RWHAP supplementary services remain vital for PLWH. Even though a significant number of PLWH have gained public or private insurance under the ACA, results from the first nationally-representative Medical Monitoring Project survey conducted after implementation of the ACA indicate that reliance on RWHAP services has actually increased since 2012 (Kates & Dawson, 2017). Between 2012 and 2014, non-expansion states experienced a 13% increase in RWHAP enrollment, as the percentage of PLWH who received RWHAP services rose from 42% to 55%. Interestingly, although PLWH in expansion states did not increase RWHAP access overall, the percentage of PLWH with private insurance who received supplementary RWHAP services rose

significantly from 27% to 39% during this period (Kates & Dawson, 2017). In their discussion, Kates and Dawson (2017) emphasize that this growing reliance on RWHAP in spite of increased insurance coverage highlights a continued need among PLWH for the unique wraparound services that RWHAP provides.

The current study also suggests that the health disparities between black/African American and white patients which are consistently observed in health services research may be attenuated by RWHAP supplementary services. Though white patients had higher odds of being retained in care using the missed visits dichotomous measure in multivariable models when compared to black/African American patients, the difference was not statistically significant (Table 7). Moreover, when the HRSA HAB measure of RiC was used, black/African American patients actually had higher odds of RiC than white patients, though, again, the difference was not statistically significant (Table 6). This provides compelling support for RWHAP's ability to mitigate racial health disparities among PLWH as a supplementary service provider. Future research should attend more closely to the interface between race and RWHAP services and how this interaction affects retention in care.

Finally, this research indicates that PLWH who are uninsured and also who lack RWHAP coverage consistently face the worst health outcomes. Since all PLWH who receive their primary care via RWHAP are uninsured in the technical sense of the word, these PLWH are often grouped with PLWH who do not have any payer type for research purposes, when, instead, these PLWH may more accurately represent a particularly vulnerable group who could benefit from expert interventionist measures. It is likely that these uninsured PLWH who lack RWHAP are either unaware of the services available to them or have difficulty accessing these services due to

structural and/or individual-level barriers in Aday and Andersen's medical care access framework. Future research should carefully attend to these uninsured PLWH who are experiencing suboptimal health outcomes and help them access the full range of services for which they are eligible. These findings may also inform discussion surrounding the attainment of the 90-90-90 target for 2020. Additional research should investigate how healthcare payer type may contribute to reaching these outcomes.

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## APPENDIX A

Authorization for Use/Disclosure of Protected Health Information (PHI) for research

**University of Alabama at Birmingham**  
**AUTHORIZATION FOR USE/DISCLOSURE OF**  
**PROTECTED HEALTH INFORMATION (PHI) FOR RESEARCH**

Participant Name: \_\_\_\_\_

UAB IRB Protocol Number: \_\_\_\_\_

Research Protocol: \_\_\_\_\_

Principal Investigator: \_\_\_\_\_

Sponsor: \_\_\_\_\_

**What is the purpose of this form?** You are being asked to sign this form so that UAB may use and release your protected health information for research. Participation in research is voluntary. If you choose to participate in the research, you must sign this form so that your protected health information may be used for the research.

**Why do the researchers want my protected health information?** The researchers want to use your protected health information as part of the research protocol listed above and as described to you in the informed consent.

**What protected health information do the researchers want to use?** All medical information, including but not limited to information and/or records of any diagnosis or treatment of disease or condition, which may include sexually transmitted diseases (e.g., HIV, etc.) or communicable diseases, drug/alcohol dependency, etc.; all personal identifiers, including but not limited to your name, social security number, medical record number, date of birth, dates of service, etc.; any past, present, and future history, examinations, laboratory results, imaging studies and reports and treatments of whatever kind, including but not limited to drug/alcohol treatment, psychiatric/psychological treatment; financial/billing information, including but not limited to copies of your medical bills, and any other information related to or collected for use in the research protocol, regardless of whether the information was collected for research or non-research (e.g., treatment) purposes.

**Who will disclose, use and/or receive my protected health information?** All Individuals/entities listed in the informed consent documents, including but not limited to, the physicians, nurses and staff and others performing services related to the research (whether at UAB or elsewhere); other operating units of UAB, HSF, UAB Highlands, Children's of Alabama, Eye Foundation Hospital, and the Jefferson County Department of Health, as necessary for their operations; the IRB and its staff; the sponsor of the research and its employees and agents, including any CRO; and any outside regulatory agencies, such as the Food and Drug Administration, providing oversight or performing other legal and/or regulatory functions for which access to participant information is required.

