COMMUNITY AND INDIVIDUAL FACTORS THAT INFLUENCE HOUSING NEED AMONG LOW-INCOME PERSONS LIVING WITH HIV/AIDS

by

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ABSTRACT

The objective of this research was to study the influence of individual- and community-level conditions on the housing needs among low-income persons living with HIV/AIDS (PLWHA). Secondary data analysis was conducted on HIV/AIDS housing survey data collected in 2006 in a four-county metropolitan area. The study sample consisted of 384 low-income PLWHA living in 78 ZIP Code areas. Community-level data were compiled from 2000 Decennial Census, U.S. Department of Housing and Urban Development, U.S. Department of Agriculture, and other affordable housing databases. Using hierarchical linear modeling, two housing need outcome variables (a) need for housing assistance and (b) housing stability were studied.

The first research question concerned the influence of individual conditions (socio-demographics, housing situations, and social histories) on housing need. In predicting need for housing assistance, none of the socio-demographics of age, gender, race, or ethnicity was a significant predictor of housing need. Of the housing situation predictors (housing burden, household composition, potential impact of rent increase, housing subsidy), only housing burden was a statistically significant predictor. Lastly, considering social history (work status, history of homelessness, mental illness and substance use history), a history of homelessness and substance use history were significant predictors. Only a history of homelessness statistically significantly predicted housing stability.

The second research question concerned the influence of the community conditions of distress, degree of rurality, and social infrastructure on housing need. All the community predictors, except number of affordable housing units (a measure of social infrastructure), were statistically significant predictors of need for housing assistance. None of the community variables was a statistically significant predictor of housing stability. The findings suggest that community conditions are associated with the need for housing assistance. The third research question concerned interactions between the individual- and community-level conditions. The relationship between history of homelessness and need for housing assistance was stronger in areas where there were more affordable housing. The findings of the study support the conclusion that both individual and community conditions are associated with housing need among PLWHA. The report concludes with a discussion of these results and offers implications for social work practice, policy, and research.

DEDICATION

This dissertation is dedicated to everyone who helped, guided, and supported me through this process. In particular, it is dedicated to my parents, who have supported and encouraged me to attempt and achieve the very best. My dad has shown me how precious life and family really are and that it never too late for new beginnings. My mom has been my constant encourager and faithful friend. This dissertation is for both of you. Without your love and support it would have never been possible.

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LIST OF ABBREVIATIONS AND SYMBOLS

a	Cronbach's index of internal consistency
AIC	Akaike Information Criterion model fit test for HLM
β	Standardized multiple regression coefficient
β_{0j}	The intercept for the dependent variable in group j (level-two; HLM)
β_{0j}	The slope for the relationship in group j (level-two) between the dependent variable and the level-one predictor (HLM)
Coef.	Coefficient
Dev.	Deviance; model fit test for HLM
df	Degrees of freedom: number of values free to vary after certain restrictions have been placed on the data
e_{ij}	Random error of prediction for the level-one equation (sometimes called r_{ij}; HLM)
F	Fisher's *F* ratio: A ration of two variances
γ_{00}	The overall intercept; the grand mean of the dependent variable scores across all groups when all predictors = 0 (level-two; HLM)
γ_{01}	The overall regression coefficient for the relationship (slope) between a level-two predictor and the dependent variable (level-two; HLM)
γ_{10}	The overall regression coefficient for the relationship (slope) between a level-one predictor and the dependent variable (level-two; HLM)
HOPWA	Housing Opportunities for Persons with AIDS
HUD	U.S. Department of Housing and Urban Development

M	Mean: the sum of a set of measurements divided by the number of measurements in the set
p	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value; intraclass correlation coefficient
PLWHA	Persons living with HIV/AIDS
r	Pearson product-moment correlation
R^2	Multiple correlation squared; measure of strength of relationship
SD	Standard deviation
SE	Standard error (of measurement)
σ^2	Within group variance (level-one; HLM)
t	Computed value of t test
τ (tau)	Variance-covariance matrix for the estimates of the values of random error components
τ_{00}	Between group variance (level-two; HLM)
u_{oj}	Random error component for the deviation of the intercept of a group from the overall intercept; the unique effect of Group j on the intercept (level-two; HLM)
u_{1j}	An error component for the slope; the deviation of the group slopes from the overall slope; also the unique effect of Group j on slope when the value of the level-two predictor W is zero (level-two; HLM)
USDA	U.S. Department of Agriculture
VC	Variance component (HLM)
X^2	Computed value of a chi-square test
X_{ij}	A level-one predictor
Y_{ij}	Dependent variable score for a case at level-one, i indexes the individual with a group, j indexes the group
<	Less than
=	Equal to

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CHAPTER 1

INTRODUCTION

HIV/AIDS incidence rates are rising in the South; however the resources to provide adequate housing, supportive services, and healthcare are disproportionately lower than in other parts of the U.S. (Southern AIDS Coalition, 2003, 2008). Although research has shown that stable housing has a positive effect on health outcomes among persons living with HIV/AIDS (PLWHA) (Aidala, Lee, Abramson, Messeri, & Siegler, 2007; Leaver, Bargh, Dunn, & Hwang, 2007) these studies have been conducted in large metropolitan areas with little attention paid to the rural areas of the South. Further, research remains focused on the individual life situations of PLWHA without consideration of the community conditions that influence their need for housing and their health. This following chapter outlines the purpose of study and the need for HIV/AIDS housing research, the significance of the study, and an overview of key terms used throughout the study.

Purpose and Need

The purpose of this research study is to examine the relationship between the housing need of low-income PLWHA and the community- and individual-level conditions that are believed to influence housing need. Most research on the housing need of persons living with HIV/AIDS has not focused on the determinants of housing need but rather on the relationship among housing status and individual health outcomes such as engagement in care, access to care,

or medication adherence. This research study will explore the community and individual conditions that influence housing need as well as how these conditions are related to each other. The goal is that such an understanding will better inform social work practice and policy to improve the overall housing and health outcomes of PLWHA.

HIV/AIDS related research is often medically oriented and is heavily focused on medical outcomes. The relatively small pool of housing focused research on PLWHA has been growing over the past few years. In November 2007, *AIDS and Behavior* released a special supplemental journal on housing and HIV/AIDS at the behest of the National AIDS Housing Coalition (NAHC). Over the past three years NAHC has hosted a series of research summits to provide a forum for researchers and practitioners to discuss findings related to housing and PLWHA. This research links stable housing to HIV prevention and to positive HIV treatment and health outcomes.

Through NAHC's research, areas for future study have been identified, including research that examines conditions outside of metropolitan epicenters of the HIV/AIDS epidemic (Aidala et al., 2007; Leaver et al., 2007; Southern AIDS Coalition, 2008). More studies that examine the influence of local community conditions on housing need and health outcomes among persons living with HIV/AIDS are needed (Elifson, Sterk, & Theall, 2007; Leaver et al., 2007). Areas of the Deep South, including rural areas, need further examination especially to more fully understand the contextual conditions that influence HIV transmission and access to care (Reif, Geonnotti, & Whetten, 2006; Southern AIDS Coalition, 2003, 2008).

As research is linking stable housing to improved access to care among persons living with HIV (Aidala, 2004, 2007; Aidala et al., 2007; Leaver et al., 2007), a more complete understanding of what constitutes and creates housing need is important. What factors are related

to or even determine that a housing need exists? An obvious void in the research is the connection between individual housing need and the community conditions that exist where a person lives (Elifson et al., 2007; Leaver et al., 2007). Communities of poverty, low education, or high unemployment can create environments that restrict housing options and exacerbate the housing need of a family. Such community factors have been linked to increasing incidence rates of HIV/AIDS (Adimora & Schoenbach, 2002, 2005; Peterman, Lindsey, & Selik, 2005); however little research has examined this relationship in the context of housing. Few research studies have explored the community or individual conditions related to housing need, much less how these factors influence and relate to one another.

Overview of Theoretical Approach and Methodology

Using a modification of a social environmental and health outcome model presented by Anderson et al (2003), this study considers individual- and community-level conditions, their influence on housing need, and ultimately their influence on health outcomes among PLWHA. Within the research model, individual-level conditions like housing situation and social history can influence housing need. An individual's housing situation includes the amount paid for housing related costs as compared to income (referred to as housing burden), the household composition, the influence of a rent increase, and the receipt of a housing subsidy. A history of unemployment, homelessness, mental health or substance use issue, are all individual social histories that may increase housing need, especially among PLWHA. In addition to individual housing situations and social histories, the study will examine socio-demographics characteristics of age, gender, race, and ethnicity that have been tied to housing need, especially among low-income PLWHA.

In addition to individual-level conditions, community-level conditions can also influence housing need. Community-level conditions like community distress, degree of rurality, and the existence of social infrastructure can also influence housing need. The distress of a community is measured by the rates of poverty, unemployment, low-educational attainment, and housing stress that exist among its citizens. An individual living in a highly distressed area may experience greater housing need; however the influence of these community conditions may be offset by the availability of community assets. A community's social infrastructure, in this research study measured by the availability of a HIV/AIDS service provider and affordable housing units, are community assets that may reduce the influence of community distress. Further, an individual's housing situation or social history may lessen or heighten the influence of community conditions and ultimately an individual's housing need. It is in the context of these community- and individual-level conditions that housing need among low-income PLWHA is examined.

Definitions of Key Terms

It is important at this point to define a few key terms that are used throughout the study. Terms are presented in a conceptual, rather than alphabetical order, following the Community Research Model which is discussed in more detail in Chapter 2. In addition to the following definitions, a discussion of the research literature related to key study terms can be found in Chapter 2 and operational definitions can be found in Chapter 3.

General Terms

Low-income. An individual or household earning no more than 80 percent of Area Median Income (AMI) as defined by the 2006 HUD income limits (HUD User, 2006).

Housing need. An individual with housing need is either determined to be unstably housed or is one who reports a self-defined need for housing assistance. An unstably housed individual is a person who is living in an abandoned building, other public place, on the street, shelter, living in someone else's home, group home, temporary housing, treatment facility, halfway house, hospital, or jail. A person who needs housing assistance is one who reports a strong need for (a) help paying rent, (b) help paying utilities, (c) help paying security and/or utility deposits, and/or (d) help in finding permanent housing.

Individual-level Terms

The following individual-level terms were conceptualized using available data collected through the Tampa Metropolitan Statistical Area (MSA) HIV/AIDS Housing Survey discussed further in Chapter 3.

Individual condition. A term used in the Community Research Model, the guiding theoretical model of this research (See Figure 1, Chapter 2), to describe the individual context or the individual characteristics of PLWHA. Examples of such conditions include socio-demographics (age, race, gender), housing situation, and social history.

Housing situation. A term encompassing four housing conditions including the percentage of housing related costs as compared to income (housing burden); impact of a potential rent increase; receipt of a housing subsidy; and household composition. Affordability of an individual's housing is measured by an individual's housing burden and the potential effect of a rent increase (see below).

Housing burden. A housing affordability measure that considers the percentage of housing costs (i.e. rent and utilities) in proportion to income. HUD defines paying no more than 30 percent of income toward housing costs as affordable (U.S. Department of Housing and

Urban Development, 2009a). Paying over 30 percent is considered housing burdened; paying over 50 percent is extremely housing burdened.

Potential rent increase. A self-reported amount of rent increase that would require a survey respondent to move. A low rent increase (i.e., $0-$50) that would require a move indicates that housing is unaffordable.

Social history. Individual situations like unemployment, history of homelessness, or mental health or substance use issues that may jeopardize a person's ability to maintain housing.

Community-level Terms

The following community-level terms were conceptualized using available data from the 2000 Decennial Census (United States Census Bureau, 2000).

ZIP Code Tabulation Area (ZCTA). An aggregation of Census blocks with addresses that contain the same ZIP Code (U.S. Census Bureau, 2008). The ZCTA estimates a U.S. Postal Service ZIP Code service area. All community-level data were collected for each ZCTA. The ZCTA was used to match community-level data to the ZIP Code of residence of respondents to the HIV/AIDS Housing Survey.

Community condition. A term used in the Community Research Model (See Figure 1, Chapter 2) to describe the environmental context or the community characteristics that PLWHA live. In the study, the community condition is descriptive of the ZCTA where respondents to the HIV/AIDS Housing Survey live. The term is synonymous with environment or social environment, which are used to describe the broader community conditions that may exist.

Community distress. A ZCTA with higher than average rates of poverty, unemployment, low-educational attainment, and housing stress (defined below) as determined by the 2000 Decennial Census (United States Census Bureau, 2000).

Housing stress. Percentage of owner- and renter-occupied housing units having at least one of the following conditions: lacking complete plumbing or kitchen, having 1.01 or more occupants per room, and housing costs as a percentage of income greater than 30 percent as defined by 2000 Decennial Census (United States Census Bureau, 2000).

Rural community. A ZCTA with a percentage of its population designated as rural based on the 2000 Decennial Census (United States Census Bureau, 2000).

Social infrastructure. Green and Haines (2008) define social capital as assets that contribute to individual well-being. In an effort to measure social capital, Temkin and Rohe (1998) developed several indicators including institutional infrastructure (i.e., presence of community organizations). Using a similar approach, the term of social infrastructure is used in this study to represent the presence of community assets that may benefit PLWHA. In this study the presence of HIV/AIDS service providers and affordable housing units in a ZCTA are used as indicators of social infrastructure.

Overview of Methodology

This study used a cross-sectional, secondary data analysis to explore the relationship between community- and individual-level conditions that influence housing need. The data analyzed are from the Tampa Metropolitan Statistical Area (MSA) HIV/AIDS Housing Survey conducted in the fall of 2006. The MSA consists of a four-county area that receives funding under the federal Housing Opportunities for Persons with AIDS (HOPWA) program. Although defined as a metropolitan area, the survey data offer the ability to explore "rural pockets" within these counties to better understand the context of rural conditions. Community-level data were

compiled from the U.S. Census Bureau (Census), the U.S. Department of Housing and Urban Development (HUD), U.S. Department of Agriculture (USDA), and other available sources.

A two-level Hierarchical Linear Model (HLM) was used to examine the relationship among individual- and community-level variables and housing need among PLWHA. The level-one model examined the relationship of three types of individual characteristics (socio-demographic, housing situation, and social history) and housing need. The level-two model examined the relationship among community-level characteristics (distress, rurality, and social infrastructure) and housing need.

Significance

This study adds to the HIV/AIDS housing research by examining the relationship of community- and individual-level conditions and their ability to predict housing need. Much attention of late has been focused on the effects of housing need on health outcomes of PLWHA. Additionally, research has shown that poorer community conditions are linked to increasing rates of HIV/AIDS. However, little research has looked at the influence of community conditions on housing need among PLWHA. Further, studies are needed that examine community conditions in light of individual conditions especially related to housing. This study examines the influence of the community and individual condition on the housing need of PLWHA and in so doing increases our understanding of how these conditions influence housing need individually as well as together. Such an understanding is helpful for social work practice and policy especially as it relates to the South and its rural areas.

A better understanding of the conditions that are related to housing need will enable social work practitioners not only to develop new programs and strategies to address housing

need, but also to intervene through community-based efforts. Through such community-based efforts as locality-development or asset-building strategies, both noted as promising social work interventions in rural areas, the issues that influence housing need can be addressed. The goal is to address the individual conditions and/or community-level conditions related to housing need before such need develops. Improving the housing conditions of PLWHA is a smart strategy as it directly affects the health, treatment, and care of PLWHA.

The sooner practitioners and policy makers understand the complex relationships among the community condition, individual condition, interventions, and ultimately health outcomes, the sooner interventions can be enhanced and developed to address the growing HIV/AIDS population in the South.

CHAPTER 2

REVIEW OF THE LITERATURE

The aim of this study was to more fully understand the influence of individual-level (i.e., socio-demographics, housing situation, and social history) and community-level (i.e., distress, degree of rurality, and social infrastructure) conditions that influence housing need among persons living with HIV/AIDS (PLWHA). This chapter presents the theoretical approach used to explore the influence of individual- and community–level conditions on housing need and ultimately health outcomes among PLWHA. A review of the present state of research related to HIV/AIDS housing, rural practice, and community assets is also provided. Finally, a review of each study variable and its connection to current research is discussed, followed by the research questions addressed in this study.

Theory and Present State of Research

Since the early 1990s models of housing for PLWHA have focused on improving health and well-being (Hendriks & Leckie, 1993; Stajduhar & Lindsay, 1999). In the early days of the AIDS epidemic hospice and end-of-life group homes were common housing models providing care and services to individuals and their families during their final days. Advances in medical treatments have allowed PLWHA to live longer and healthier lives. Housing models have also shifted. More independent and long-term support as found through scattered-site apartments or

other more independent settings is more often desired by PLWHA (AIDS Housing of Washington, 1998c). What has not changed is a continued focus on the connection between housing and positive health outcomes for PLWHA. Over the last few years through the work of the National AIDS Housing Coalition, there has been a surge in new research exploring the previously under-discussed topic of housing and health among PLWHA.

Recent HIV/AIDS housing research has focused on the connection of housing to health related outcomes. Researchers found positive relationships between stable housing and HIV prevention (Coady et al., 2007; Des Jarlais, Braine, & Friedman, 2007; German, Davey, & Latkin, 2007; Weir, Bard, O'Brien, Casciato, & Stark, 2007), access to and engagement in care (Aidala et al., 2007; Bennett, Pope, & Dantzler, 2007), maintenance of care (Aidala et al., 2007; Smith, 2000), and improved health outcomes (Leaver et al., 2007). Such a focus of HIV/AIDS research is not surprising considering the AIDS epidemic and its devastating effect domestically and abroad. Further, the focus on improved health outcomes resonates with the current political and social environment encouraging continued support for research and care for PLWHA.

Although previous research is substantial in its attention to the individual characteristics that relate to housing need (i.e., drug use, poor mental health, job loss), little attention has been given to the community conditions (i.e., rural) that may contribute to housing instability among PLWHA. Individuals living with HIV/AIDS are disproportionately individuals living on low-incomes or of minority status who live in underserved and impoverished areas (Greiff, Proscio, & Wilkins, 2003; Reif, Geonnotti et al., 2006). Further, the community context where individuals live has been tied to increased infection rates of HIV/AIDS (Adimora & Schoenbach, 2005; Ellerbrock et al., 2004; Peterman et al., 2005). This has been seen most notably in areas of the Deep South especially among individuals living in rural areas (Hall, Li, & McKenna, 2005;

Qian, Taylor, Fawal, & Vermund, 2006; Reif, Geonnotti et al., 2006; Southern AIDS Coalition, 2003, 2008). Most of the HIV/AIDS housing research has centered on the large metropolitan epicenters of the disease, paying very little attention to the rising infection rates in rural areas, especially in the Southeast (Aidala et al., 2007; Leaver et al., 2007; Southern AIDS Coalition, 2003, 2008).

There is a need to explore further the housing needs of PLWHA, especially as they relate to the community conditions that may contribute to housing need. As the current housing models no longer suffice, especially in rural areas of the Southeast, U.S., housing and community practitioners will need to have a better understanding of how community conditions (i.e., rurality, poverty) relate to the individual conditions of PLWHA and their housing need. Only by gaining an understanding of this relationship will new models of community intervention and housing be developed.

Theoretical Approach

To explore the connection between the community and housing, it is important to note the critical connection between housing and health. Housing is a basic human right (National Low Income Housing Coalition, 2007; The National AIDS Housing Coalition, 2008). All people deserve a safe, decent, and affordable place to live and raise their families. The connection between housing and health dates back to the early 1800s when public health officers observed that poor housing conditions promoted disease and sickness (Dunn, 2000). In reviewing health and housing research, Dunn noted that both individual characteristics (i.e. individual disability or health) and environmental conditions (i.e. housing quality or neighborhood characteristics) are connected to poor health or mental health outcomes among residents. This connection of the

environment, individual characteristics, and health outcomes was the basis for the development of the social environment and health model by the Task Force on Community Preventive Services (Anderson, Scrimshaw et al., 2003). This conceptual model has guided this dissertation research in exploring how environmental or community conditions affect housing need among PLWHA as well as how these community conditions relate to individual conditions of PLWHA.

The social environment and health model recognizes that understanding health outcomes requires consideration not only of individual characteristics and behavior, but also the characteristics of the social and physical environment in which individuals live. The Anderson, Scrimshaw et al. (2003) research model posits that social determinants are important environmental conditions or resources that affect individual health. Social determinants are broadly defined as social institutions, surroundings, and social relationships. An individual's ability to access these societal resources helps determine health outcomes. In the model "intermediate outcomes" such as neighborhood condition, the availability of learning opportunities, or health promotion opportunities are indicators of an individual's access to community resources and ultimately the achievement of positive health outcomes. Additionally, these are areas to which interventions can be targeted.

Based on the Anderson, Scrimshaw et al. (2003) model, a community research model has been developed for this research study (see Figure 1). In the community research model, the community conditions represent those social determinants referred to by Anderson, Scrimshaw et al. (2003) that can influence intermediate outcomes. In this case, community conditions of distress (i.e., poverty, unemployment, low-educational attainment, and housing stress), degree of rurality, and the existence of social infrastructure can affect the housing need of an individual within a community. A person's housing condition or housing need then becomes an

intermediate outcome in this research model. As Anderson, Scrimshaw et al (2003) posit, this is the area of intervention, thus housing interventions that alleviate housing need can have a positive effect on health outcomes.

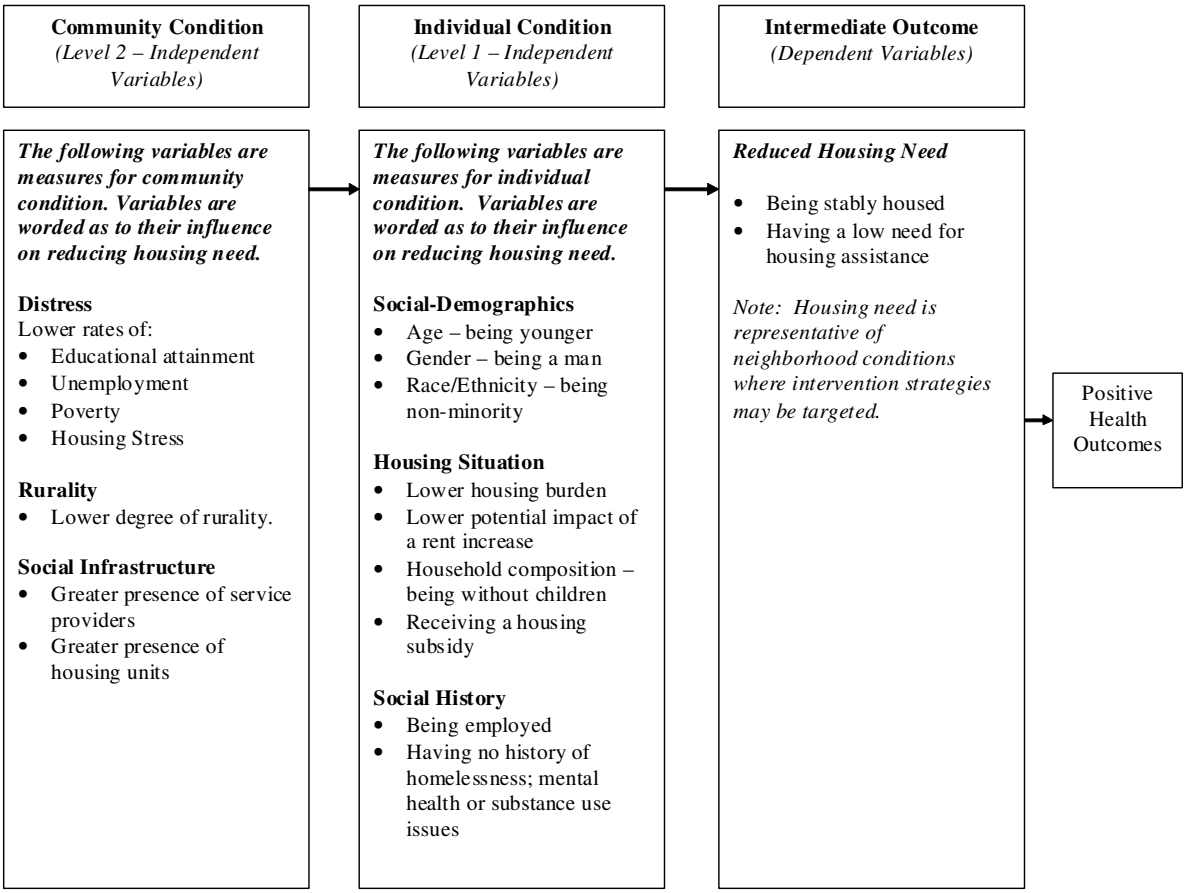

Figure 1: Community research model

The presence or absence of some community conditions can be seen as an asset to a community. Earlier in Chapter 1, it was discussed that increased social infrastructure, like the presence of an HIV/AIDS service provider in the community, is an asset that can positively contribute to the well-being of individuals living in the community. Taking this idea further, if a community has lower rates of poverty, unemployment, low-educational attainment, and housing stress, then this community may have more assets that, in turn, have a positive influence on the

housing need among its citizens. The research model considers housing need within the community context and posits that community condition can positively and negatively influence health outcomes.

Beyond the community conditions that are associated with housing need, the community research model recognizes that individual conditions also are related to housing need, both on their own and in interaction with community conditions. Community conditions can have an effect on "individual social, economic and health outcomes that is either independent of, or interacts with, individual-level factors" (Anderson, St. Charles et al., 2003). In their review of sociological theories relating the social environment to health, Yen and Syme (1999) state the environment and individuals interact with one another to create health outcomes. For PLWHA, environmental or community conditions have been related to increased infection rates (Adimora & Schoenbach, 2005; Ellerbrock et al., 2004; Peterman et al., 2005). The conceptual model recognizes this relationship between the individual and the environment and posits that individual-level conditions can moderate or mediate the community conditions that affect housing need.

Although examining the health outcomes of persons living with HIV/AIDS (PLWHA) is not within the scope of this research, stable housing (housing where individuals can live permanently) can be considered a positive health outcome for PLWHA. In her examination of HIV/AIDS housing, Aidala posits that housing is a mechanism by which broader economic, political, and social systems are carried to individuals. Thus as posited by Anderson et al, (2003), housing is an intermediate outcome that reflects the broader social environment. This macro-environment can moderate or mediate individual health risks. Housing is representative of the social and economic inequalities that exist (Aidala, 2004, 2007).

HIV/AIDS housing research links stable housing to a reduction in risky behaviors (Des Jarlais et al., 2007; Eastwood & Birnbaum, 2007; Henny, Kidder, Stall, & Wolitski, 2007), the improvement of health outcomes (Kidder, Wolitski, Royal et al., 2007), and increased access to care (Aidala et al., 2007; Leaver et al., 2007; Smith, 2000). However, little research examines the community conditions that affect housing need of PLWHA, much less how such determinants interact with the individual conditions.

If as Aidala posits (2004), housing is representative of the social inequalities that exist within a community, then what social inequalities in the community influence housing need among PLWHA? Further, is there a relationship between these community conditions and individual conditions of PLWHA who live in the community? These questions are the basis of the conceptual model (see Figure 1) and of this research project.

Research Gaps in Current Knowledge

The focus of this research is to gain a better understanding of the community-and individual conditions that influence housing need among PLWHA. In considering the community condition, two areas that have received little attention in the literature related to PLWHA and their housing needs were explored: (a) rural versus urban residence, and (b) the existence of relevant community assets (the presence of service providers and affordable housing stock within the community). Because most HIV/AIDS housing research has been focused on individual health outcomes and has been primarily conducted in large urban areas, the effects of rural residence and other environmental factors have not been adequately explored.

To review the current state of research and these most notable gaps, three primary areas of research are discussed. First, the current state of housing and HIV/AIDS is discussed. This is

followed by a review of how rural and urban residence differentially affects housing needs of PLWHA. Lastly, community assets, their relationship to the social environment, and their role in community interventions to reduce housing need among PLWHA are discussed.

Housing and HIV/AIDS

Over the last several years there has been interest in understanding the relationship between housing and health outcomes of PLWHA. Much of this attention has been the result of the National AIDS Housing Coalition's (NAHC) push to promote and build a research base documenting the connection between housing and health care. NAHC continues to promote adequate housing as a basic human right, a necessary component to HIV care and treatment, and a mechanism to end the AIDS epidemic (The National AIDS Housing Coalition, 2008). The NAHC estimates that 50 percent of PLWHA will experience a housing crisis during their lifetimes; however, the real housing need may be higher. In a recent study conducted in Tampa, Florida, over 84 percent of PLWHA engaged in care were considered unstably housed based on such indicators as housing burden, history of homelessness, and their requests for housing assistance (Bennett et al., 2007).

Research indicates that stable housing has an effect on reducing risky behaviors, improving health outcomes, and increasing access to care. Researchers have shown that housing is an effective structural intervention, and that lack of housing or housing instability can have adverse affects on PLWHA. Homeless or unstably housed PLWHA are more likely to be victims of physical abuse, share unclean needles, participate in sex exchange, and suffer from alcohol abuse and depression (Des Jarlais et al., 2007; Eastwood & Birnbaum, 2007; Henny et al., 2007). Salazar et al. (2007) found that homeless, HIV-positive African American men who were injection drug users (IDUs) were 2.6 times more likely to report sharing needles, 2.4 times more

likely to have sex with other men, and 2 times more likely to have unprotected sex with a casual partner than stably housed counterparts. Such risky behaviors place others at risk of HIV infection.

Kidder et al. (2007) found that homeless HIV-positive individuals had lower CD4 counts (a common marker for HIV patients; healthier patients have higher counts) and were less likely to be on or adherent to HIV medication regimens, increasing their risk for poorer health outcomes. Unmet housing needs are a significant barrier to accessing and maintaining appropriate HIV medical care (Aidala et al., 2007; Kidder, Wolitski, Campsmith et al., 2007; Leaver et al., 2007; Smith, 2000). Additionally, Aidala et al. (2007) found that housing assistance increased access to and retention of medical care among PLWHA. Overall, research demonstrates that access to adequate housing significantly affects the health of individuals at risk of or living with HIV. The lack of housing is an environmental influence as it interacts with other risk factors such as substance use, risky sexual and injection practices, sexual abuse, physical violence, and/or sex work (Wolitski, Kidder, & Fenton, 2007).

Although current HIV/AIDS housing research is substantial in its contribution; little attention has been given to the examination of HIV housing issues beyond urban centers, in rural areas, or as they relate to community conditions (i.e., high rates of poverty or unemployment). HIV/AIDS housing researchers have identified a need for more studies outside of metropolitan areas to more fully understand the connection of housing to health (Aidala et al., 2007; Leaver et al., 2007). In its manifesto, the Southern AIDS Coalition (2008), highlights the relatively low levels of federal funding for the Southeast United States and its rural areas even as infection rates continue to rise in the region. The Deep South is disproportionately affected by HIV with new rates of AIDS cases increasing by 35.6 percent from 2000 to 2003 compared to 5.2 percent

nationally (Reif, Geonnotti et al., 2006). In areas of the Mississippi Delta and Southeast Region, researchers found higher rates of HIV diagnoses for economically distressed counties (Ellerbrock et al., 2004; Hall et al., 2005; Peterman et al., 2005). Further, rural PLWHA were more likely to be African American, heterosexual, less educated, less likely to seek out mental health treatment, and more likely live in communities characterized by drugs or prostitution (Ellerbrock et al., 2004; Reif, Whetten, Ostermann, & Raper, 2006). Such research suggests that there are rural-urban differences among PLWHA; however, little research has explored the HIV/AIDS housing needs in these rural areas. More research is needed to understand how the rural environment contributes to or interacts with housing need and how such factors relate to individual conditions of PLWHA.

Rural vs. Urban

It is difficult to conduct research that examines the rural environment, especially because of the difficulty in defining rural in a way that allows for meaningful comparison of research findings. No single definition of rural exists that can easily encompass this elusive concept (Deavers, 1992; Hall, Kaufman, & Ricketts, 2006; Hart, Larson, & Lishner, 2005; Olaveson, Conway, & Shaver, 2004). The definitions that do exist vary for each federal agency. The most common federal definitions include those of the U.S. Census Bureau (Census), Office of Management and Budget (OMB), and U.S. Department of Agriculture (USDA). Such definitions are limited in that they often dichotomize living environments as rural and urban. There is a consistent call among researchers for a taxonomy that moves beyond such a dichotomy and recognizes the variability that exists in the rural environment. For example, different rural environments have different population densities, proximities to urban areas, and economies that definitions should attempt to encompass.

Additionally, most definitions including those developed by the USDA and OMB, define rural at the county level, making within county analysis difficult (Hart et al., 2005; Olaveson et al., 2004). Olaveson et al. (2004) posit that different methods and units of analysis are necessary when determining rurality. For example, measuring the population per square mile within a ZIP Code area is one example of redefining a rural area. The ZIP Code level allows for the analysis of community factors in sociological research, especially when making comparisons to client data that are available by ZIP Code. In their research examining the characteristics of HIV-infected adults living in the Deep South, Reif et al. (2006) used ZIP Code Tabulation Areas (ZCTA) created by the U.S. Census Bureau to determine the percentage of rural residents in a ZCTA. The researchers found that as the percentage of rural residents in a ZCTA increased, PLWHA were more likely to be African-American, heterosexual, less educated, disabled, and living with children. Further, rural PLWHA were less likely to receive mental health treatment (Reif, Whetten et al., 2006).

Because rural housing research has tended to focus on national or regional housing issues and has relied on county-level definitions of rural (Belden & Wiener, 1999a, 1999b, 1999c; Dolbeare, 1998; Housing Assistance Council, 2002; McCray, 1999), the ZCTA approach offers housing researchers the opportunity to study the differences in housing need among rural populations at levels smaller than the county. In this study, rurality is measured as a percentage based on the total population in a ZCTA. This allows not only for the study of the differences in housing need in areas with higher or lower degrees of rurality, but also for differences among individual conditions.

Community Assets

In the social work community practice literature, the use of asset-based strategies has been recognized as a promising approach for practice in rural areas (Locke & Winship, 2005; Murty, 2004). One such asset-based approach is offered by Green and Haines (2002b). Green and Haines see housing as a physical asset which helps to strengthen both individuals and communities. In the case of PLWHA, supportive housing could be considered as a community asset as it brings together affordable housing and supportive services. Supportive services help individuals to gain access to and maintain stable housing (Hannigan & Wagner, 2003).

However, community factors may jeopardize the affordability, adequacy, availability, or accessibility of housing for PLWHA. For PLWHA paying no more 30 percent of income toward rent and utilities is considered being affordably housed; however, it may be difficult for a low income person to find accessible housing that meets his/her needs (i.e., supportive services or transportation) especially in rural, distressed areas (AIDS Housing of Washington, 1998d; Newton, 2006). Green and Haines (2002b) point out that high housing burden, overcrowding, stigma, discrimination, limited housing stock, and living in rural areas with limited resources can all contribute to housing problems.

To consider community assets within this study, the community condition of social infrastructure has been included. As discussed in Chapter 1, social infrastructure was defined as community assets that contribute to the well-being of PLWHA, such as the presence of HIV/AIDS housing and/or service providers and affordable housing units. Other community conditions may also be seen as assets. For example, living in a community with low rates of poverty, unemployment, or housing stress may be related to the existence of other community resources.

Variables of Interest

As presented in the community research model (see Figure 1), the variables of interest were broken down into individual conditions, including socio-demographics, housing situation, and social history, as well as community conditions including the level of distress, the degree of rurality, and the level of social infrastructure of the ZCTAs. The study focused on the association of these variables with housing need among PLWHA. Individual conditions were the level-one independent or predictor variables that were included in the HLM. The community conditions were the level-two independent or predictor variables. In this section, the conceptual background for each variable is presented. Operational definitions for each variable are presented in Chapter 3.

Outcome (Dependent Variables)

The study explored the relationship between individual- and community-level conditions and housing need. In many studies examining housing need of PLWHA, housing need was determined by the place of residence (i.e. homelessness, unstable, or stable) (Aidala et al., 2007; Des Jarlais et al., 2007; Eastwood & Birnbaum, 2007; Kidder, Wolitski, Royal et al., 2007). Aidala et al. (2007) have referred to such a measure as an "objective" measure of housing need. They recommend including "subjective" measures which represent an individual's immediate need for housing assistance. Examples may include self-report of a housing problem, need for rent or utility assistance, or whether an attempt was made to get assistance. Subjective factors measure the various circumstances that households may be facing that constitute housing need.