**How will my protected health information be protected once it is given to others?** Your protected health information that is given to the study sponsor will remain private to the extent possible, even though the study sponsor is not required to follow the federal privacy laws. However, once your information is given to other organizations that are not required to follow federal privacy laws, we cannot assure that the information will remain protected.

**How long will this Authorization last?** Your authorization for the uses and disclosures described in this Authorization does not have an expiration date.

**Can I cancel this Authorization?** You may cancel this Authorization at any time by notifying the Principal Investigator, in writing, referencing the research protocol and IRB Protocol Number. If you cancel this Authorization, the study doctor and staff will not use any new health information for research. However, researchers may continue to use the protected health information that was provided before you cancelled your authorization.

**Can I see my protected health information?** You have a right to request to see your protected health information. However, to ensure the scientific integrity of the research, you will not be able to review the research information until after the research protocol has been completed.

Signature of participant: \_\_\_\_\_

Date: \_\_\_\_\_

or participant's legally authorized representative: \_\_\_\_\_

Date: \_\_\_\_\_

Printed Name of participant's representative: \_\_\_\_\_

Relationship to the participant: \_\_\_\_\_

APPENDIX B

Approval to Use 1917 Clinic Cohort Data

**DATE:** May 2, 2017

**TO:** UAB's Office of Institutional Review Board

**FROM:** Michael J. Mugavero, MD, MHSc

**RE: Expedited protocol for use with 1917 Clinic data: Verification for IRB approval of dissertation research:  
Healthcare Payer Type and HIV Health: A Retrospective Analysis**

As the Co-Director of the UAB Center for AIDS Research, I am writing to inform you that Emma Sophia Kay, MSW, has my permission to access 1917 Clinic data in accordance with the proposed protocol.

If you have any questions, please feel free to call me at (205) 996-5822.

Thank you.

Michael J. Mugavero, MD, MHSc  
Department of Medicine, Division of Infectious Diseases  
University of Alabama at Birmingham  
BBRB 206H  
845 19<sup>th</sup> Street South  
Birmingham, AL 35294-2170

APPENDIX C

University of Alabama at Birmingham IRB Approval Letter

Form 4: IRB Approval Form  
Identification and Certification of Research  
Projects Involving Human Subjects

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The Assurance number is FWA00005960 and it expires on November 8, 2021. The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56.

---

Principal Investigator: Kay, Emma S.  
Co-Investigator(s): Mugavero, Michael J  
Westfall, Andrew O  
Protocol Number: **X170522004**  
Protocol Title: *Healthcare Payer Type and HIV Health: A Retrospective Analysis*

---

The IRB reviewed and approved the above named project on 5/31/17. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This Project will be subject to Annual continuing review as provided in that Assurance.

This project received EXPEDITED review.

IRB Approval Date: 5-31-17

Date IRB Approval Issued: 5/31/17

IRB Approval No Longer Valid On: 5/31/18

HIPAA Waiver Approved?: Yes

---

Expedited Reviewer  
Member - Institutional Review Board  
for Human Use (IRB)

---

Investigators please note:

The IRB approved consent form used in the study must contain the IRB approval date and expiration date.

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.

**UAB IRB Approval of Waiver of Informed Consent and/or Waiver of Patient Authorization**

**Approval of Waiver of Informed Consent to Participate in Research.** The IRB reviewed the proposed research and granted the request for waiver of informed consent to participate in research, based on the following findings:

1. The research involves no more than minimal risk to the subjects.
2. The research cannot practicably be carried out without the waiver.
3. The waiver will not adversely affect the rights and welfare of the subjects.
4. When appropriate, the subjects will be provided with additional pertinent information after participation.