Using Aidala's guide, this study used both an "objective" and "subjective" measure for housing need. First the objective measure of housing need was the determination if an individual was stably or unstably housed. This was operationalized as the current living situation of each

respondent. Respondents were considered stably housed if they lived in their own place including a room, rental, or ownership unit. Unstably housed respondents were those who lived in an abandoned building, other public place, on the street, shelter, in someone else's home, group home, temporary housing, treatment facility, halfway house, hospital, or jail. Normally, living in an abandoned building, other public place, on the street, or in a shelter would constitute homelessness; however too few respondents with such living situations made such a categorization impractical.

The second subjective measure for housing need was operationalized as need for housing assistance. Participants self-reported, using a 7-point Likert scale, their immediate need for housing assistance including need for help paying rent, utilities or security deposits, and/or help in locating permanent housing. A higher score indicated a higher housing need. Based on these measures, two dependent variables were used 1) stably versus unstably housed respondents (dichotomous) and 2) a participant's reported need for housing assistance (continuous).

Individual (Independent Variables)

Socio-demographics. Basic socio-demographics of age, race/ethnicity, and gender, were considered. In considering housing needs of rural populations, research has found that households that are minority and low-income have higher housing need (Belden & Wiener, 1999a; Dolbeare, 1998; McCray, 1999). Similar findings have been found among PLWHA. Particularly in the South, HIV/AIDS has adversely affected minority, female-headed households (Peterman et al., 2005; Reif, Whetten et al., 2006; Southern AIDS Coalition, 2003, 2008). Peterman et al., (2005) found that poor socio-economic conditions were related to low-income and lower education especially among women and African Americans living with HIV/AIDS.

Further, the risk of housing instability is higher among minority PLWHA, including Hispanics (Dasinger & Speiglman, 2007).

Among homeless and unstably housed PLWHA, Aidala et al.(2007) found statistically significant differences in age and race. In their study, older, white men were less likely to have a history of homelessness or to be unstably housed. Older residents living in rural areas experience higher rates of housing need than their urban counterparts (Belden & Wiener, 1999b). Based on this research, age, race/ethnicity, and gender were included in the model as they each have been linked to housing need.

Housing situation. An individual's housing situation has much to do with the affordability of the housing in which they live. Having affordable housing is defined as paying no more than 30 percent of income toward housing costs, a marker used by HUD. In this study, several markers of housing affordability were examined including housing burden, influence of a potential rent increase, and the receipt of a housing subsidy. These variables are discussed below.

Housing burden. Housing burden, measured as a percentage of an individual's monthly housing costs (i.e., rent, mortgage, utilities) in proportion to monthly income, is a common indicator of housing affordability. A housing burden at or below 30 percent is considered affordable by HUD (U.S. Department of Housing and Urban Development, 2009a). Rural housing and HIV/AIDS housing research has linked higher housing burdens to low-income residents including PLWHA (AIDS Housing of Washington, 1998b; Dolbeare, 1998; Housing Assistance Council, 2002).

Potential rent increase. Increased housing cost, as represented through an increase of rent, is also an indicator of housing affordability. Small rent increases such as those from $0-50 that cause an individual to move are indicators of housing instability (Bennett et al., 2007).

Especially among PLWHA where any health crisis may jeopardize ability to work and thus pay rent or utilities, small rent increases that would cause a move are indicators of the precarious nature of their housing.

Rent subsidy. The receipt of a housing subsidy (i.e., Section 8 voucher) can promote housing stability among PLWHA (Aidala et al., 2007; Dasinger & Speiglman, 2007; Scott, Ellen, Clum, & Leonard, 2007). A housing subsidy can often mean the difference in living affordably or paying too much – increased housing burden – for housing.

Based on this research lower housing burden, lower potential rent increase, effect of a rent increase, and receipt of a housing subsidy were considered individual conditions that could reduce housing need.

Household composition. Participant household composition has also been found to be linked to housing stability among PLWHA. Elifson et al., (2007) found that unstably housed women were less likely to have children. It should be noted, that a larger household may cause housing instability due to increased housing related costs. In this study, large household sizes were seen as contributing to housing need.

Social history. In the research model, four aspects of social history were considered – work status, history of homelessness, mental illness history, and substance use history. Each of these factors has been tied to housing instability. Additionally, homelessness is often caused by a combination of poverty and such risk factors as unemployment, drug/alcohol use, chronic health problems, or other disabilities (Stover, 1999).

Work status. In their study of PLWHA, Dasinger and Speilman (2007) found that not being employed increased the risk of being housing unstable by 1.41 times. In the South, rates of poverty, especially among households of minority status, are disproportionately higher among

PLWHA than other parts of the country (Hall et al., 2005; Peterman et al., 2005; Reif, Geonnotti et al., 2006; Southern AIDS Coalition, 2003, 2008).

History of homelessness, mental illness, or substance use. In their analysis of the HIV/AIDS in the Deep South, Reif et al. (2006) found that rural PLWHA were less likely than their urban counterparts to see a mental health provider and reported fewer mental health visits. In their book on rural AIDS housing, Building Changes (formerly AIDS Housing of Washington) found that poverty, health, mental health problems, substance use problems, and discrimination were common risk factors for homelessness (AIDS Housing of Washington, 1998d). This is further confirmed by Aidala et al., (2007) who found that a substance use and a mental illness history were both significantly related to housing instability among PLWHA.

Based on this research, the following social history indicators were included: work status, history of homelessness, mental illness, and/or substance use. Working and not having a history of homelessness, mental illness, or substance use were all considered individual conditions that reduced housing need.

Community (Independent Variables)

Distressed ZCTA. Community distress was measured through a scale measuring the degree of education attainment, unemployment, poverty, and housing stress in each ZCTA. Each of these factors (i.e. educational attainment, unemployment, poverty, housing stress) has been tied to housing need (AIDS Housing of Washington, 1998d; Dolbeare, 1998). In the research model, lower rates of community distress are tied to a reduction in housing need.

In examining rural communities, USDA utilizes County Typology Codes which are designed to measure distress on the county level (Economic Research Service, 2002). Such indicators include housing stress, education attainment, employment, and poverty. Because in the

community research model the focus was on the ZIP Code area and not the county, the exact USDA Typology Codes could not be used. Instead, using the Typology Codes as a guide, Census data were collected for each ZCTA and indicators were created for educational attainment, unemployment, poverty, and housing stress. These four indicators were used as a scale to measure the degree of distress in the ZCTA. Following is a description of each indicator used to measure distress. The operational definitions and scale development are discussed further in Chapter 3.

Educational attainment. In research studies examining rural residents in the U.S., Dolbeare (1998) found that rural residents were more likely to be older, less educated, poor, and had larger families. Such findings have also been found among PLWHA (Aidala et al., 2007; Ellerbrock et al., 2004; Peterman et al., 2005). In this study, low educational attainment was defined as having less than a high school education based. The percentage of individuals having a low-educational attainment was determined utilizing U.S. Census data.

Unemployment. In their examination of HIV in rural areas of the United States, Hall et al. (2005) found that 19-24 percent of PLWHA were living in areas of distress located in the Southeast. Distressed areas included areas of high poverty and unemployment rates. In counties with high incidence rates of AIDS, most in the South, Peterman et al. (2005) found a higher proportion of low-income households than in counties with lower incidence rates. Using Census data, the percentage of individuals that were unemployed was determined for all individuals in the labor force.

Poverty. As stated above, Peterman et al. (2005) found a higher proportion of low-income households in counties with high incidence rates of AIDS. Additionally, individuals were predominately African American and had less than a 9^{th} –grade education. The Southern AIDS

Coalition (2003) reports that the South has the highest regional rates of poverty and unemployment when compared to other regions of the U.S. As defined by the U.S. Census, the percentage of individuals living in poverty was determined for each ZCTA.

Housing stress. Housing stress represented as having a higher housing burden and housing problems (i.e. inadequate housing or overcrowding) was greater among rural residents (Dolbeare, 1998). Further, the communities in which the rural household lived had poorer infrastructure (McCray, 1999). Housing stress, unemployment, low-education, and poverty are increasingly common among PLWHA (AIDS Housing of Washington, 1998d; Peterman et al., 2005; Reif, Geonnotti et al., 2006). As defined by the U.S. Census Bureau, a household is housing stressed if they live in a housing unit that lacks a complete kitchen or plumbing, has 1.01 or more occupants per room, and/or housing costs as a percentage of household income are greater than 30 percent.

Rural ZCTA. Since the resurgence of rural social work practice over the last 30 years, the challenges associated with rural practice and the uniqueness of the rural environment have been examined extensively (Davenport, Davenport, & Wiebler, 1980; Farley, Griffiths, Skidmore, & Thackeray, 1982; Ginsberg, 1976; Ginsberg, 1993; Ginsberg, 2001; Ginsberg, 2005a, 2005b; Lohmann & Lohmann, 2005; Martinez-Brawley, 1981). Empirical research is needed to confirm or disconfirm findings from years of rural practice that have been based on observation and experience (Ginsberg, 2005a). This especially true when considering housing and HIV/AIDS.

HIV/AIDS research studies have shown that areas of the South, especially rural areas, are adversely affected by the epidemic (McKinney, 2002; Newton, 2006; Peterman et al., 2005; Reif, Geonnotti et al., 2006; Reif, Whetten et al., 2006; Southern AIDS Coalition, 2008). In the first extensive examination of rural AIDS housing issues, Building Changes documented that over

half of HIV+ participants had a housing need (AIDS Housing of Washington, 1998a). Additionally, in relation to HIV housing, care, and services, rural areas often have fewer resources than their urban counterparts (AIDS Housing of Washington, 1998d; Bennett, 2005a; Schur et al., 2002).

To examine rural versus urban differences, this study used a process similar to one used by Reif et al. (2006) in their examination of mental health utilization among PLWHA. Reif et al. used U.S. Census data to determine the proportion of rural residents as compared to the total population that lived in a ZCTA. A similar process was used in this study. In the research model, a lower degree of rurality is tied to lower housing need.

Social infrastructure. Locke and Winship (2005), posit that asset-building approaches to community development are particularly promising in rural areas. In their conceptualization of community assets, Green and Haines (2002b) discuss several types of community assets or capital including social capital and physical capital. As discussed in Chapter 1, Green and Haines (2008) define social capital as assets that contribute to individual well-being. In an effort to measure social capital, Temkin and Rohe (1998) developed several indicators including institutional infrastructure (i.e., presence of community organizations). Using a similar approach, the term of social infrastructure has been used to represent the presence of community assets that may benefit PLWHA. In this study the presence of HIV/AIDS service providers and affordable housing units in a ZCTA were used as indicators of social infrastructure.

In considering physical capital, Green and Haines (Green & Haines, 2002b) see housing as a physical asset within the community. An attribute of a community is its ability to successfully offer accessible and available housing to its residents. Access to housing and the availability of housing are two factors that are important to the overall care for PLWHA.

Housing accessibility is defined as the lack of barriers that may make obtaining housing difficult (Green & Haines, 2002b). For example, barriers such as a lack of knowledge of housing opportunities, stigma, poor credit, or poor rental history, can all limit access to housing. Often for PLWHA access to supportive services, such as case management, provides necessary support to navigate the housing system to gain access (AIDS Housing of Washington, 1998a; Hannigan & Wagner, 2003; National Low Income Housing Coalition, 2002). The close proximity of a service provider (access to services) to an individual's residence increases the likelihood that an individual will have access to care (Heckman, Somlai, Kalichman, Franzoi, & Kelly, 1998; McKinney, 2002; Schur et al., 2002). In this study accessibility of services was measured by the presence of an AIDS service organization located within the ZCTA. The presence of a service provider is seen as a community asset or increased social infrastructure that helps promote access to physical capital, such as housing (Green & Haines, 2002a; Kretzmann & McKnight, 1993; Murty, 2004; Swanson, 1996).

The availability of housing to meet the needs of community citizens is part of a community's physical assets and its social infrastructure (Green & Haines, 2002b). Increasingly, affordable housing is shrinking in the United States, a fact that has adverse implications for low-income and special needs households (Dolbeare, Basloe Saraf, & Crowley, 2004; Pelletiere, Wardrip, & Crowley, 2006). In the research model, housing availability, especially for low-income residents, was considered a community asset, thus ZCTAs with greater affordable housing resources were considered as having greater physical assets as well as greater social infrastructure. Affordable housing was measured by the availability of subsidized housing including housing dedicated to PLWHA and other federally subsidized housing located within the ZCTA. Such an approach builds on asset-mapping approaches that posit that community

assets can have positive effects for community residents (Green & Haines, 2002a; Kretzmann & McKnight, 1993; Locke & Winship, 2005; Murty, 2004).

Although a case can be made that the presence of service providers and available housing units could offer a community both physical capital and social infrastructure, in this study social infrastructure is used for simplicity to cover both terms. In the research model, greater social infrastructure is tied to lower housing need.

Research Questions

This study posed the following research questions designed to more fully understand the individual and community conditions related to housing need among PLWHA and how these conditions relate.

How do individual-level conditions (i.e. socio-demographic, housing situation, social history) influence the housing needs of low-income PLWHA?

Socio-Demographics

1. How do (a) gender, (b) age, (c) race, and (d) ethnicity of low-income PLWHA influence housing need?

Housing Situation

2. How does the housing burden of a low-income PLWHA influence housing need?
3. How does a potential increase in rent influence the housing need of low-income PLWHA?
4. How does the household composition of low-income PLWHA influence housing need?
5. How does the receipt of a housing subsidy by a low-income PLWHA influence housing need?

Social History

6. How does the work status of the head of household influence housing need of low-income PLWHA?
7. How does a history of homelessness influence housing need of low-income PLWHA?
8. How does a history of mental illness influence housing need of low-income PLWHA?
9. How does a history of substance use influence housing need of low-income PLWHA?

How do community-level factors (i.e. distress, degree of rurality, social infrastructure) influence housing needs of low-income PLWHA?

1. How does living in a distressed ZIP Code Tabulation Area (ZCTA) influence housing need of low-income PLWHA?
2. How does living in a ZCTA with a higher percentage of rural population influence housing need of low-income PLWHA?
3. How does living in a ZCTA with greater social infrastructure relate to the housing need of low-income PLWHA?

How do community- and individual-level conditions relate to each other and to housing need across ZIP Codes among PLWHA?

CHAPTER 3

METHODOLOGY

As discussed in the previous chapter, both community- and individual-level conditions can shape housing need; however little research has been conducted that examines the impact of these conditions on housing need for rural, low-income person living with HIV/AIDS (PLWHA). Further, an increased understanding of how community and individual conditions relate to each other and affect housing need is particularly necessary for policy makers and practitioners facing increasing incidence rates of HIV/AIDS in many parts of the Southeast. The conceptual housing research model discussed and illustrated in Figure 1 represents this relationship between the community- and individual-level conditions, housing need, and ultimately health outcomes. This model was the basis for this study which used a cross-sectional, secondary data analysis to explore the relationship between community- and individual-level conditions and their influence on housing need. The data analyzed were from the Tampa Metropolitan Statistical Area (MSA) HIV/AIDS Housing Survey conducted in the fall of 2006. The MSA consists of a four-county area that receives funding under the federal HOPWA program. Community-level data were compiled from the Census, HUD, USDA, and other available sources.

A two-level Hierarchical Linear Model (HLM) was used to examine the relationship among individual- and community-level variables and housing need among PLWHA. To test for model assumptions and to narrow the number of level-one predictor variables that would be used

in the HLM a series of multiple regressions and logistic regressions were run. Through this analysis, significant level-one predictors were selected, they were then used in the HLM analysis. The level-one HLM model examined the relationship of three types of individual characteristics (socio-demographic, housing situation, and social history) and housing need. The level-two model examined the relationship among community-level characteristics (distress, rurality, and social infrastructure) and housing need.

The following will provide an overview of the samples used to examine both the individual- and community-level conditions. Data collected from the Tampa MSA HIV/AIDS Housing Survey and community data collected from the 2000 Decennial Census were used. Operational definitions of both the individual- and community-levels are provided. Last, a review of the study design and methods utilized to develop a two-level HLM will be discussed.

Research Objectives

Using the community research model as a frame, this study was intended to examine the individual- and community-level factors that influence housing need among low-income PLWHA. Specifically, the study examined the following aspects: 1) the influence of individual conditions, including socio-demographics, housing situation, and social history, on housing need; 2) the influence of community conditions, including distress, degree of rurality, and social infrastructure, on housing need, and 3) the relation of community- and individual-level conditions and how they each work together to influence housing need.

Sample

Two data sets were used in the study. The first included data collected through the Tampa MSA HIV/AIDS Housing Survey. The survey data provided information on PLWHA living in the four-county area of Tampa, Florida. The data were used for level-one of the HLM. The second data set included community data collected from the Census, HUD, USDA, and other community data sources. These data were used for level-two of the HLM. Both data sets are described in this section.

Tampa MSA HIV/AIDS Housing Survey

From August 2006 through December 2006 the Tampa MSA HIV/AIDS Housing Survey was completed by 515 participants living with HIV/AIDS within the four-county MSA (Bennett et al., 2007). The HIV/AIDS Housing Survey research design called for a stratified, random sample of people living with HIV/AIDS in the four-county area. To compare survey data to the known HIV/AIDS population, data on persons living with HIV/AIDS in the Tampa MSA were retrieved from the Florida Department of Health (Bennett et al., 2007). As of February 2006, 8,294 people were living with HIV or AIDS in the Tampa MSA (The Health Councils Inc., 2006). This is 0.3% of the total population of the entire Tampa MSA. Among PLWHA, Hillsborough (57%) and Pinellas (35%) Counties had the highest percentages of individuals living with HIV/AIDS. The majority of individuals living with HIV/AIDS in the Tampa MSA were male (71.9%) and Caucasian (50.0%) (See Table 1). African-Americans were the second largest racial group, 44 percent. The Hispanic population represented 6 percent of the total number of cases within the four-county region (Bennett et al., 2007).

Efforts were made throughout the implementation phase to obtain a 5 percent stratified sample based on the county of residence, race/ethnicity, and gender compared to the overall HIV/AIDS population (See Table 2). Selected distribution sites for survey instruments included HIV/AIDS service or health providers in the four-county Tampa MSA. In all, fourteen service providers participated in the survey distribution (Bennett et al., 2007). A sample of 515 respondents was obtained. In a review of the sample compared to the HIV/AIDS population in the Tampa MSA, the sample was representative of each county. The sample of PLWHA was slightly lower for Hillsborough County, yet higher for Pasco County. Race and ethnicity of respondents compared well with slightly higher percentages when compared to the known HIV/AIDS population (See Table 2). In considering gender, a higher percentage, 36 percent, of women compared to 28 percent in the population were included in the sample.