Check one:  and Waiver of Authorization (below)  
 or Waiver of Authorization (below)  
 Waiver of Authorization not applicable

**Approval of Waiver of Patient Authorization to Use PHI in Research.** The IRB reviewed the proposed research and granted the request for waiver of patient authorization to use PHI in research, based on the following findings:

1. The use/disclosure of PHI involves no more than minimal risk to the privacy of individuals
  - i. There is an adequate plan to protect the identifiers from improper use and disclosure.
  - ii. There is an adequate plan to destroy the identifiers at the earliest opportunity consistent with conduct of the research, unless there is a health or research justification for retaining the identifiers or such retention that is otherwise required by law.
  - iii. There is an assurance that the PHI will not be reused or disclosed to any other person or entity, except as required by law, for authorized oversight of the research study, or for other research for which the use or disclosure of PHI would be permitted.
2. The research cannot practicably be conducted without the waiver or alteration.
3. The research cannot practicably be conducted without access to and use of the PHI.

—OR—

**Full Review**

The IRB reviewed the proposed research at a **convened meeting** at which a majority of the IRB was present, including one member who is not affiliated with any entity conducting or sponsoring the research, and not related to any person who is affiliated with any of such entities. The waiver of authorization was approved by the majority of the IRB members present at the meeting.

Date of Meeting

Signature of Chair, Vice-Chair or Designee

Date

**Expedited Review**

The IRB used an **expedited review procedure** because the research involves no more than minimal risk to the privacy of the individuals who are the subject of the PHI for which use or disclosure is being sought. The review and approval of the waiver of authorization were carried out by the Chair of the IRB, or by one of the Vice-Chairs of the IRB as designated by the Chair of the IRB.

5-31-17  
Date of Expedited Review

Signature of Chair, Vice-Chair or Designee

Date 5-31-17  
The University of  
Alabama at Birmingham  
Mailing Address:  
AB 470  
1720 2ND AVE S  
BIRMINGHAM AL 35294-0104

APPENDIX D

University of Alabama IRB Approval Letter

July 21, 2017

Emma Sophia Kay, MSW  
School of Social Work  
The University of Alabama  
Box 870314

Re: IRB # 17-OR-239-ME: "Healthcare Payer Type and HIV Health: A Retrospective Analysis"

Dear Ms. Kay,

The University of Alabama Institutional Review Board has granted approval for your proposed research. Your application has been given expedited approval according to 45 CFR part 46. You have also been granted a waiver of consent and HIPAA authorization. Approval has been given under expedited review category 5 as outlined below:

*(5) Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for non-research purposes (such as medical treatment or diagnosis).*

**Your approval will expire on July 20, 2018.** If the study continues beyond that date, you must complete and submit the Renewal Form within e-Protocol. If you modify the application, please submit the Revision Form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete the Final Report Form.

Should you need to submit any further correspondence regarding this application, please include the assigned IRB approval number. Good luck with your research.

Sincerely,

Carpatato T. Myles, MSM, CIM, CIP  
Director & Research Compliance Officer  
Office for Research Compliance

cc: Dr. Brenda Smith

APPENDIX E

Supplement 1

Inclusion of ADAP-Funded Private Insurance Category

Table S1.1. Unadjusted Odds Ratios for being Retained in Care (HRSA HAB Measure) by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=3146)

Characteristic	Mod. 1	OR (95% CI)	<i>p</i>	Mod . 2	OR (95% CI)	<i>p</i>	Mod. 3	OR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		5.14 (3.77-7.01)	<.001		<b>0.10</b> (0.02-0.42)	.002		<b>1.10</b> (0.90-1.33)	.34
Private Insurance		<b>4.68</b> (3.50-6.27)	<.001		<b>0.09</b> (0.2-0.38)	.001		Ref.	
ADAP Private Insurance		<b>10.04</b> (6.02-16.73)	<.001		<b>0.20</b> (0.05-0.87)	.03		<b>2.14</b> (1.37-3.36)	.001
RWHAP Primary		<b>50.13</b> (12.0-209.34)	<.001		Ref.			<b>10.71</b> (2.62-43.81)	.001
Uninsured (No PPT)		Ref.			<b>0.02</b> (0.005-0.08)	<.001		<b>0.21</b> (0.16-0.29)	<.001

Table S1.2. Unadjusted Odds Ratios for being Retained in Care (Missed Visits Dichotomous Measure) by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=3146)