In preparation for data analysis, the data were reviewed to determine the cases to include in the analysis. The review included determination of missing data, verification of age and gender, comparison of ZIP Codes, and determination of income. First, in reviewing missing data, two surveys that were not fully completed were identified, those cases were excluded. Additionally, a review of responses to the outcome questions including housing stability and a stated need for housing assistance was conducted. Sixteen cases were deleted from the sample because the respondents did not identify their current living situation which was used in the operational definition of housing stability. An additional seven cases were deleted because the respondents did not complete the housing need Likert-type scale which was used to calculate the need for housing assistance. Following the review of missing data, the sample was reviewed based on the gender and age of the respondents. Only one case represented a transgender respondent, thus the case was deleted. Minors are not eligible for federal housing programs, so

minors (respondents under the age of 18) were deleted from the sample. Based on this review a total of five cases were deleted from the sample.

Additionally, respondent ZIP Codes were compared to U.S. Census data for matching the individual- and community-level data. This was important because to conduct a two-level HLM respondent ZIP Codes had to be matched to Census data. Through this analysis, an additional forty Cases had ZIP Codes that could not be matched to ZIP Code Tabulation Areas (ZCTAs) for the following reasons (a) the respondent ZIP Code was not in Census data file, (b) the ZIP Code was for a P.O. Box and could not be tied to a ZCTA, (c) the respondent reported ZIP Code was not located in one of the four Tampa EMSA counties, or (d) the ZIP Code was not valid.

Respondent income was also considered a factor in sample selection. Annual respondent income was calculated and compared to the 2006 income limits provided by HUD to ensure that all cases represented low-income individuals who would qualify for federal housing programs (HUD User, 2006). Through this analysis, nineteen cases were deleted as they did not meet the HUD 2006 low income limits by household size. An additional thirty-three cases were deleted from the sample as they had missing income data. Of these cases, seventeen reported a rent amount yet no income, whereas the remaining sixteen did not report income or rent. Although rent was not used in the calculation of income, it was used to determine respondents' housing burden.

In considering the income variable, the deletion of 33 cases can be problematic. Large number of cases with missing data is noted problem in statistical analysis. Tabachnick and Fidell (2007) offer several scenarios of estimating missing data including (a) using prior knowledge to estimate the data or (b) mean substitution. For both options, the replacement of missing values would have had an impact on two parts of the study. First, estimating income would influence

the inclusion of the cases into the sample, since the sample was selected to represent low-income PLWHA. Without income data, there was no way to determine if the respondents actually qualified as low-income, especially since some respondents were excluded based on income. Second, estimation would also influence housing burden, since income was used to calculate this variable. As discussed later in the review of outliers, housing burden had extreme values which may have overestimated the amount of rent being paid by respondents if estimation was undertaken. Due to these challenges, it was decided not to estimate the missing values of income opting instead for exclusion of the cases.

As a result of each of these steps, the sample was reduced from 515 cases to 393 cases. As discussed later during a review of outliers an additional nine cases were deleted creating a final sample of 384 cases. In comparing the final sample to the known population of PLWHA in the Tampa MSA, only Pasco County was slightly more represented. In considering race, ethnicity, and gender, whites and Hispanics were slightly more represented than the known HIV/AIDS population (See Table 3). Lastly, females, at 37 percent, were more highly represented in the sample than the known HIV/AIDS population at 28 percent. Overall, the selected sample continued to be representative of the known HIV/AIDS population in the Tampa MSA.

The large sample size (n=384) allows for estimating the housing and services needs of the larger HIV/AIDS population in the Tampa MSA; however some limitations should be noted. The sample primarily represents persons living with HIV/AIDS who were engaged in care. Surveys were distributed through local health care and service providers, many of which are part of the Ryan White system of care. Ryan White is the primary funding source for HIV/AIDS care and services funded by the federal government. Thus, individuals not in care and who may need

housing or other services may not be fully represented in the survey sample (Bennett et al., 2007). Therefore, conclusions based on this study are likely to be conservative.

Table 1

Prevalence of HIV and AIDS in Tampa MSA by Gender, Race, & County

	Hernando		Hillsborough		Pasco		Pinellas			
	Male	Female	Male	Female	Male	Female	Male	Female	Total	(%)
Hispanic All Races	13	10	492	236	33	18	127	40	969	12%
Black – non-Hisp.	11	12	1182	890	32	30	539	380	3,076	37%
White – non-Hisp.	80	21	1541	304	314	100	1523	259	4,142	50%
Other – non-Hisp.	1	1	38	15	6	0	38	8	107	1%
Total by gender	105	44	3,253	1,445	385	148	2,227	687	8,294	
Total by county	149		4,698		533		2,914			
Percent by county	2%		57%		6%		35%			

Table 2

Sample of PLWHA in Tampa MSA by Gender, Race, & County

	Hernando		Hillsborough		Pasco		Pinellas			
	Male	Female	Male	Female	Male	Female	Male	Female	Total	(%)
Hispanic All Races	2	1	17	26	5	2	13	4	70	14%
Black – non-Hisp.	3	0	46	70	7	8	34	23	191	39%
White – non-Hisp.	4	1	85	37	27	16	94	13	277	57%
Other – non-Hisp.	1	0	5	5	1	2	6	2	22	4%
Total by gender	8	1	136	112	35	26	134	38	490	
Total by county	9		248		61		172		490	
Percent by county	2%		51%		12%		35%			

Table 3

Selected Sample of PLWHA in Tampa MSA by Gender, Race, & County (N=384)

	Hernando		Hillsborough		Pasco		Pinellas			
	Male	Female	Male	Female	Male	Female	Male	Female	Total	(%)
Hispanic All Races	1	0	11	20	5	2	10	3	52	14%
Black – non-Hisp.	1	0	32	58	5	3	25	15	139	38%
White – non-Hisp.	4	0	68	30	19	11	70	11	213	58%
Other – non-Hisp.	0	0	4	4	1	1	4	1	15	4%
Total by gender	5	0	104	92	25	15	99	27	367	
Total by county	5		196		40		126			
Percent by county	1.4%		53.4%		10.9%		34.3%			

Community Level Data Set

To explore the community characteristics that influence housing need among PLWHA it was necessary to create a data set containing community-level variables. Using the 2000 Decennial Census, Summary File 3 of the U.S. Census Bureau (2000), data were compiled for 127 ZCTAs which correspond to the ZIP Code areas in the Tampa MSA. ZCTAs are representations of U.S. Postal Service ZIP Code service areas developed by the U.S. Census Bureau (U.S. Census Bureau, 2008). The ZCTAs are aggregations of Census blocks where addresses use a single ZIP Code. Since the Tampa MSA is a defined metropolitan area by the Office of Management and Budget, data used to define rural areas, like the USDA Typology Codes, are not useful. The codes are used to define counties, but are not used within county areas. Using the ZCTA serves two purposes (a) it allows for an examination of within county areas (i.e., ZIP Code areas), especially related to rurality and distress and (b) the ZCTA provides a mechanism to connect the community data to the respondents in the Tampa MSA HIV/AIDS Housing Survey. The community conditions were matched to each respondent by matching the respondent's ZIP Code to the ZCTA.

The community variables of interest included: characteristics of community distress including educational attainment, unemployment, poverty, and housing stress; degree of rurality; and degree of social infrastructure. Data for these community variables, except social infrastructure, were all obtained from the Census, Summary 3 file. Upon comparison of the community data file to the HIV/AIDS Housing Survey data, it was determined that a total of 78 ZCTAs matched both data sets.

Data from HUD, USDA, Internet sites, and other sources were used to develop the social infrastructure variables. Two variables were developed (a) a count of HIV/AIDS service

providers and (b) a count of affordable housing units. To compile the list of service providers, a comparison was completed using the Tampa MSA HIV/AIDS Housing Plan (Bennett et al., 2007) and the 2005-10 Ryan White Comprehensive Plan (The Health Councils Inc., 2005). Providers were identified and cross-referenced between both documents. Additional searches were conducted via the Internet to locate such data as address, ZIP Code, and office sites. If an organization had multiple sites, these were added to the database. Priority was given to the HIV/AIDS Housing Plan and the Comprehensive Plan as both represented services and providers that were in operation at the time the HIV/AIDS Housing Survey was conducted. Additionally, only organizations providing primary HIV/AIDS housing and/or services through Ryan White or HOPWA were included in the database. A total of thirty organizations were identified throughout the four-county Tampa MSA.

In addition to HIV/AIDS providers, data were collected on affordable housing properties throughout the Tampa MSA. No readily accessible or single database exists that contains all affordable housing data. To compile a database of properties by ZIP Code multiple data sources were accessed and reviewed. A beginning data set was taken from HUD's subsidized housing inventory (HUD User, 2000). The subsidized housing inventory includes affordable housing developed through HUD including public housing, multifamily, and Low Income Housing Tax Credit (LIHTC) properties. This listing was compared systematically to other databases available through the Internet on the Florida HUD Field Office's website (U.S. Department of Housing and Urban Development, 2009b). A total of 47,022 units of affordable housing were identified throughout the 78 ZCTAs. The number of affordable units ranged from 0 to 3,463 with a mean number of units of 538 throughout the 78 ZCTAs.

In considering the community-level data, some limitations should be noted. First, the community-level data is limited to that available through the 2000 Decennial Census. More recent data on community educational attainment, employment, poverty, and housing stress would provide a more relevant picture of community conditions. Additionally, examining community trends by comparison between the 1990 and 2000 Census to determine areas of persistent poverty or unemployment would have provided a better understanding on the long-term challenges facing communities; however differences in Census definitions and reporting made comparison by ZCTAs infeasible. Even with these limitations, data collected does provide insight into the community conditions and is suitable for examining their influence on housing need.

Unequal sample sizes do not pose a problem for HLM analysis, nor do small group sizes (even as small as one) for level-two analyses (Tabachnick & Fidell, 2007). Out of the 78 ZCTAs, group sizes ranged from 1 to 40 respondents. Such unbalanced group sizes were found not to have an effect on multilevel estimates or standard errors (Maas & Hox, 2005). Further, Maas and Hox state that larger level-two groupings, over 50, help to alleviate biased regression and variance estimates as well as standard errors. Power to detect cross-level effects, those between level-one and level-two, is higher when the level-one sample is larger and the group number is higher than 20 on level-two (Tabachnick & Fidell, 2007). Based on this research, it was determined in this study that 78 ZCTA groupings even with unbalanced group sizes remained appropriate for HLM, thus they were used.

Instrument

The survey instrument was based on two HIV/AIDS housing community surveys used by service providers who had conducted similar efforts in other parts of the United States. Based on these two surveys, a group of community stakeholders in Tampa created a new survey that contained 36 questions covering participant: demographics, housing stability and longevity, housing satisfaction, housing preferences and needs, engagement in supportive services, engagement in medical care, and unmet needs. The survey was designed to be self-administered and versions in both English and Spanish were made available for distribution (Bennett et al., 2007).

At the fourteen distribution sites, designated program staff members were provided with in-depth instructions about distribution of the survey, confidentiality, procedures for helping consumers with literacy challenges, provision of incentives, and handling of completed surveys. The designated staff members were instructed to provide a brief description of the study and invite participants to complete the survey, offering a $5 gift certificate for the survey completion. Participation in the survey was voluntary. Staff were instructed to provide a comfortable and quiet place to complete the survey. To ensure confidentiality, staff sealed the completed survey in a provided envelope and stored all completed surveys in a locked cabinet until retrieved by research staff. Although the survey was self-administered, participants requiring aid in reading or completing the survey were offered assistance by a trained program staff member at each site. In addition to participant completed surveys, a small number of surveys were conducted by phone to reach consumers who were unable to participate at a group site (Bennett et al., 2007). A copy of the survey is provided in Appendix A.

Protection of Human Subjects

The data used in this study were collected for the City of Tampa by Collaborative Solutions, Inc. (CSI), a nonprofit in Birmingham, Alabama. The data are the property of CSI and have been made available by the organization for research purposes. Data collected and provided do not identify participants, thus the identity and confidentiality of every survey respondent is secure. The University of Alabama Institutional Review Board provided review and approved the research (IRB: EX-09-CM-005; 1/20/2010. see Appendix B)

Procedures

Variables of Interest and Operational Definitions

In reviewing the community research model, both community-level and individual-level variables were considered in this study. It is important to recognize the community conditions in which PLWHA live. To better understand the influence of community conditions on housing need and ultimately health outcomes, the community conditions of distress – conceptualized as higher rates of low-educational attainment, unemployment, poverty, and housing stress; degree of rurality; and the level of social infrastructure were studied.

Because individual conditions can be affected by community conditions, the individual conditions of social-demographics, housing situation, and social history were also considered. The multi-level nature of the data, in this case two levels – one for the individual and one for the community – was well suited to an HLM analysis. By using HLM individual-level conditions and their influence on housing need can be studied within the context of community conditions. Below operational definitions are provided for each of the study variables.

The following outlines the individual, community, and outcome variables that were used in the study and provides operational definitions for each:

Individual Variables (Independent)

Individual variables are based on selected variables from the HIV/AIDS Housing Survey.

Socio-demographics. The four variables included the respondent's gender (coded: female (1=yes, 0=no), male (1=yes, 0=no)); respondent age in years; respondent race (coded: black (1=yes, 0=no), white (1=yes,0=no), other (1=yes, 0=no)); and respondent ethnicity (Coded: Hispanic 1= yes, 0= no). Both male and other race were used as the reference groups for statistical analysis.

Housing situation. Four variables were used for this construct: (a) respondent housing burden, (b) respondent household composition, (c) respondent's receipt of a housing subsidy, and (d) potential rent increase that would require a move. Respondent's housing burden was figured as the percentage of the reported monthly income used for rent or mortgage payments (continuous). In the literature, a housing burden at or below 30% = no housing burden, 30%-49% = moderate housing burden, and 50% = extreme housing burden. A respondent's household composition had four categories (coded single – only one adult (1=yes, 0=no), adults – two or more adults (1=yes, 0=no), single with children (1=yes, 0=no), adults with children (1=yes, 0=no). Adults with children was used as the reference group in statistical analysis. Respondent's receipt of a housing subsidy (i.e., Section 8 voucher, HOPWA voucher, Shelter Plus Care, or living in public housing) was a dichotomous variable (coded 1= yes, 0= no). Potential rent increase that would require a move had seven categories (coded as 1 = an increase of $200 or more, 2 = $151 to $200, 3 = $101 to $150, 4 = $76 to $100, 5 = $51 to $75, 6= $26 to $50, and 7=$1 to $25).

Social history. Four variables were used for this construct: (a) respondent work status, (b) respondent's history of homelessness, (c) respondent's mental illness history, and (d) respondent's substance use history. Respondent work status was a dichotomous variable (coded 1 = working, 0 = not working). History of homelessness was a dichotomous variable, measuring a respondent's history of homelessness in the past year (i.e., not having a place to live) (coded 1 = yes; 0 = no). Respondents were asked if they had ever seen a mental health professional such as a counselor, psychologist, or social worker to talk about stress, depression, or any other mental health issue. Responses to these questions were used as the measure for a mental illness history (coded 1 = yes, 0 = no). Respondents were asked if they felt or had been told that they might need help for a drug or alcohol problem and asked if they ever received help for alcohol or drug problems. Responses to either of these questions were used as the measure for a substance use history (coded 1 = yes, 0 = no).

Community Variables (independent)

The ZIP Code for each participant was ascertained through the HIV/AIDS Housing Survey. Each ZIP Code represented in the sample was coded as follows using ZCTA data from the 2000 U.S. Census, Summary File 3 (United States Census Bureau, 2003). A total of 127 ZCTAs were identified in the Tampa MSA. Through the matching of the two data files, 78 ZIP Codes areas were used in the final analysis.

Distressed Zip Code Tabulation Area (ZCTA). A distressed ZCTA was conceptualized as an area with higher than average rates of low-educational attainment, unemployment, poverty, and housing stress. A ZCTA was a high distressed area if the percentage of distress was higher than the average of all 127 ZCTAs in the four-county Tampa MSA. To operationalized the variable, a 4-item scale was created and each ZCTA was coded for distress based on the sum of

the scale items. To create the scale, each distress indicator (i.e., education attainment, unemployment, poverty, housing stress) was dichotomized (1 = yes, 0 = no) to designate whether the ZCTA was higher than average. A higher summed score (score range: 0-4) represented a higher distressed ZCTA. The four indicators of distress were created by using the USDA County Typology Codes as a guide. Census data was then compiled for each indicator by ZCTA. The following describes each indicator.

Housing stress. ZCTA where 29 percent (mean of all ZCTAs) or more of owner- and renter-occupied housing units had at least one of the following conditions: lacked complete plumbing, lacked complete kitchen, had 1.01 or more occupants per room, and housing costs as a percentage of income greater than 30 percent (dichotomized to 1 = yes, 0 = no). Of the 78 ZCTAs, 34 (44%) were determined to be housing stressed.

Low-education. ZCTA where 19 percent (mean of all ZCTAs) or more of residents 25 years old or older had neither a high school diploma nor GED (dichotomized to 1= yes, 0 = no). Of the 78 ZCTAs, 36 (46%) were determined to be areas with a high percentage of residents with low-education.

Unemployment. ZCTA where 6 percent (mean of all ZCTAs) or more of residents 16 years old and older were unemployed and in the labor force (dichotomized to 1= yes, 0 = no). Those in the labor force included only individuals that Census classifies in the civilian labor force and in the U.S. Armed Services. This does not include retirees, students, or other seasonal workers. Of the 78 ZCTAs, 22 (28%) were areas of high unemployment.

Poverty. ZCTA where 11 percent (mean of all ZCTAs) or more of residents were living in poverty (dichotomized to 1= yes, 0 = no). Of the 78 ZCTAs, 35 (45%) were areas of high poverty.

Item scores were summed and ZCTAs with higher scores were considered to be more distressed. The scale had good internal consistency, with a Cronbach alpha coefficient of .81. Of the 127 identified ZCTAs in the four-county Tampa MSA, 78 ZCTAs were identified for inclusion in the study based on a comparison of the Censes data file and the HIV/AIDS Housing Survey data file. Of the 78 ZCTAs, 50 (64%) had one or more of the above characteristics.

Rural ZCTA. A rural ZCTA was operationalized as a ZCTA with a percentage of its population designated as rural. Using 2000 Decennial data, the percentage of rural population for each ZCTA was figured by dividing the reported rural population by the total population of the ZCTA (continuous). The higher the percentage, the more rural the ZCTA was considered. Of the 78 ZCTAs, 25 (32%) had some percentage of rural population. The percent of rural population ranged from 1-100%.