Characteristic	Mod 1	OR (95% CI)	<i>p</i>	Mod. 2	OR (95% CI)	<i>p</i>	Mod. 3	OR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		<b>1.66</b> (1.23-2.22)	.001		1.0 (0.52-1.60)	.98		<b>0.65</b> (0.41-1.05)	<.001
Private Insurance		<b>2.52</b> (1.90-3.56)	<.001		1.52 (0.95-2.44)	.08		Ref.	
ADAP Private Insurance		0.79 (0.53-1.16)	.22		<b>0.47</b> (0.28-0.81)	.006		<b>0.31</b> (0.23-0.42)	<.001
RWHAP Primary		1.66 (0.98-2.82)	.06		Ref.			0.66 (0.41-1.05)	.08
Uninsured (No PPT)		Ref.			.60 (.35-1.02)	.06		<b>0.40</b> (0.30-0.53)	<.001

Table S1.3. Unadjusted Odds Ratios for being Virally Suppressed by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=2886)

Characteristic	Mod 1	OR (95% CI)	<i>p</i>	Mod 2	OR (95% CI)	<i>p</i>	Mod 3	OR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		<b>2.95</b> (1.90-4.59)	.001		0.93 (0.42-2.09)	.86		<b>0.42</b> (0.30-0.59)	<.001
Private Insurance		<b>6.95</b> (4.43-10.92)	<.001		2.19 (0.97-4.95)	.06		Ref.	
ADAP Private Insurance		<b>4.77</b> (2.37-9.56)	<.001		1.50 (0.57-3.97)	.41		0.69 (0.36-1.29)	.24
RWHAP Primary		<b>3.17</b> (1.34-7.52)	.009		Ref.			0.46 (0.20-1.03)	.06
Uninsured (No PPT)		Ref.			<b>0.32</b> (0.13-0.75)	.009		<b>0.14</b> (0.09-0.23)	<.001

Table S1.4. Adjusted Odds Ratios for being Retained in Care (HRSA HAB Measure) by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=1169)

Characteristic	Mod. 1	AOR (95% CI)	<i>p</i>	Mod. 2	AOR (95% CI)	<i>p</i>	Mod. 3	AOR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		1.61 (0.83-3.10)	.16		<b>0.11</b> (0.01-0.88)	.04		0.92 (0.60-1.42)	.72
Private Insurance		1.74 (0.95-3.19)	.07		<b>0.12</b> (0.02-0.94)	.04		Ref.	
ADAP Private Insurance		<b>3.06</b> (1.30-7.16)	.01		0.22 (0.03-1.79)	.16		1.76 (0.87-3.57)	.12
RWHAP Primary		<b>14.15</b> (1.79-111.71)	.01		Ref.			<b>8.14</b> (1.07-62.13)	.04
Uninsured (No PPT)		Ref.			<b>0.07</b> (0.009-0.56)	.01		0.58 (0.31-1.06)	.07
<b>Gender</b>									
Male		0.79 (0.51-1.21)	.28						
Female		Ref.							
<b>Race/Eth.</b>									
Black/AA		Ref.							
White		0.75 (0.48-1.17)	.21						
Other		1.41 (0.40-4.98)	.59						
Monthly Income (Per 100 Dollars)		1.00 (1.00-1.00)	.26						
Age (in years)		<b>1.03</b> (1.02-1.05)	<.001						
<b>Highest Ed.</b>									
Less than HS		Ref.							
HS or GED		0.92 (0.58-1.46)	.73						
Some College		1.09 (0.59-2.00)	.78						
College or Higher		0.76 (0.37-1.56)	.45						

Table S1.5. Adjusted Odds Ratios for being Retained in Care (Missed Visits Dichotomous Measure) by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=1169)

Charact.	Mod 1	AOR (95% CI)	<i>p</i>	Mod 2	AOR (95% CI)	<i>p</i>	Mod 3	AOR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		1.25 (0.73-2.16)	.41		0.79 (0.39-1.62)	.52		<b>0.68</b> (0.51-0.91)	.01
Private Insurance		<b>2.06</b> (1.06-2.98)	.00		1.30 (0.65-2.61)	.46		Ref.	
ADAP Private Insurance		0.94 (0.50-1.77)	.84		0.59 (0.27-1.29)	.19		<b>0.45</b> (0.29-0.71)	.001
RWHAP Primary		1.58 (0.72-3.51)	.26		Ref.			0.77 (0.38-1.54)	.46
Uninsured (No PPT)		Ref.			0.63 (0.28-1.40)	.26		<b>0.48</b> (0.29-0.71)	.006
<b>Gender</b>									
Male		0.93 (0.70-1.24)	.62						
Female		Ref.							
<b>Race/Eth.</b>									
Black/AA		Ref.							
White		1.25 (0.89-1.74)	.20						
Other		<b>2.68</b> (1.21-5.94)	.02						
Monthly Income (Per 100 Dollars)		1.03 (1.02-1.05)	<.001						
Age (in years)		<b>1.03</b> (1.02-1.04)	<.001						
<b>Highest Ed.</b>									
Less than HS		Ref.							
HS or GED		1.25 (0.92-1.71)	.16						
Some College		<b>1.66</b> (1.10-2.50)	.02						
College or Higher		<b>2.89</b> (1.61-5.20)	<.001						

Table S1.6. Adjusted Odds Ratios for being Virally Suppressed by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=1159)

Charact.	Mod 1	AOR (95% CI)	<i>p</i>	Mod 2	AOR (95% CI)	<i>p</i>	Mod 3	AOR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		1.38 (0.69-2.77)	.37		0.56 (0.18-1.82)	.34		<b>0.36</b> (0.21-0.62)	<.001
Private Insurance		<b>3.81</b> (1.89-7.68)	<.001		1.56 (0.49-5.01)	.45		Ref.	
ADAP Private Insurance		2.47 (1.01-6.06)	.05		1.01 (0.28-3.67)	.98		0.65 (0.29-1.45)	.29
RWHAP Primary		2.44 (0.73-8.11)	.15		Ref.			0.64 (0.20-2.05)	.45
Uninsured (No PPT)		Ref.			0.41 (0.12-1.36)	.15		<b>0.26</b> (0.13-0.53)	<.001
<b>Gender</b>									
Male		1.25 (0.78-2.10)	.36						
Female		Ref.							
<b>Race/Eth.</b>									
Black/AA		Ref.							
White		1.91 (0.95-3.85)	.07						
Other		2.96 (0.65-13.54)	.17						
<b>Monthly Income</b> (Per 100 Dollars)		1.06 (1.02-1.10)	<.001						
<b>Age</b> (in years)		<b>1.03</b> (1.02-1.04)	<.001						
<b>Highest Ed.</b>									
Less than HS		Ref.							
HS or GED		0.94 (0.56-1.56)	.81						
Some College		1.35 (0.63-2.88)	.44						
College or Higher		0.89 (0.32-2.53)	.83						

Appendix F

Supplement 2

Multivariable Analyses without Inclusion of Education Variable

Table S2.1. Adjusted Odds Ratios for being Retained in Care (HRSA HAB Measure) by Receipt of Ryan White HIV/AIDS Program Supplementary Services among Patients Receiving HIV Primary Care Services in 2016 (n=2288)

Characteristic	AOR (95% CI)	<i>p</i>
<b>RWHAP Supp.</b>		
Yes	<b>2.84</b> (2.13-3.78)	<.001
No	Ref.	
<b>Gender</b>		
Male	0.91 (0.68-1.23)	.52
Female	Ref.	
<b>Race/Eth.</b>		
Black/AA	Ref.	
White	<b>0.75</b> (0.57-0.99)	.04
Other	1.44 (0.51-4.11)	.49
<b>Monthly Income (Per 100 Dollars)</b>	1.02 (1.02-1.03)	.05
<b>Age (in years)</b>	<b>1.03</b> (1.02-1.04)	<.001

Table S2.2. Adjusted Odds Ratios for being Retained in Care (Missed Visits Dichotomous Measure) by Receipt of Ryan White HIV/AIDS Program Supplementary Services among Patients Receiving HIV Primary Care Services in 2016 (n=2288)

Characteristic	AOR (95% CI)	<i>p</i>
<b>RWHAP Supp.</b>		
Yes	<b>1.38</b> (1.77-4.01)	.001
No	Ref.	
<b>Gender</b>		
Male	1.01 (0.82-1.24)	.94
Female	Ref.	
<b>Race/Eth.</b>		
Black/AA	Ref.	
White	<b>1.59</b> (1.29-1.96)	<.001
Other	<b>2.55</b> (1.35-4.79)	.004
<b>Monthly Income</b> (Per 100 Dollars)	<b>1.05</b> (1.03-1.06)	<.001
<b>Age</b> (in years)	<b>1.04</b> (1.03-1.04)	<.001