Social infrastructure in a ZCTA: Social infrastructure was conceptualized as a ZCTA having community assets that may benefit PLWHA. In this study the presence of HIV/AIDS service providers and affordable housing units located in the ZCTA were used as indicators of higher social infrastructure.

HIV/AIDS service providers. HIV/AIDS housing or service providers were defined as organizations that receive funding under the HOPWA program as reported by the City of Tampa or organizations that receive funding through the Ryan White HIV/AIDS Treatment Modernization Act as reported by the State of Florida. This is a continuous variable operationalized as the number of HIV/AIDS housing or service provider organizations located with the ZCTA. Within the 78 ZCTAs, 57 ZCTAs had no HIV/AIDS provider organizations located in the area. Of the remaining 21 ZCTAs, a total of 29 service providers were identified.

Service providers ranged from 1 up to 3 located within a ZCTA. Of the ZCTAs with providers, 14 had 1 provider, 6 had two providers, and 1 had three providers.

Affordable housing inventory. Affordable housing was defined as federal housing programs targeted to low-income individuals, defined as no higher than 80 percent of Area Median Income. Such affordable housing included public housing, multifamily housing, low-income housing tax credit properties, rural housing, and other subsidized housing. In addition to federal housing, some state funded housing may be included as listed on available affordable housing websites. Often federal and state funding streams are mixed to develop affordable housing properties making clear distinctions difficult. Data were collected using available on-line databases made available through HUD, USDA, and other affordable housing databases available through the Internet. Affordable housing is a continuous variable operationalized as the number of affordable housing units located with the ZCTA. Within the 78 ZCTAs, 47,022 units of subsidized housing were identified. Of the 78 ZCTAs, 16 ZCTAs had no identified affordable housing units. The remaining ZCTAs ranged from 3 to 3,463 units of affordable housing.

Dependent Variables

The following housing need variables are taken from participant data collected through the Tampa MSA HIV/AIDS Housing Survey. Housing need was defined as a respondent's (a) housing stability based on current living situation and (b) stated need for housing assistance.

Housing Stability. Housing stability was operationalized as a respondent's self-report of current living situation categorized into the following: (a) unstable – if living in a abandoned building, other public place, on the street, shelter, living in someone else's home, group home, temporary housing, treatment facility, halfway house, hospital, or jail; (b) stably housed –if living in own place including a room, rental, or ownership unit. The variable was dichotomous

(coded 1=stable, 0=unstable). Of respondents, seventy-one percent were determined to be stably housed.

Need for Housing Assistance. Need for housing assistance was operationalized as the sum of the participants' responses to a 4-item, 7-point scale (*0= not needed and 6= very much needed*) assessing the current need for housing assistance. Participants were asked to report if they currently needed the following: (a) help paying rent, (b) help paying utilities, (c) help paying security and/or utility deposits, and (d) permanent housing. Responses to each question were summed, resulting in a range of scores from 0-24, with higher scores representing greater housing need.

Data Clean-up

In an effort to ensure the sample was ready for statistical analysis all variables were examined for accuracy of data entry, missing values, and fit between their distributions and the assumptions of multivariate analysis. A more in-depth analysis to determine outliers and normality of distribution was conducted on the continuous variables both at the community- and individual-levels. Since most of the individual-level predictor variables were dichotomous, assessment of outliers and normality of distribution were only conducted on age, housing burden, and rent increase. A similar assessment was conducted on the community-level variables of distress, rurality, and social infrastructure. Additionally, analysis was conducted on the housing need outcome – need for housing assistance. SPSS 14.0 was used for all data analysis.

Outliers

SPSS DESCRIPTIVE was used to generate boxplots that were reviewed to identify outliers among the continuous variables of age, housing burden, rent increase, and need for

housing assistance. Influence of outliers was assessed by comparing the mean to the 5 percent trimmed mean. Similar means between the two approaches suggest that outliers were having limited influence on the mean (Pallant, 2001). Because extreme outliers can bias statistical results, following the advice of Tabachnick and Fidell (2007), cases with extreme outliers were deleted from the sample.

Assessing Normality

An examination of normality was conducted on the three individual-level continuous, independent variables including age, housing burden, and rent increase. Additionally, an assessment of normality was conducted on the dependent variable housing need. Assessments of normality and outliers were also conducted on the community-level variables of distress, rurality, and social infrastructure. As suggested by Tabachnick and Fidell (2007), a review of the graphical shape of the distribution of variables to determine normality was completed. Tabachnick and Fidell (2007) state most tests of inference are not reliable with larger data sets, such as those over 200 cases. To conduct a review of normality, SPSS DESCRIPTIVE was used. During analysis, pairwise exclusion of missing data was utilized. For each variable, a review of skewness, kurtosis, histogram, normal Q-Q plots, and detrended normal Q-Q plots were all conducted. In a normal Q-Q plot the observed values for each score is plotted against the expected value from a normal distribution; a straight line suggests a normal distribution (Pallant, 2001). A detrended normal Q-Q plot examines the deviation of the scores from the straight line. In this plot, there should be no clustering of points with most points collecting around the zero line (Pallant, 2001).

Model assumptions for HLM, including those typically applied to multiple linear regression are discussed later in this chapter.

Data Analysis Procedures

A goal of this study was the development of a model using community and individual conditions to predict housing need among PLWHA. A General Linear Model (GLM) is often used to determine the best fit model to predict housing need. However, GLM assumes the independence of the observations. The research model which examines the community effects on the individual violated this assumption of independence because individuals living in the same ZIP Code receive the same score on each community-level measure. To compensate for the violation of the assumption of independence, a Hierarchical Linear Model (HLM) was used to analyze the community effects on housing need among PLWHA. The HLM offers a more robust analysis that can handle the multi-level design necessary to build a predictive model. Using the HLM, the research model provides analysis on two levels, the individual-level and the community-level and creates a predictive model utilizing both levels.

Descriptive Statistics

Descriptive statistics were run using SPSS 14.0, SPSS DESCRIPTIVE, for each of the community- and individual-level variables as well as the dependent outcome variables of housing need – housing stability and need for housing assistance. Descriptive analyses were completed before any other analysis to gain a better understanding of both the community- and individual-level samples. Frequencies, means, standard deviations, and ranges were all determined. Of the 127 ZCTAs in the four-county Tampa MSA, 78 ZCTAs were included in the community-level sample. These 78 ZCTAs were matched with the respondent data from the HIV/AIDS Housing Survey. On the individual-level a final sample (n=384) was obtained from the HIV/AIDS Housing Survey and used in the analyses.

Assumptions of Multilevel Linear Modeling

Hierarchal Linear Modeling (HLM), requires consideration of both theoretical and practical issues (Tabachnick & Fidell, 2007). First, correlated predictors are problematic in HLM since within the model the predictors are all adjusted for one another, which makes none of the regression coefficients statistically significant. To remedy this issue, Tabachnick and Fidell recommend keeping the number of predictors low. This can be accomplished through a strong theoretical framework.

Many limitations and assumptions of GLM including multiple linear regression also apply to HLM (Tabachnick & Fidell, 2007). Assumptions include adequate sample size, the absence of multicollinearity and singularity among variables, the lack of outliers, normality of the distribution of the error, and homoscedasticity. Each of these assumptions was examined in preparation for the HLM analysis. As discussed earlier, during the data clean-up process outliners were deleted from the sample; however outliers can also be analyzed through the residuals following a regression. SPSS offers the ability to check the Mahalanobis distances to ensure no outliers are in the data. The examination of the Mahalanobis distances was used as a check for outliers. Additionally as discussed earlier, normality of the distribution error was assessed and it was determined that the original version of all variables would be used.

Considering the theoretical and practical issues, multiple regression and logistic regression statistical analysis was chosen as the analytic methods to address both of these areas before proceeding to the HLM. First, regression was used to create a predictive model thus lowering the number of predictor variables to be used in the HLM analysis. Having too many predictive variables in one HLM model can cause convergence problems. Secondly, the

regression was used to examine the data for outliers, multicollinearity, and other model assumptions, again to be ready for the HLM analyses.

Multicollinearity exists when the independent variables are highly correlated (r=.9 or higher). Singularity exists when an independent variable is a combination of other independent variables. In regression and hence HLM, it is best to not have multicollinearity and singularity among the independent variables. Using SPSS REGRESSION to examine assumptions is recommended before undertaking HLM (Tabachnick & Fidell, 2007).

To determine violations of model assumptions and to narrow the number of individual-level predictor variables that would be used in the HLM, both multiple regression and logistic regression were utilized. Multiple regression was used to predict the need for housing assistance and logistic regression was used to predict housing stability. Data analysis procedures for both are discussed below.

Multiple Regression Models

To check for violation of model assumptions and to narrow the number of individual predictor variables that would be used in the HLM, a standard multiple regression was performed between need for housing assistance as the dependent variable and each set of individual independent variables in the research model including demographics, housing situation, and social history. A regression was completed on each set of variables since theoretically the variables in each set were conceptually similar. It was determined that it would be easier to evaluate the assumptions of multicollinearity and singularity with each set of variables. For example, it was theorized that the social characteristics of history of homelessness, substance use, and mental health would be highly correlated, thus examining only these variables in a regression model would more clearly show these correlations, if they existed.

Multiple regression was also chosen for the analysis since need for housing assistance was measured on an interval level. Need for housing assistance was the dependent (outcome) variable and each grouping of individual predictor variables - demographics, housing situation, social history – served as the independent variables. Since the goal was to narrow down the predictor variables that would be included in the HLM, from a practical standpoint it was decided to create separate regression models for each set of predictor variables.

Multiple regression employs the following equation:

$$Y = A + B_1X_1 + B_2X_2 + \cdots + B_KX_K$$

Using the above equation, the following equations represent the first models for each set of predictor variables:

Need for housing assistance and demographic model:

$$Y\,(\text{housing need}) =$$

$$A + B_1X_1(\text{female}) + B_2X_2(\text{black}) + B_3X_3(\text{white}) + B_4X_4(\text{hispanic}) + B_5X_5(\text{age})$$

Need for housing assistance and housing situation:

$$Y\,(\text{housing need}) =$$

$$A + B_1X_1(\text{single}) + B_2X_2(\text{single w/children}) + B_3X_3(\text{adults only}) +$$

$$B_4X_4(\text{housing subsidy}) + B_5X_5(\text{rent burden}) + B_6X_6(\text{rent increase})$$

Need for housing assistance and social history

$$\text{Y (housing need)} = \text{A} + \text{B}_1\text{X}_1(\text{work status}) + \text{B}_2\text{X}_2(\text{history of homelessness}) + \text{B}_3\text{X}_3(\text{mental illness history}) + \text{B}_4\text{X}_4(\text{substance use history})$$

Following each regression, an evaluation of the model was conducted with the following areas being examined (a) correlation of the variables, (b) model fit and significance, and (c) contribution and significance of variables. Using these three areas as a guide, a modeling approach was used to determine the best fit model between need for housing assistance and each set of predictor variables. A final best fit model between need for housing assistance and all the significant predictor variables was determined. This model was used on the level-one model in the HLM.

Logistic Regression Models

In considering the second outcome variable, housing stability, multiple regression could not be used since the variable is a dichotomous variable, i.e., stably vs. unstably housed. Instead logistic regression tested for differences between respondents who were housing stable and those who were unstable. Using a similar approach to that in multiple regression, three theoretical groupings of the predictors were used in an exploratory model building process: demographics – including age, gender, race and ethnicity; housing situation – including housing burden, rent increase, household composition, and housing subsidy; and social history – including work status and history of homelessness, mental illness, and substance use. Each set of predictor variables were included in separate models. This process was used to select the best predictors to be included in level-one of the HLM.

The equation for logistic regression is:

$$\log\left(\frac{\mathrm{p}}{1}-\mathrm{p}\right)=\mathrm{b0}+\mathrm{B}_1*\mathrm{X}_1+\mathrm{B}_2*\mathrm{X}_2+\cdots+\mathrm{B}_\mathrm{K}*\mathrm{X}_\mathrm{K}$$

Using the above equation, the following equations represent the first models for each set of predictor variables:

Housing stability and demographic model:

$$\log\left(\frac{\mathrm{p}}{1}-\mathrm{p}\right)=\mathrm{b0}+\mathrm{B}_1*\mathrm{X}_1(\mathrm{female})+\mathrm{B}_2*\mathrm{X}_2(\mathrm{black})+\mathrm{B}_3*\mathrm{X}_3(\mathrm{white})+$$

$$\mathrm{B}_4*\mathrm{X}_4(\mathrm{hispanic})+\mathrm{B}_5*\mathrm{X}_5(\mathrm{age})$$

Housing stability and housing situation model:

$$\log\left(\frac{\mathrm{p}}{1}-\mathrm{p}\right)=\mathrm{b0}+\mathrm{B}_1*\mathrm{X}_1(\mathrm{single})+\mathrm{B}_2*\mathrm{X}_2(\mathrm{single\ w/children})+\mathrm{B}_3*\mathrm{X}_3(\mathrm{adults})+$$

$$\mathrm{B}_4*\mathrm{X}_4(\mathrm{housing\ burden})+\mathrm{B}_5*\mathrm{X}_5(\mathrm{housing\ subsidy})+\mathrm{B}_5*\mathrm{X}_5(\mathrm{rent\ increase})$$

Housing stability and social history model:

$$\log\left(\frac{\mathrm{p}}{1}-\mathrm{p}\right)=\mathrm{b0}+\mathrm{B}_1*\mathrm{X}_1(\mathrm{work\ status})+\mathrm{B}_2*\mathrm{X}_2(\mathrm{history\ homelessness})+$$

$$\mathrm{B}_3*\mathrm{X}_3(\mathrm{mental\ illness\ history})+\mathrm{B}_4*\mathrm{X}_4(\mathrm{substance\ use\ history})$$

Following each regression, an evaluation of the model was conducted with the following areas being examined (a) effectiveness of the model in prediction housing stability, (b) model fit

and significance, and (c) significance of variables. Using these three areas as a guide, a modeling approach was used to determine the best predictive model between housing stability and each set of predictor variables. A final predictive model between housing stability and all the significant predictor variables was determined. This model was used on the level-one model in the HLM.

Hierarchical Linear Models (HLM)

Following the tests for model assumptions and the selection of the individual predictor variables to be included in the HLM, the final HLM analysis was completed. First, a two-level Hierarchical Linear Model (HLM) was used to study the interval housing need outcome variable – need for housing assistance. HLM models are recommended when data is nested within groups (i.e., individuals within ZIP Code areas). This two-level model building process to study the community- and individual- level influences on housing need among low-income PLWHA was conducted first.

Secondly, a special version of HLM, Hierarchical Generalized Linear Model (HGLM) was used to explore the housing need outcome variable – housing stability (stable versus unstable). HGLM, similar to logistic regression, was used to examine data with binary outcomes. In this case, housing stability is a dichotomous variables (stable = 1, unstable = 0), thus the HGLM used a logit link transformation to determine the probability of housing stability. This two-level HGLM approach to study the community- and individual- influences on housing need among PLWHA was conducted second.

HLM Analysis – Need for Housing Assistance as the Housing Need Outcome Variable

A multilevel model building process was used as described by Luke (2004), Hox (2002), and Tabachnick and Fidell (2007) to explore the study questions. HLM for Windows, Version 6.06 was used for all HLM analyses.

Constant only model. The first step in the modeling building was the construction of the constant only model. This model had no level-one or level-two predictors in the model and was used to calculate the *intraclass correlation coefficient* (Luke, 2004). Intraclass correlation coefficient indicates the amount of variability for the housing need outcome that can be explained at the community level or ZCTA. If community characteristics were statistically significant in predicting housing need, then such findings would indicate that significant variation exists on the community-level (among the ZCTAs), thus making the two-level HLM appropriate. If significant variation does not exist, a regression model or General Linear Model (GLM) would be used. The constant only model was used as the baseline model to judge future models.

To calculate the intraclass correlation a null, unconstrained or constant only model was run (Luke, 2004; Tabachnick & Fidell, 2007). In a constant only model no level-one or level-two predictors are included. The equations were as follows:

Level 1: $Y_{ij} = \beta_{0j} + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + u_{0j}$

In reviewing the equations above, it is important to note the level-one equation was similar to a normal regression equation without a predictor variable. Y_{ij} was the dependent variable housing need (i.e., need for housing assistance) for a respondent (*i*) within a particular ZCTA (*j*). β_{0j} was the intercept for the dependent variable in a ZCTA (*j*). r_{ij} was the random errors of prediction for the level-one equation. If a predictor variable, like an individual's history

of homelessness (β_{1j}), were added into the model this would represent the slope for the relationship housing need and history of homelessness in a ZCTA.

Moving to the level-two equation the inclusion of which makes HLM unique from multiple regressions, notice the level-two equation above was predicting the intercept (β_{0j}) for a particular ZCTA in the level-one equation. γ_{00} was the overall intercept or the grand mean of the dependent variable housing need across all ZCTAs when all predictors were equal to zero. Lastly, u_{0j} was the random error component for the deviation of the intercept of a ZCTA from the overall intercept of all ZCTAs. This was the unique effect of a particular ZCTA on the intercept.

In a HLM, there are fixed and random variables and effects (Newsom, 2009). Normally, level-one and level-two predictors are considered fixed; however the level-one intercepts (β_{0j}) and slopes (β_{1j}) are assumed to vary randomly across groups in this case ZCTAs (Newsom, 2009). In the above equations, there was one fixed effect (γ_{00}) which was the grand mean of housing need among respondents across all ZCTAs. r_{ij} and u_{0j} were random effects as these represent the error terms within the equations.

The relationship of the fixed and random effects can sometimes be easier to see if a mixed-effects equation is written. A mixed-effects equation combines the level-one and level-two equation into one equation as follows:

$$Y_{ij} = \gamma_{00} + u_{0j} + r_{ij}$$

Going back to the constant only model and the intraclass correlation, significant components at the community level would indicate that a two-level model is warranted. To calculate the intraclass correlation coefficient, the following formula was used:

$$p = \frac{\tau_{u0}^2}{\tau_{u0}^2 + \sigma_r^2}$$

In the constant only model, since no predictors are included, the error has been split into two components including (a) the variability between ZCTA (u_{0j}) and (b) the variability between respondents with a ZCTA (r_{ij}) (Luke, 2004). By entering these values into the above formula the value of *p* can be determined. Spybrook et al. (2006) indicated that the intraclass correlation for community research can be .05 or smaller. Additionally, intraclass correlations for school research typically ranges from .05 and .15. An intraclass correlation at or above this level was used to determine if a two-level HLM was appropriate.