Table S2.3. Adjusted Odds Ratios for being Virally Suppressed by Receipt of Ryan White HIV/AIDS Program Supplementary Services among Patients Receiving HIV Primary Care Services in 2016 (n=2273)

Characteristic	AOR (95% CI)	<i>p</i>
<b>RWHAP Supp.</b>		
Yes	<b>1.54</b> (1.09-2.12)	.01
No	Ref.	
<b>Gender</b>		
Male	<b>1.54</b> (1.09-2.17)	.02
Female	Ref.	
<b>Race/Eth.</b>		
Black/AA	Ref.	
White	<b>1.81</b> (1.18-2.78)	.006
Other	1.90 (0.58-6.28)	.29
<b>Monthly Income</b> (Per 100 Dollars)	<b>1.06</b> (1.03-1.08)	<.001
<b>Age (in years)</b>	<b>1.03</b> (1.02-1.05)	<.001

Table S2.4. Adjusted Odds Ratios for being Retained in Care (HRSA HAB Measure) by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=2288)

Charact.	Mod 1	AOR (95% CI)	<i>p</i>	Mod 2	AOR (95% CI)	<i>p</i>	Mod 3	AOR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		<b>2.40</b> (1.50-3.83)	<.001		<b>0.15</b> (0.04-0.64)	.01		0.84 (0.63-1.11)	.23
Private Insurance		<b>2.86</b> (1.85-4.43)	<.001		<b>0.18</b> (0.04-0.75)	.02		Ref.	
RWHAP Primary		<b>15.91</b> (3.68-68.69)	<.001		Ref.			<b>5.56</b> (1.33-23.23)	.02
Uninsured (No PPT)		Ref.			<b>0.06</b> (0.01-0.27)	<.001		<b>0.35</b> (0.23-0.54)	<.001
<b>Gender</b>									
Male		0.92 (0.68-1.23)	.56						
Female		Ref.							
<b>Race/Eth.</b>									
Black/AA		Ref.							
White		<b>0.73</b> (0.56-0.97)	.03						
Other		1.88 (0.64-5.51)	.25						
<b>Monthly Income</b> (Per 100 Dollars)		1.01 (0.99-1.02)	.39						
<b>Age</b> (in years)		<b>1.03</b> (1.02-1.04)	<.001						

Table S2.5. Adjusted Odds Ratios for being Retained in Care (Missed Visits Dichotomous) by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=2288)

Charact.	Model 1	AOR (95% CI)	<i>p</i>	Model 2	AOR (95% CI)	<i>p</i>	Model 3	AOR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		<b>1.69</b> (1.11-2.59)	.02		0.66 (0.39-1.12)	.12		<b>0.71</b> (0.58-0.87)	.001
Private Insurance		<b>2.37</b> (1.58-3.57)	<.001		0.92 (0.55-1.54)	.76		Ref.	
RWHAP Primary		<b>2.57</b> (1.39-4.76)	.003		Ref.			1.08 (0.65-1.81)	.76
Uninsured (No PPT)		Ref.			<b>0.39</b> (0.21-0.72)	.003		<b>0.42</b> (0.28-0.63)	<.001
<b>Gender</b>									
Male		1.01 (0.82-1.23)	.96						
Female		Ref.							
<b>Race/Eth.</b>									
Black/AA		Ref.							
White		<b>1.54</b> (1.25-1.90)	<.001						
Other		<b>3.03</b> (1.56-5.87)	.001						
<b>Monthly Income</b> (Per 100 Dollars)		1.04 (1.03-1.05)	.26						
<b>Age</b> (in years)		<b>1.04</b> (1.03-1.05)	<.001						

Table S2.6. Adjusted Odds Ratios for being Virally Suppressed by Primary Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=2273)