Model 1 – Level-one Predictors. The first study question was how individual-level conditions (i.e., socio-demographic, housing situation, social history) influence housing needs among low-income PLWHA. Specifically, housing need was defined as a need for housing assistance. To answer this question, several sub-questions were asked: (a) How do gender, race, age, race, and ethnicity influence housing need?; (b) How do housing burden, a potential rent increase, household composition, or a receipt of a housing subsidy influence housing need?; and (c) How do work status, history of homelessness, or history of mental health or substance use issues influence housing need? As discussed previously, through multiple regressions, it was determined that only significant individual predictors would be included in the HLM.

These variables were each included on level-1 on the model as predictors for need for housing assistance. In Model 1, no level-two predictors were included; however the level-one intercept and slopes were allowed to vary across ZCTAs (as represented by the error terms u_{0j}, u_{1j}, u_{2j}…). Allowing the intercept and slopes to vary was based on the theoretical construct that

ZCTAs were different from one another and had varying effects on respondents. Continuous predictors were mean centered, which allowed for an easier interpretation of the coefficients (Tabachnick & Fidell, 2007). To establish the "best fit" model, an evaluation of all significant level-one predictors was conducted (social-demographics, housing situation, and social history). Only significant variables (p <.05) determined through the previous multiple regression and logistic regression were included. As an example, if all the predictor variables were considered, the beginning level-one equation would be specified as:

Level-1:

Y_{ij} (Need for Housing Assistance) = β_{0j} + β_{1j} (socio-demographic $_{ij}$) + β_{2j} (housing situation $_{ij}$) + β_{3j} (social history $_{ij}$) +rij

Level 2:

$\beta_{0j} = \gamma_{00} + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

Mixed-effects:

Y_{ij} (Need for Housing Assistance) = γ_{00}+ γ_{10} (socio-demographic $_{ij}$) + γ_{20} (housing situation $_{ij}$) + γ_{30} (social history $_{ij}$) + u_{0j} + u_{1j} (socio-demographic $_{ij}$) + u_{2j} (housing situation $_{ij}$) + u_{3j} (social history $_{ij}$) + rij

Significant predictors ($p < .05$) were retained in the model, thus creating the "best fit" model at the individual level. Such model building is common in the multilevel modeling (Li, 2005; Luke, 2004). To determine model fit, the *deviance* was used. The deviance measures the lack of fit between the data and model (Luke, 2004; Tabachnick & Fidell, 2007). To compare two models, the difference of the deviances can be distributed as a chi-square statistic along with the difference in the degrees of freedom, this is referred to as the *likelihood ratio test* (Li, 2005; Luke, 2004). A significant difference between models suggests that the model is a better fit to the data. Through hypothesis testing in the HLM software, the deviance and likelihood ratio was calculated to compare models. Luke (2004) suggests also figuring the *Akaike Information Criterion (AIC)* as another model fit test. Like the deviance, the AIC should decrease as model fit improves. Each model was reviewed for model fit using the deviance, likelihood ratio, and AIC.

In addition to model fit, variance components were also reviewed. Instead of using significance tests, like those in HLM, Luke (2004) recommends examining the *effect size*. Effect size is the total variance that is attributed to the model (Tabachnick & Fidell, 2007); however it has limited use in models with random slopes (Kreft & Leeuw, 1998). Because in this study random slopes were allowed, Luke (2004) recommends refitting the models without random slopes. By doing so, only two variance components are included in the model (a) within- ZCTA variance (level-1 (σ^2)) and (b) between ZCTA variance (level – 2 (τ_{00})). The formulas for determining the effect size are found below:

Level 1:

$$\frac{\sigma^2\text{Constant Only Model} - \sigma^2\text{New Model}}{\sigma^2\text{Constant Only Model}}$$

Level 2:

$$\frac{\tau_{00}^2 \text{Constant Only Model} - \tau_{00}^2 \text{New Model}}{\tau_{00}^2 \text{Constant Only Model}}$$

The recommended approach was completed on each model to determine the amount of explained variance attributable to the individual- and community-level predictors.

Model 2 – Intercept only. The second research question considered was how community-level conditions influenced housing need of low-income PLWHA. A series of sub-questions were considered including a) How does living in a distressed ZCTA influence housing need? b) How does living in ZCTA with a higher degree of rurality influence housing need? c) How does living in ZCTA with greater social infrastructure (i.e., presence of HIV providers and affordable housing units) influence housing need? Due to the level of the data, mainly the nesting of respondents in ZCTA, multiple regressions could not be used to explore these questions for the reasons discussed previously. To explore these questions, a second model (Model 2) was developed that contained the community-level conditions of distress, degree of rurality, and social infrastructure. The community predictors were entered on the intercept of Model 1, thus this is called an intercept only model (Hox, 2002; Luke, 2004).

In the intercept model, the community conditions of distress, degree of rurality, and social infrastructure were each included in a model. The intent of the models was to determine the extent of ZCTA variability of need for housing assistance that could be explained by the community predictors. Instead of entering all the community conditions into one model, separate models were created for each predictor. Significant predictors were kept for inclusion into a full model. For example, using the community condition of community distress, a level-two equation was created as follows:

Level-1:

Y_{ij} (Need for Housing Assistance) = β_{0j} + β_{1j} (socio-demographic $_{ij}$) + β_{2j} (housing situation $_{ij}$) + β_{3j} (social history $_{ij}$) +rij

Level 2:

$\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Distress $_{j}$) + u_{0j}

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

$\beta_{4j} = \gamma_{40} + u_{4j}$

Mixed-effects:

Y_{ij} (Need for Housing Assistance) = γ_{00}+ γ_{01} (Distress $_{j}$) + γ_{10} (socio-demographic $_{ij}$) + γ_{20} (housing situation $_{ij}$) + γ_{30} (social history $_{ij}$) + u_{0j} + u_{1j} (socio-demographic $_{ij}$) + u_{2j} (housing situation $_{ij}$) + u_{4j} (social history $_{ij}$) + rij

This was repeated for each community conditions including degree of rurality and social infrastructure. Again model fit was reviewed through the deviance, likelihood test ratio, and AIC. Additionally, effect size was determined for each model.

Model 3 – Intercepts and slopes. The third research question considered was how community- and individual-level conditions related together to influence housing need of low-income PLWHA. To explore this question, a third model (Model 3) was developed that

contained the community-level conditions of distress, degree of rurality, and social infrastructure on the slopes. The community predictors were entered on the slopes of Model 2, thus this is called an intercept and slope model (Hox, 2002; Luke, 2004).

The third model (Model 3) included the community-level predictors on the intercept and the slopes (Luke, 2004). As demonstrated below in the equations, including the community predictors on the slopes is equivalent to modeling interaction affects between the level-one predictors and the level-two predictors. Each Model 2 (distress, degree of rurality, social infrastructure) were modeled. Each model was run with each community predictor on the slopes. For example, community distress was entered on the intercept and each slope. This was repeated with the other community variables (degree of rurality, HIV providers, and affordable housing units) on the slopes, while keeping distress on the intercept.

To review the newly formed equations, community distress is used again as an example:

Level-1:

Y_{ij} (Need for Housing Assistance) = β_{0j} + β_{1j} (socio-demographics $_{ij}$) + β_{2j} (housing situation $_{ij}$) + β_{3j} (social history $_{ij}$) +rij

Level 2:

$\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Distress $_j$) + u_{0j}

$\beta_{1j} = \gamma_{10} + \gamma_{11}$ (Distress) +u_{1j}

$\beta_{2j} = \gamma_{20} + \gamma_{21}$ (Distress) + u_{2j}

$\beta_{3j} = \gamma_{30} + \gamma_{31}$ (Distress) + u_{3j}

Mixed-effects:

Y_{ij} (Need for Housing Assistance) = γ_{00}+ γ_{01} (Distress $_j$) + γ_{10} (socio-demographic $_{ij}$) + γ_{11} (Distress) (socio-demographic $_{ij}$) + γ_{20} (housing history $_{ij}$) + γ_{21} (Distress) (housing history $_{ij}$) + γ_{30} (social history $_{ij}$) + γ_{31} (Distress) (social history $_{ij}$) + u_{0j} + u_{1j} (socio-demographic $_{ij}$) + u_{2j} (housing situation $_{ij}$) + u_{3j} (social history $_{ij}$) + rij

A similar approach was taken for the community predictors of degree of rurality and social infrastructure (i.e., HIV providers and affordable housing units). A final "best" fit model was determined for the outcome variable of need for housing assistance.

HGLM Analysis – Stably Housed as the Housing Need Outcome Variable

The second housing need outcome variable considered was stable versus unstable housing. Considering the outcome variable was dichotomous (i.e., stable = 1; unstable = 0), a Hierarchical Generalized Linear Model (HGLM) was used (Raudenbush & Bryk, 2002). In HGLM, a Bernoulli distribution can be specified that uses a Logit link function, a common transformation of binary data. This is a similar approach to that used in logistic regression. All models are estimated using a full *penalized quasi-likelihood* (PQL) estimation procedure and *EM Laplace interactions*. Such estimation allows for calculation of deviances for model comparison (Raudenbush, Bryk, Cheong, Congdon, & Toit, 2004). The same research questions were considered, as before, including examining the influence of community and individual conditions on housing need among low-income PLWHA. Additionally, the study examined the influence of community conditions on individual conditions. The same multilevel model building process that was used to analyze need for housing assistance was used for the housing stability analysis.

Constant only model. Similar to the approach before, a constant only model with no level-one or level-two predictors was constructed. The equations were as follows:

$$\ln\left(\frac{p}{1-p}\right) = \text{logit}\,(p) = n_{ij}$$

Level-1

$$n_{ij} = \beta_{0j}$$

Level-2

$$\beta_{0j} = \gamma_{00} + \gamma_{01}$$

Mixed Equation

$$n_{ij} = \gamma_{00} + \gamma_{01}$$

In the constant only model, γ_{00} was the average log-odds of housing stability across all ZCTA, while τ_{00} is the variance between ZCTA in ZCTA-average log-odds of housing stability. To determine model fit the deviance was reviewed for model.

Model 1 – Individual level predictors. The first study question was how individual-level conditions (i.e., socio-demographic, housing situation, social history) influence housing needs among low-income PLWHA. Specifically, housing need was defined as housing stability (i.e., stable versus unstable). To answer this question, several sub-questions were asked: (a) How do gender, race, age, race, and ethnicity influence housing need?; (b) How do housing burden, a potential rent increase, household composition, or a receipt of a housing subsidy influence housing need?; and (c) How does work status, history of homelessness, or history of mental

health or substance use issues influence housing need? As discussed previously, through logistic regressions, it was determined which individual-level predictors were included in the HGLM.

A level-one model (Model 1) was constructed with the individual-level predictors which were found to be significant predictors during the logistic regression analysis. In this model no level-two predictors were included; however the level-one intercept and slopes were allowed to vary across ZCTAs (as represented by the error terms u_{0j}, u_{1j}, u_{2j}…). Allowing the intercept and slopes to vary was based on the theoretical construct that ZCTAs were different from one another and had varying effects on respondents. Continuous variables, were grand mean centered, which allows for a meaningful zero point for interpretation of the final coefficient. Additionally, grand mean centering can reduce multicollinearity without changing the underlying model (Tabachnick & Fidell, 2007). To establish the "best fit" model, an evaluation of all selected level-one predictors was conducted, thus the level-one equation was specified as:

Level-1:

n_{ij} (Housing Stability) = β_{0j} + β_{1j} (socio-demographic $_{ij}$) + β_{2j} (housing situation $_{ij}$) + β_{3j} (social history $_{ij}$)

Level 2:

$\beta_{0j} = \gamma_{00} + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

Mixed-effects:

n_{ij} (Housing Stability) = γ_{00}+ γ_{10} (socio-demographic $_{ij}$) + γ_{20} (housing situation $_{ij}$) + γ_{30} (social history $_{ij}$) + u_{0j}+ u_{1j} (socio-demographic $_{ij}$) + u_{2j} (housing situation $_{ij}$) + u_{3j} (social history $_{ij}$)

Significant predictors ($p < .05$) were retained in the model, thus creating the "best fit" model at the individual level. A final model was created, removing the non-significant level-one predictors which resulted in a beginning model for the next step in the modeling process. To determine model fit, the deviance, was reviewed.

Model 2 – Intercept only models. The second research question considered was how community-level conditions influenced housing need of low-income PLWHA. A series of sub-questions were considered including (a) How does living in a distressed ZCTA influence housing need? (b) How does living in ZCTA with a higher degree of rurality influence housing need? (c) How does living in ZCTA with greater social infrastructure (i.e., presence of HIV providers and affordable housing units) influence housing need? To explore these questions, a second model (Model 2) was developed that contained the community-level conditions of distress, degree of rurality, and social infrastructure. The community predictors were entered on the intercept of Model 1, thus this is called an intercept only model (Hox, 2002; Luke, 2004).

In the intercept model, the community conditions of distress, degree of rurality, and social infrastructure were each included in a model. The intent of the models was to determine the extent of ZCTA variability of need for housing assistance that can be explained by the community predictors. Instead of entering all the community conditions into one model, separate models were created for each predictor. Significant predictors were kept in the model and this model was used for the next modeling step. To determine model fit, the deviance, was reviewed.

Model 3 – Intercept and slopes. The third research question considered was how community- and individual-level conditions related together to influence housing need of low-income PLWHA. To explore this question, a third model (Model 3) was developed that contained the community-level conditions of distress, degree of rurality, and social infrastructure on the slopes. The community predictors were entered on the slopes of Model 2, thus this is called an intercept and slope model (Hox, 2002; Luke, 2004).

The third model (Model 3) included the community-level predictors on the slopes and intercepts. Including the community predictors on the slopes is equivalent to modeling interaction affects between the level-one predictors and the level-two predictors. Significant predictors were left in the model, thus creating the "best" fit model for predicting the probability of housing stability. To determine model fit, the deviance, was reviewed.

CHAPTER 4

RESULTS

Description of the Sample

The analysis for this study was completed through several steps. First, descriptive statistics, including frequency distributions and percentages for dichotomous variables, were completed. Frequencies, means, standard deviations, percentages, and range of values were all calculated for continuous community and individual variables. Second, multiple regression analyses were used to test model assumptions and narrow the number of individual variables to be used in the HLM. Multiple regression was used to predict the housing need outcome variable - need for housing assistance. A similar process was used to study housing stability, but logistic regression was used because housing stability was a dichotomous variable.

To examine the research questions, a two-level HLM analysis was utilized. A level-one model was used to study the influence of individual-level conditions on housing need (i.e., housing stability and need for housing assistance) among low-income persons living with HIV/AIDS (PLWHA). To study the community conditions that influence housing need, the community conditions of distress, degree of rurality, and social infrastructure were included on level-two. Interaction effects between the community- and individual-levels were also examined utilizing HLM.

Data Clean-up & Screening

In an effort to ensure the data were ready for statistical analysis all variables were examined through various SPSS analyses for accuracy of data entry, missing values, and fit between their distributions and the assumptions of multivariate analysis. A more in-depth analysis to determine outliers and normality of distribution was conducted on the continuous variables. SPSS 14.0 was used for all data analysis.

HIV/AIDS Housing Survey Data

Outliers

An analysis of outliers for continuous variables of age, housing burden, rent increase, and housing need was conducted using SPSS DESCRIPTIVES. In a review of the boxplot, age had one potential outlier; however a review of the mean and the 5 percent trimmed mean yielded similar results (44 mean age). Such a finding suggests that the outlier has limited influence on the mean (Pallant, 2001). A similar review was conducted for housing need and rent increase. No changes were made to age, rent increase, or housing need based on this analysis. A boxplot revealed that housing burden had many outliers (1.5 box-lengths) and extreme outliers (extending more than 3 box – lengths away from the edge of the box). Because extreme outliers can bias statistical results, it was decided that these cases would be deleted from the sample. This is an alternative offered by Tabachnick and Fidell (2007) when dealing with outliers.

In the first review of the boxplot of housing burden, one case was found to be an extreme outlier with a value of 32.50, thus it was deleted. A second analysis was conducted and the decision was made by a review of the boxplot and comparison of the mean (.41) and the 5

percent trimmed mean (.36), a difference of .05, to delete an additional five cases. This resulted in a sample of 387 with a mean average of .38 and a 5 percent trimmed mean of .36. In review of the histogram, three cases still seemed to be outliers. Based on the extreme cases analysis, an additional three were deleted from the sample. This resulted in a final sample (n=384) with a mean of .37 and a 5 percent trimmed mean of .35. This combination of mean and trimmed mean seemed consistent with each iteration of the analysis. Because of this fact and that additionally the boxplot had no extreme outliers, no further cases were deleted. This became the final sample (n=384).

Assessing Normality

An examination of normality was conducted on the three continuous independent variables including age, housing burden, and rent increase. Additionally, an assessment of normality was conducted on the dependent variable housing need. As suggested by Tabachnick and Fidell (2007), a review of the graphical shape of the distribution of variables to determine normality was completed verses conducting tests of inference. Tabachnick and Fidell (2007) state most tests of inference are not reliable with larger data sets such as those over 200 cases. To conduct a review of normality, SPSS DESCRIPTIVE was used. During analysis, pairwise exclusion of missing data was utilized.

In reviewing age, the variable was not skewed and meso-kurotic, a normal distribution [sk = (-.083/.125=-.664) kt = (.081/.249=.325)]. A review of the histogram shows a close to normal distribution with slight peakedness. In addition a review of the normal Q-Q plots and detrended normal Q-Q plots was conducted. In a normal Q-Q plot the observed value for each score is plotted against the expected value from a normal distribution; a straight line suggests a normal distribution (Pallant, 2001). A detrended normal Q-Q plot examines the deviation of the

scores from the straight line. In this plot, there should be no clustering of points with most points clustering around the zero line (Pallant, 2001). A review of the normal probability plots (normal Q-Q plots) for age showed a straight line of the plotted observed and expected values, which is consistent with normally distributed data. Finally, the detrended normal Q-Q plot should showed no clustering of plots with most centering on the zero line. The plot for age showed no clustering, but two peaks and valleys in the graph. Through this analysis it was determined that age was nearly normally distributed.

A second independent variable, housing burden, was analyzed and was found positively skewed and meso-kurotic, not a normal distribution [sk = (.760/.127 = 5.98) kt = (.348/.253 = 1.375)]. This was further confirmed through a review of the histogram, normal Q-Q plot, and detrended normal Q-Q plot. The histogram showed a near normal curve with slight skew left. A review of the normal probability plots (normal Q-Q plot) shows a strong straight line until the higher values at which point it curves downward. Finally, the detrended normal Q-Q plot shows plots close to zero line until higher values curved upward. Through this analysis it was determined that housing burden was not normally distributed.

The third independent variable, rent increase, was analyzed and was found not skewed, lepto-kurotic, not a normal distribution [sk = (.133/.141= .943) kt = (-1.310/.281 = -4.662)]. A review of the normal probability plots (normal Q-Q plot) showed a relatively straight line with lower values above and higher below the line. Finally, the detrended normal Q-Q plot showed no clustering, yet greater dispersion above and below the zero line. Through this analysis it was determined that rent increase was not normally distributed.

Lastly, analysis was conducted on the dependent variable housing need scale. Analysis showed that the distribution of the scores not skewed, lepto-kurotic, not a normal distribution [sk

= (.420/.125 = 3.36) kt = (-1.145/.248 = 4.617)]. A review of the histogram showed a long, flat curve. A review of the normal probability plots (normal Q-Q plot) showed a fairly straight line with a curvature at the end. The detrended normal Q-Q plot is diagonal with little clustering around the zero line. Through this analysis it was determined that the housing need scale was not normally distributed.

In addition to the above a Kolmogorov-Smirnov statistic, which assesses the normality of the distribution of scores for the sample, was conducted. The results were significant, which confirms that rent increase, housing burden, and housing need scale violate the assumption of normality. This is quite common in large samples (Pallant, 2001).

For the non-normal variables of housing burden, rent increase, and housing need scale some common transformations were considered including the square root and logarithm transformations using SPSS. A comparison of the histograms, skewness, and kurtosis scores did not result in a normal distribution of the scores; rather in most cases the transformation was worse than the original. Based on this analysis, it was decided to use the original variables.

Community Data

Outliers

An analysis of outliers for continuous variables of distress scale, rural population, service providers, and affordable housing units was conducted using SPSS DESCRIPTIVES. In a review of the boxplot, service providers, affordable housing units, and rural population all had outliers. Service providers units had one outlier. Affordable housing units had four outliers and one extreme outliner. Rural population also had several extreme outliers. In a review of each variable it was determined that all cases would remain in the sample. In the case of rurality, all the

extreme variable cases were those with a rural population. Deleting these cases would make any exploration of rurality impossible. Both a square root and logarithm transformation were completed on rural population; however the transformation did not reduce the number of outliers. Although Tabachnick and Fidell (2007) state that extreme outliers can bias statistical results, it was decided for theoretical reasons to keep all level-two cases.

Assessing Normality

An examination of normality was conducted on the four continuous independent community variables including: distress scale, rural population, HIV/AIDS service providers, and affordable housing units. As suggested by Tabachnick and Fidell (2007), a review of the graphical shape of the distribution of variables to determine normality was completed. To conduct a review of normality, SPSS DESCRIPTIVE was used. During analysis, pairwise exclusion of missing data was utilized. Using approaches similar to those described previously, it was determined that the community variables were not normally distributed.

Sample size for HLM

To determine if the sample size (n=384) was sufficient for the HLM analysis, a formula offered by Tabachnick and Fidell (2007), N>50+8m (where m = number of independent variables) was used. Because there were 4 level-one IVs in each analyses, a sample size of 384 was adequate for the HLM analysis (384>50+8*4).

Data Analysis

Descriptive Statistics

Descriptive statistics were run using SPSS 14.0, SPSS DESCRIPTIVE, for each of the community- and individual-level variables as well as the dependent outcome variables of housing need – housing stability and need for housing assistance.

Community Variables

Of the 127 ZCTAs in the four-county Tampa MSA, 78 ZCTAs were included in the community-level sample. These 78 ZCTAs were matched with the respondent data from the HIV/AIDS Housing Survey. Considering rurality, 25 ZCTAs had some percentage of rural population living within the area. Of those areas with a rural population, the percentage of rurality ranged from 1%-100%. Social infrastructure was measured by the presence of an HIV/AIDS service or housing provider organization and the presence of affordable housing units. Of the 78 ZCTAs, 16 (21%) had no providers or units located within the ZCTA. The descriptive statistics for the community-level variables are presented in Table 4.

The level of distress of each ZCTA was based on Census data for four indicators similar to the USDA Typology Codes. The indicators included – educational attainment, unemployment, poverty, and housing stress. Based on this initial information, ZCTAs were rated for their level of distress based on a scale from 0-4 with 0 representing no distress and 4 representing the highest distress. Of the ZCTAs (n=78), 28 (36%) had no level of distress and 16 (21%) had high levels of distress (See Table 5). The scale had good internal consistency, with a Cronbach alpha coefficient of .81.

Table 4

Descriptive Statistics for Community-level Variables

	ZCTA (n=78)		
Variable	M	SD	Range
Distressed ZCTA Scale	1.63	1.563	0-4
Rural ZCTA (%)	.0812	.20345	0-100%
Social Infrastructure			
HIV Housing & Service Providers	.37	.686	0-3
Subsidized Housing Units	537.53	632.636	0-3463

Distress Scale Items	Yes (%)	No (%)
Housing Stress (Y/N)	43.6	56.4
Low Education (Y/N)	46.2	53.8
Unemployment (Y/N)	28.2	71.8
Poverty (Y/N)	44.9	55.1

Table 5

ZCTA Level of Distress

	ZCTA (N=78)	
Distressed ZCTA Scale Score	Number	%
0	28	35.9
1	14	17.9
2	11	14.1
3	9	11.5
4	16	20.5

Individual Variables

Descriptive statistics were completed for each individual variable including: socio-demographics – age, gender, race, ethnicity; housing situation – housing burden, rent increase, household composition, housing subsidy; social history – work status, history of homelessness, mental illness, or substance use issue. Table 6 provides the descriptive statistics of the sample (N=384).

Table 6

Descriptive Statistics for Individual-level Variables (N=384)

Variable	M	SD	Range
Demographics: Age	43.60	9.414	19-68
Housing Situation			
Housing Burden (%)	.3687	.29345	.00-1.30
Potential Rent Increase	3.69	2.146	1-7
		Yes (%)	No (%)
Demographics			
Gender			
Male		64	36
Female		36	64
Race			

Black	37.8	62.2
White	58.1	41.9
Other	4.1	95.9
Hispanic	14.1	85.9
Housing Situation		
Household Composition		
Single	42.3	57.7
Single w/ Children	9.3	90.7
Adults (2 or more)	38.8	61.2
Adults w/Children	9.5	90.4
Housing Subsidy (Y/N)	25.4	74.6
Social History		
Work Status	30.7	69.3
Homeless History	33.3	66.7
Mental Health History	59.1	40.9
Substance Use History	34.6	65.4

Housing Need Outcome Variables

Two variables were used to measure housing need: (a) stability and (b) need for housing assistance. Of respondents, 273 (71%) were in stable housing – living in their own place including a room, rental, or ownership unit. The need for housing assistance was determined by responses to four questions using a 7-point Likert-type response scale. Respondents were asked to rate their need – help paying for rent, help paying utilities, help paying for security deposits,

and help locating permanent housing. The range of scores was from 0-24 with 78 percent of participants having scores between 1 and 24. Descriptive statistics for each question in the scale is provided in Table 7. The housing need scale had good internal consistency with a Cronbach alpha coefficient of .83.

Table 7

Descriptive Statistics for Housing Need Scale

Question	n	%	M	SD
Help paying rent			2.88	2.524
Not Needed	134	34.9		
1	19	4.9		
2	21	5.5		
3	44	11.5		
4	32	8.3		
5	19	4.9		
Very Much Needed	115	29.9		
Help paying utilities			2.94	2.533
Not Needed	134	34.9		
1	12	3.1		
2	26	6.8		
3	39	10.2		
4	33	8.6		
5	23	6.0		

Very Much Needed	117	30.5		
Help paying security and/or utility deposits			1.935	2.546
Not Needed	223	58.1		
1	14	3.6		
2	14	3.6		
3	17	4.4		
4	14	3.6		
5	18	4.7		
Very Much Needed	84	21.9		
Need permanent housing			2.13	2.697
Not Needed	225	58.6		
1	7	1.8		
2	6	1.6		
3	12	3.1		
4	12	3.1		
5	18	4.7		
Very Much Needed	104	27.1		

Results of Multiple Regression Predicting Need for Housing Assistance

Multiple regression was utilized to narrow the number of predictor variables to be included in level-one of the HLM and to test model assumptions. Multiple regression was used

for the housing need outcome variable – need for housing assistance. Regression models were built for each set of individual predictor variables including demographics – age, gender, race, ethnicity; housing situation – housing burden, rent increase, household composition, rent subsidy; and social history – work status, history of homelessness, mental health or substance use history. In each regression model, pairwise exclusion of missing data was utilized.

Socio-demographics as Predictors of Need for Housing Assistance

The first standard multiple regression was performed between housing need (need for housing assistance) as the dependent variable and each of the demographic variables, including race (two dummy variables of black and white), age, ethnicity, and gender (dummy variable female). Following each regression, an evaluation of the model was conducted examining the following areas (a) correlation of the variables, (b) model fit and significance, and (c) contribution and significance of variables. Using these three areas as a guide, a modeling approach was used to determine the best fit model between housing need and the demographic variables.

In model 1, the standard multiple regression was performed between housing need and all the demographic variables. The correlation between the demographic variables and housing need was low ranging from .011 to -.137. None of the demographic variables showed a strong correlation of .3 or higher with housing need, a value recommended by Pallant (2001). Tabachnick and Fidell (2007) suggest excluding variables with low correlations; however the theoretical connection of the variables to the outcome variable and the preliminary nature of the regression analysis warranted keeping the variables in the analysis. In examining the correlations between the independent variables only the race variables, black and white, were highly correlated (-.919). Tabachnick and Fidell (2007) suggest not including both variables in the

model when they are correlated higher than .7 because this is an indicator of multicollinearity. Additionally, in reviewing the tolerance for each independent variables, Black (.151) and White (.155) each were closest to zero, further suggesting multicollinearity.

In model 1, the demographic variables did not explain a significant proportion of variance in the housing need scores, $R^2 = .03$, $F(5,362) = 2.126$, $p = .062$. In examining each independent variable, white was the only variable that significantly contributed to predicting housing need, $\beta = -4.724$, $t(362) = -2.1$, $p<.05$. Due to its significance in the model and its high correlation to white, the black race variable was deleted from the model.

Model 2 was a standard multiple regression performed between housing need and white, age, female, and Hispanic. In model 2, the remaining variables did explain a significant proportion of the variance in the housing need scores, $R^2 = .03$, $F(4,362) = 2.339$, $p = .05$. In examining each independent variable, white again was the only variable that significantly contributed to predicting housing need, $\beta = -2.657$, $t(362) = -2.78$, $p<.01$. In a review of the standardized coefficients, white had the strongest unique contribution to the model (-.157), the lowest contributor was female (-.04), thus it was deleted from the model. This process of deleting the lowest contributor to the model was continued until a final model was determined.

A final best fit model between housing need and white was determined after deleting the lowest contributing, non-significant socio-demographic variables from the model. In the resulting model, where white was the only socio-demographic variable in the model, explained a significant proportion of variance in housing need scores, $R^2 = .14$, $F(1,369) = 7.049$, $p <.01$. Additionally, white significantly contributed to predicting housing need, $\beta = -2.326$, $t(369) = -2.655$, $p<.01$ (See Table 8).

Table 8

Summary of Multiple Regression Analysis for Socio-Demographic Variables Predicting Need for Housing Assistance (N = 384)

	Model 1			Model 2			Model 3			Final Model		
Variable	B	SE B	β	B	SE B	β	B	SE B	β	B	SE(B)	β
Female	-.615	.972	-.035	-.702	.968	-.040	-	-	-			
Black	-2.35	2.32	-.136	-	-	-	-	-	-			
White	-4.72	2.25	-.278*	-2.66	2.22	-.157**	-2.435	.905	-.144**	-2.33	.876	-.137**
Hispanic	.983	1.32	.041	1.21	1.30	.050	1.046	1.284	.043			
Age	-.060	.047	-.068	-.061	.047	-.068	-.058	.046	-.065			
R^2			.03			.03			.03			.02
F for change in R^2			2.13			2.4*			3.03*			7.05**

*$p < .05$. **$p < .01$.

Housing Situations as Predictors of Need for Housing Assistance

The second standard multiple regression model was performed between need for housing assistance as the dependent variable and each of the housing situation variables, including housing burden, housing composition (three dummy variables of single, adults, and single with children), receipt of housing subsidy, and rent increase. A similar model building approach similar to that described above was used.

In model 1, the standard multiple regression was performed between housing need and all the housing situation variables. The correlation between the housing situation variables and housing need ranged from .001 to -.682. In examining the correlations between the independent variables only the household composition variables, single and adults, were highly correlated (-.682). Additionally, in reviewing the tolerance for each independent variable, single (.318) and adults (.319) each were closest to zero, suggesting multicollinearity.

In model 1, the housing situation variables did not explain a significant proportion of variance in the housing need scores, $R^2 = .04$, $F(6,292) = 1.736$, $p = .113$. In examining each independent variable, housing burden ($\beta = 3.606$, $t(292) = 2.075$, $p<.05$) and rent increase ($\beta = -.443$, $t(292) = 1.938$, $p<.05$) both significantly contributed to predicting housing need.

The next models examined the remaining non-significant variables and deleted them in order of the lowest standardized coefficients – single, housing subsidy, single with children, and adults. This resulted in a final model.

A final best fit model between housing need and two predictor variables housing burden and rent increase was created. In the resulting model, housing burden and rent increase explained a significant proportion of variance in housing need scores, $R^2 = .03$, $F(2,292) = 4.116$, $p <.05$. Additionally, housing burden ($\beta = 3.5$, $t(292) = 2.116$, $p<.05$) and rent increase ($\beta = -.443$, $t(292)$

= 1.96, $p<.05$) both significantly contributed to predicting housing need (See Table 9). Additionally, in reviewing the tolerance for each independent variable, housing burden (1.00) and rent increase (1.00), suggested no multicollinearity.

Table 9

Summary of Multiple Regression Analysis for Housing Situation Variables Predicting Need for Housing Assistance (N = 384)

	Model 1			Model 2			Model 3			Final Model		
Variable	B	SE B	β	B	SE B	β	B	SE B	β	B	SE(B)	β
Single	-1.86	1.75	-.110									
Single w/ Children	-.835	2.25	-.029	.677	1.75	.024						
Adults Only	-2.42	1.77	-.141	-.905	1.06	-.053	-.938	1.01	-.055			
Housing Burden	3.61	1.74	.126*	3.60	1.74	.126*	3.69	1.67	.129*	3.5	1.65	.123*
Rent Increase	.443	.229	.113	.425	.228	.109	.424	.227	.109	.443	.226	.113*
Housing Subsidy	-.374	1.198	-.019	-.378	1.20	-.020						
R^2			.03			.03			.03			.03
F for change in R^2			1.74			1.85			3.03*			4.12*

*$p < .05$

Social History as a Predictor of Need for Housing Assistance

The third standard multiple regression model was built between housing need as the dependent variable and each of the social history variables, including work status, history of homelessness, substance use history, and mental health history. A model building approach similar to that described above was used.

In model 1, the standard multiple regression was performed between housing need and all the social history variables. The correlation between the social history variables and housing need was low ranging from -.157 - .393. Only one of the social history variables, history of homelessness (.393), showed a strong correlation of .3 or higher with housing need, a value recommended by Pallant (2001). In examining the correlations between the independent variables, none of the variables were correlated higher than .7, a value Tabachnick and Fidell (2007) suggest using as a cut off value for including both variables in the model. Additionally, in reviewing the tolerance for each independent variables all were very high suggesting no multicollinearity.

In model 1, the social history variables did explained a significant proportion of variance in the housing need scores, $R^2 = .18$, $F(4,361) = 19.9$, $p<.001$. In examining each independent variable, history of homelessness ($\beta = 6.267$, $t(361) = 7.154$, $p<.001$) was the only variable to uniquely and significantly predict housing need. In an examination of the standardized coefficients, work status (-.088) and history of substance use (.087) contributed the most to the model after considering history of homelessness. The next model examined the remaining variables after a history of mental illness was deleted from the mode. This resulted in a final model.

A final best fit model between housing need and three predictor variables history of homelessness, work status, history of substance use was created. In the resulting model all three variables explained a significant proportion of variance in housing need scores, $R^2 = .18$, $F(3,361) = 25.660$, $p < .001$. Additionally, history of homelessness ($\beta = 3.56.346$, $t(361) = 7.243$, $p<.001$), work status ($\beta = -1.810$, $t(361) = -2.054$, $p<.05$), and history of substance use ($\beta = -1.871$, $t(361) = 2.152$, $p<.05$) significantly contributed to predicting housing need (See Table 10). Additionally, in reviewing the tolerance for each independent variable, work status (.974), history of homelessness (.944), and history of substance use (.941), suggested no multicollinearity.

Table 10

Summary of Multiple Regression Analysis for Social History Variables Predicting Need for Housing Assistance (N = 384)

	Model 1			Final Model		
Variable	B	SE B	β	B	SE B	β
Work Status	-1.60	.891	-.088	-1.81	.881	-.100*
History Homeless	6.27	.876	.353**	6.35	.876	.357**
Mental Health	1.32	.862	.077			
Substance Use	1.54	.895	.087	1.87	.869	.106*
R^2		.18			.18	
F for change in R^2		19.9**			25.660**	

*$p < .05$. **$p < .001$.

Significant Individual Predictors of Need for Housing Assistance

The fourth standard multiple regression model was performed between housing need as the dependent variable and each of the significant variables found in the previous model building. These included the demographic variable – white; the housing history variables – housing burden and rent increase; and the social history variables – history of homelessness, work status, and history of substance use. A similar model building approach to that used in the previous models was used.

In the model, the predictor variables did explain a significant proportion of variance in the housing need scores, $R^2 = .21$, $F(6,285) = 12.336$, $p<.001$. In examining each predictor variable, housing burden ($\beta = 4.399$, $t(285) = 2.862$, $p<.01$), history of homelessness ($\beta = 5.975$, $t(285) = 6.026$, $p<.001$), and history of substance use ($\beta = 2.118$, $t(285) = 2.179$, $p<.05$) all significantly predicted housing need. In an examination of the standardized coefficients, rent increase (.076) had the lowest contribution to the model and was deleted from the model.