Charact.	Mod 1	AOR (95% CI)	<i>p</i>	Mod 2	AOR (95% CI)	<i>p</i>	Mod 3	AOR (95% CI)	<i>p</i>
<b>PPT</b>									
Public Insurance		<b>1.85</b> (1.08-3.17)	.02		0.70 (0.29-1.66)	.41		<b>0.45</b> (0.31-0.65)	<.001
Private Insurance		<b>4.10</b> (2.44-6.89)	<.001		1.54 (0.65-3.62)	.32		Ref.	
RWHAP Primary		<b>2.67</b> (1.08-3.17)	.03		Ref.			0.65 (0.28-1.53)	.32
Uninsured (No PPT)		Ref.			<b>0.38</b> (0.15-0.93)	.03		<b>0.24</b> (0.15-0.41)	<.001
<b>Gender</b>									
Male		<b>1.52</b> (1.07-2.16)	.02						
Female		Ref.							
<b>Race/Eth.</b>									
Black/AA		Ref.							
White		<b>1.70</b> (1.11-2.61)	.02						
Other		2.75 (0.81-9.41)	.11						
<b>Monthly Income</b> (Per 100 Dollars)		<b>1.05</b> (1.02-1.07)	<.001						
<b>Age</b> (in years)		<b>1.03</b> (1.02-1.05)	<.001						

Table S2.7. Adjusted Odds Ratios for being Retained in Care (HRSA HAB Measure) by Combination Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=2288)

Characteristic	AOR (95% CI)	<i>p</i>
<b>Combination Payer Type</b>		
Public Insur. + RWHAP Supp.	<b>2.32</b> (1.09-4.94)	.03
Private Insur. + RWHAP Supp	Ref.	
Public Insur. Only	<b>0.27</b> (0.17-0.41)	<.001
Private Insur. Only	<b>0.41</b> (0.27-0.61)	<.001
Uninsured	<b>0.14</b> (0.06-0.32)	<.001
RWHAP Only	<b>0.40</b> (0.23-0.71)	.002
<b>Gender</b>		
Male	0.92 (0.68-1.25)	.60
Female	Ref.	
<b>Race/Eth.</b>		
Black/AA	Ref.	
White	<b>0.72</b> (0.55-0.95)	.02
Other	2.17 (0.74-6.35)	.16
<b>Monthly Income</b> (Per 100 Dollars)	1.01 (0.99-1.02)	.23
<b>Age</b> (in years)	<b>1.03</b> (1.01-1.04)	<.001

Table S2.8. Adjusted Odds Ratios for being Retained in Care (Missed Visits Dichotomous Measure) by Combination Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=2288)

Characteristic	AOR (95% CI)	<i>p</i>
<b>Combination Payer Type</b>		
Public Insur. + RWHAP Supp.	0.79 (0.58-1.09)	.15
Private Insur. + RWHAP Supp.	Ref.	
Public Insur. Only	<b>0.48</b> (0.36-0.63)	<.001
Private Insur. Only	<b>0.73</b> (0.56-0.93)	.01
Uninsured	<b>0.28</b> (0.13-0.61)	.001
RWHAP Only	<b>0.55</b> (0.37-0.82)	.003
<b>Gender</b>		
Male	1.01 (0.82-1.24)	.92
Female	Ref.	
<b>Race/Eth.</b>		
Black/AA	Ref.	
White	<b>1.54</b> (1.25-1.90)	<.001
Other	<b>3.21</b> (1.65-6.23)	.001
<b>Monthly Income</b> (Per 100 Dollars)	<b>1.04</b> (1.03-1.05)	<.001
<b>Age</b> (in years)	<b>1.04</b> (1.03-1.05)	<.001

Table S2.9. Adjusted Odds Ratios for being Virally Suppressed by Combination Healthcare Payer Type among Patients Receiving HIV Primary Care Services in 2016 (n=2273)

Characteristic	AOR (95% CI)	<i>p</i>
<b>Combination Payer Type</b>		
Public Insur. + RWHAP Supp.	<b>0.41</b> (0.20-0.83)	.02
Private Insur. + RWHAP Supp.	Ref.	
Public Insur. Only	<b>0.19</b> (0.10-0.35)	<.001
Private Insur. Only	<b>0.41</b> (0.22-0.75)	.004
Uninsured	<b>0.19</b> (0.06-0.57)	.003
RWHAP Only	<b>0.17</b> (0.09-0.34)	<.001
<b>Gender</b>		
Male	<b>1.54</b> (1.08-2.20)	.02
Female	Ref.	
<b>Race/Eth.</b>		
Black/AA	Ref.	
White	<b>1.70</b> (1.11-2.62)	.02
Other	3.46 (1.01-11.85)	.05
<b>Monthly Income</b> (Per 100 Dollars)	<b>1.05</b> (1.03-1.08)	<.001
<b>Age</b> (in years)	<b>1.03</b> (1.02-1.05)	<.001