The next two models examined the remaining variables after rent increase and white, which were found to no longer be significant predictors of housing need, were deleted from the model. This resulted in a final model.

A final best fit model between housing need and four predictor variables housing burden, history of homelessness, work status, history of substance use was created. In the resulting model all four variables explained a significant proportion of variance in housing need scores, $R^2 = .20$, $F(4,359) = 21.841$, $p < .001$. Additionally, housing burden ($\beta = 4.111$, $t(359) = 3.013$, $p<.01$), history of homelessness ($\beta = 6.354$, $t(359) = 7.313$, $p<.001$), work status ($\beta = -1.830$, $t(359) = -2.094$, $p<.05$), and history of substance use ($\beta = 2.113$, $t(359) = 2.440$, $p<.05$) significantly contributed to predicting housing need (See Table 11). Additionally, in reviewing the tolerance

for each independent variable, housing burden (.991), work status (.974), history of homelessness (.944), and history of substance use (.933), suggested no multicollinearity.

Table 11

Summary of Multiple Regression Analysis for All Significant Level-1 Variables Predicting Need for Housing Assistance (N = 384)

	Model 1			Final Model		
Variable	B	SE B	β	B	SE B	β
White	-1.55	.931	-.091			
Housing Burden	4.40	1.54	.154**	4.11	1.36	.144**
Rent Increase	.296	.211	.076			
Work Status	-1.63	.983	-.090	-1.83	.874	-.101*
History Homeless	5.98	.992	.337***	6.35	.869	.358***
Substance Use	2.12	.972	.120*	2.11	.866	.120**
R^2		.21			.20	
F for change in R^2		12.34***			21.84***	

*$p < .05$. **$p < .01$. ***$P < .001$

An assessment of model assumptions including screening for multicollinearity, reviewing for outliers through examination of Mahalanobis distances, and reviewing of scatterplot was conducted. The model adequately met all of these assumptions. This final model was used as a starting model for the level-one HLM analysis in studying the outcome variable, need for housing assistance.

Results of Logistic Regression Predicting Housing Stability

A direct logistic regression analysis was performed to predict the probability that a respondent would be stably housed, the second outcome variable. Three theoretical groupings of the predictors were used in an exploratory model building process: demographics – including age, gender, race and ethnicity; housing situation – including household composition, rent increase, housing burden, and housing subsidy; and social history – including work status, history of homelessness, and mental illness and substance use histories. Analysis was performed using SPSS LOGISTIC REGRESSION. This exploratory process was used to narrow the set of predictor variables that would be used in the HLM analysis.

Socio-demographics as Predictors of Housing Stability

The first model included the demographic predictors. After deletion of 25 missing cases, data from 359 respondents were available for analysis: 255 stable and 104 unstable. A test of the full model with all four predictors, including age, gender, white, and ethnicity against a constant-only model was not statistically significant using the omnibus test of model coefficients, $X^2(4, N=359) = 8.8, p>.05$. The test indicates that as a set the predictors do not reliably distinguished between unstably and stably housed persons living with HIV/AIDS. Classification of the model was not impressive with an overall success rate of 71 percent predicting stable and unstable persons living with HIV/AIDS correctly, the same percentage for the constant-only model.

The constant only model tallies the correct and incorrect predictions, in this case the prediction of respondents that are stable and unstable, for the null model using only the constant. In the above model, the constant only model predicted housing stability correctly 71 percent of the time. On its face this may seem like a good prediction, but this was the same as blindly estimating or the chance occurrence of the most frequent category, in this case, stably housed. By

adding additional predictors to the model, the goal is to determine a model that has a better predictive power than the constant only model (Garson, 2009). In this case, adding the demographic predictors did not increase predictive power of the model.

Table 12 shows the regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the four predictors. The Wald statistic is commonly used to test the significance of individual logistic regression coefficients for each predictor variable (Garson, 2009). Garson (2009) suggests using the Wald statistic when deciding to drop predictor variables from the model. Any non-significant variables can be dropped in an approach similar to multiple regression.

According to the Wald criterion, only white was a significant predictor in the model (See Table 12). For exploratory purposes, a model was run including only white respondents and a second with only black respondents; both models were significantly different from the constant-only model, $X^2(1, N=370) = 4.090$, $p<.05$ and $X^2(1, N=370) = 5.633$, $p<.05$, respectively. Neither model was able to offer a better prediction for housing stability than the constant only model at 71 percent.

In addition to the Wald statistic, the odds ratio should be considered. The odds ratio is a measure of effect size, representing the relative importance of the predictor variable on the dependent variable's odds (Garson, 2009). In examining the odds ratios of the predictor variables in the model, being black (*exp* (-.553) =.575, $p<.05$*)* is significantly associated with a reduced likelihood of stable housing when compared to non-black. Conversely, being white (*exp* (.466) = 1.594, $p<.05$*)* is significantly associated with an increased likelihood of being housing stable when compared to non-white (see Table 12).

In addition to the Wald statistic and the odds ratio, Table 12 also includes the confidence interval. Garson (2009) notes that if the low-high range of the confidence interval includes 1, this indicates that a change in the predictor variable is not associated with a change in the odds of the dependent variable. In such a situation, the predictor variable is not useful. In model 1, the predictor variables age, Hispanic, and female all contain 1 in their confidence intervals, thus these variables were not associated with a change in the odds of housing stability.

Since race was the only significant demographic predictor in the model, as seen by the significant Wald statistic, race was kept as a predictor variable to be included in a final model. It should be noted that because the proportions of black and white respondents were nearly equal, black and white were highly correlated (both had high standard errors when included in the model) (Garson, 2009). In the final model, therefore, only black was included.

Table 12

Logistic Regression Analysis of Housing Stability as a Function of Respondent Demographics

				95% Confidence Interval for Odds Ratio	
Variables	B	Wald Chi-square	Odds Ratio	Lower	Upper
Model 1 – All Predictors					
Age	.019	2.184	1.019	.994	1.044
White	1.154	6.339*	1.906	1.154	3.150

Female	.178	.463	1.195	.716	1.994
Hispanic	-.190	.247	.827	.390	1.751
Final Models with White & Black					
White	.466	4.091*	1.594	1.015	2.505
Black	-.553	5.654*	.575	.364	.907

*p<.05

Housing Situation as a Predictor of Housing Stability

The second model included the housing situation predictors. After deletion of 95 missing cases, data from 289 respondents were available for analysis: 235 stable and 54 unstable. A test of the full model with all six predictors, including single, adult, single with children, housing burden, housing subsidy, and rent increase against a constant-only model was statistically significant using the omnibus test of model coefficients, $X^2(5, N=289) = 13.008$, $p<.05$. The test indicates that as a set, the predictors reliably distinguished between unstably and stably housed persons living with HIV/AIDS. Although the predictive model is statistically significant, it did not do a better job of predicting housing stability. In this case, the constant only model had an overall success rate of 81 percent, thus blindly predicting housing stability, the model was correct 81 percent of the time. Model 1 had the same overall success rate, 81 percent, as the constant only model, thus it predicted no better than chance.

Table 13 shows the regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the six predictors. According to the Wald criterion, the receipt of a housing subsidy was the only significant predictor in the model. For exploratory purposes, various models were run excluding variables with low Wald statistics. A

final model was determined with two predictor variables including housing burden and housing subsidy. Although this model was statistically significantly different from the constant-only model, $X^2(1, N=368) = 39.586$, $p<.001$, it was not able to offer a better prediction for housing stability than the constant only model at 72 percent. When considering housing burden, greater housing burden ($exp(1.468) = 4.340$, $p<.001$) was significantly associated with an increased likelihood of being housing stable. At first, this may seem counterintuitive, however upon closer examination; this finding may be a result of the operational definition. For example, stability was operationalized as respondents living in such housing situations as apartments, houses, or rooms they rented. Unstably housed included respondents in transitional or other group living situations where rent is often not collected. It therefore stands to reason that respondents classified as stable, operationally, are more affected by housing burden than those who were classified as unstable. In considering the receipt of a housing subsidy, a receipt of a rent subsidy ($exp(2.023) = 7.563$, $p<.001$) was significantly associated with a increase in the likelihood of PLWHA of being housing stable. Due to the significant contribution of both variables in the model, the variables were kept as predictor variables to be included in the final model.

Table *13*

Logistic Regression Analysis of Housing Stability as a Function of Respondent Housing Situation

				95% Confidence Interval for Odds Ratio	
Variables	B	Wald Chi-square	Odds Ratio	Lower	Upper

Model 1 – All Predictors					
Single	.355	.386	1.426	.426	4.369
Single with Children	-.039	.003	.961	.239	3.874
Adults Only	-.325	.350	.723	.246	2.119
Housing burden	.379	.400	1.461	.451	4.729
Housing Subsidy	1.175	5.943*	3.238	1.259	8.328
Rent Increase	-.075	1.036	.928	.804	1.072
Final Model					
Housing Burden	1.468	10.731**	4.340	1.803	10.445
Housing Subsidy	2.023	25.388**	7.563	3.443	10.615

*$p<.05$, $p<.001$

Social History as a Predictor of Housing Stability

The third model included the social history predictors. After deletion of 27 missing cases, data from 357 respondents were available for analysis: 259 stable and 98 unstable. A test of the full model with all four predictors, including work status, history of homelessness, history of substance use, and history of mental illness against a constant-only model was statistically significant using the omnibus test of model coefficients, $X^2(4, N=357) = 60.621$, $p<.001$. The test indicates that as a set the predictors reliably distinguished between unstably and stably housed persons living with HIV/AIDS. The classification of the model showed improvement over previous models as the model predicted unstable respondents correctly 44 percent of the time and

stably housed respondents correctly 88.4 percent of the time, for an overall success rate of 76.2 percent. This is compared to a success rate of 72.5 percent for the constant-only model.

Table 14 shows the regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the four predictors. According to the Wald criterion, work status and a history of homelessness were the only significant predictors in the model. For exploratory purposes, various models were run excluding variables with low Wald statistics. A final model was determined with two predictor variables including history of homelessness and work status. This model was significantly different from the constant-only model, $X^2(2, N=362) = 58.311$, $p<.001$. The model, at 76 percent, was able to offer a better prediction for housing stability than the constant only model at 72 percent. When considering work status and a history of homelessness, having a history of homelessness ($exp(-1.676) = .187$, $p<.001$) was significantly associated with a decrease in the likelihood of housing stability and working ($exp(.912) = 2.490$, $p<.01$) was significantly associated with the increased likelihood of housing stability. Due to the significant contribution of both variables in the model, the variables were kept as predictor variables to be included in the final model.

Table 14

Logistic Regression Analysis of Housing Stability as a Function of Respondent Social History

				95% Confidence Interval for Odds Ratio	
Variables	B	Wald Chi-	Odds	Lower	Upper

		square	Ratio		
Model 1 – All Predictors					
Work Status	.858	7.028*	2.358	1.251	4.445
History of Homelessness	-1.576	35.423**	.207	.123	.348
History of Substance Use	-.377	1.822	.686	.397	1.186
History of Mental Health	-.224	.612	.799	.456	1.401
Final Model					
Work Status	.912	8.534*	2.490	1.350	4.593
History of Homelessness	-1.676	42.490**	.187	.113	.310

*p<.01, **p<.001

Significant Individual Variables as Predictors of Housing Stability

The fourth model included all the significant predictors found in the previous models. After deletion of 48 missing cases, data from 336 respondents were available for analysis: 244 stable and 92 unstable. A test of the full model with all five predictors, including black, housing burden, housing subsidy, work status, and history of homelessness against a constant-only model was statistically significant using the omnibus test of model coefficients, $X^2(4, N=336) = 96.849$, p<.001. The test indicates that as a set the predictors reliably distinguished between unstably and stably housed persons living with HIV/AIDS. The classification of the model showed improvement over previous models as the model predicted unstable respondents correctly 44 percent of the time and stably housed respondents correctly 91.4 percent of the time, for an

overall success rate of 78.3 percent. This is compared to a success rate of 72.6 percent for the constant-only model.

Table 15 shows the regression coefficients, Wald statistics, odds ratios, and 95% confidence intervals for odds ratios for each of the five predictors. According to the Wald criterion, black was not a significant predictor in the model and thus was deleted from the model. A final model was determined with the remaining four predictor variables, which resulted in a model significantly different from the constant-only model, $X^2(2, N=349) = 97.895$, $p<.001$. The classification of the model showed improvement over the previous model as the model predicted unstable respondents correctly 43.2 percent of the time and stably housed respondents correctly 93.3 percent of the time, for an overall success rate of 79.7 percent. This is compared to a success rate of 72.8 percent for the constant-only model.

When considering the contribution of each variable to housing stability, having a housing burden ($exp(1.734)= 5.665$, $p<.001$) was significantly associated with an increased likelihood of housing stability. Also, the receipt of a housing subsidy ($exp(2.312)= 10.099$, $p<.001$) was significantly associated with an increased likelihood of housing stability. In considering history of homelessness, having a history of homelessness ($exp(-1.691)= .184$, $p<.001$) was significantly associated with a decreased likelihood of housing stability. Lastly, working ($exp(1.375)= 3.96$, $p<.001$) was significantly associated with an increased likelihood of housing stability. Due to the significant contribution of all the variables in the model, the variables were kept as predictor variables to be included in the HLM.

Table 15

Logistic Regression Analysis of Housing Stability as a Function of all Significant Predictors

				95% Confidence Interval for Odds Ratio	
Variables	B	Wald Chi-square	Odds Ratio	Lower	Upper
Model 1 – All Predictors					
Work Status	1.453	16.717*	4.274	2.130	8.576
History of Homelessness	-1.597	28.859*	.202	.113	.363
Race: Black	-.454	2.267	.635	.351	1.147
Housing burden	1.791	12.063*	5.998	2.183	16.484
Housing Subsidy	2.411	27.997*	11.145	4.563	27.222
Final Model					
Work Status	1.375	16.010*	3.96	2.017	7.758
History of Homelessness	-1.691	34.476*	.184	.105	.324
Housing Subsidy	2.312	27.547*	10.099	4.258	23.950
Housing Burden	1.734	12.191*	5.665	2.140	14.999

*$P<.001$

Results of HLM Analysis Predicting Need for Housing Assistance

The study was designed to examine the influence of community and individual conditions on housing need among low-income PLWHA. Additionally, the study examined the interaction of community conditions and individual conditions and their influence on housing need. To explore each research question, a multilevel model building process described by Luke (2004), Hox (2002), and Tabachnick and Fidell (2007) was used. HLM for Windows, Version 6.06 was used for all HLM analyses. Two separate approaches were used to examine each of the housing need outcomes.

First, a two-level Hierarchical Linear Model (HLM) was used to study the continuous housing need outcome variable – need for housing assistance. HLM models are recommended when data is nested within groups (i.e., individuals within ZIP Code areas). This two-level model building process to study the community- and individual- level influences on housing need among low-income PLWHA will be discussed first.

Second, a special version of HLM, Hierarchical Generalized Linear Model (HGLM) was used to explore the housing need outcome variable – housing stability (stable versus unstable). HGLM, similar to logistic regression, is used to examine data with binary outcomes. In this case, housing stability was a dichotomous variable (stable = 1, unstable = 0), thus the HGLM used a logit link transformation to determine the probability of housing stability. This two-level HGLM approach to study the community- and individual-influences on housing need among PLWHA will be discussed second.

Constant Only Model

The first step in the HLM was to determine if a multilevel model was needed. This was determined statistically through the calculation of the intraclass correlation coefficient (p) (Luke,

2004). The intraclass correlation coefficient indicates the amount of variability for each housing need outcome (i.e., housing stability and need for housing assistance) that can be explained at the community level, or ZCTA. A high intraclass correlation coefficient confirms that a multilevel model is needed (Luke, 2004). To calculate the intraclass correlation a null, unconstrained or constant only model was run (Luke, 2004; Tabachnick & Fidell, 2007). In a constant only model no level-one or level-two predictors are included. The equations were as follows:

Level 1: $Y_{ij} = \beta_{0j} + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + u_{0j}$

Note the level-one equation is similar to a normal regression equation without a predictor variable. Y_{ij} is the dependent variable housing need (i.e., need for housing assistance) for a respondent (i) within a particular ZCTA (j). β_{0j} was the intercept for the dependent variable in a ZCTA (j). r_{ij} was the random errors of prediction for the level-one equation. If a predictor variable, like an individual's history of homelessness (β_{1j}), was added into the model this would represent the slope for the relationship between housing need and history of homelessness in a ZCTA.

Moving to the level-two equation, the inclusion of which makes HLM different from multiple regression, notice the level-two equation above was predicting the intercept (β_{0j}) for a particular ZCTA in the level-one equation. γ_{00} was the overall intercept or the grand mean of the dependent variable housing need across all ZCTAs when all predictors are equal to zero. Lastly,

u_{0j} was the random error component for the deviation of the intercept of a ZCTA from the overall intercept of all ZCTAs. This is the unique effect of a particular ZCTA on the intercept.

In a HLM, there are fixed and random variables and effects (Newsom, 2009). Normally, level-one and level-two predictors are considered fixed; however the level-one intercepts (β_{0j}) and slopes (β_{1j}) were assumed to vary randomly across groups in this case ZCTAs (Newsom, 2009). In the above equations, there was one fixed effect (γ_{00}) which was the grand mean of housing need among respondents across all ZCTAs. r_{ij} and u_{0j} were random effects as these represent the error terms within the equations.

The relationship between the fixed and random effects can sometime be easier to see if a mixed-effects equation is written. A mixed-effects equation combines the level-one and level-two equation into one equation as follows:

$$Y_{ij}= \gamma_{00} + u_{0j} + r_{ij}$$

Returning to the constant only model and the intraclass correlation, significant components at the community level would indicate that a two-level model is warranted. To calculate the intraclass correlation coefficient *(p)*, the following formula was used:

$$p = \frac{\tau^2_{u0}}{\tau^2_{u0} + \sigma^2_r}$$

In the constant only model, since no predictors are included, the error was split into two components including (a) the variability between ZCTAs (u_{0j}) (6.74) and (b) the variability

between respondents within a ZCTA (r_{ij}) (64.06) (Luke, 2004). Entering these values into the formula for *p* results in the following value:

$$p = \frac{\sigma^2_{U0}}{\sigma^2_{U0} + \sigma^2_r} = \frac{6.74}{6.74 + 64.06} = \frac{6.74}{70.80} = .10$$

Based on the above calculation, it was determined that 10 percent of the ZCTA variance in housing need (need for housing assistance) was between ZCTAs or at level-two. Spybrook et al. (2006) indicated that the intraclass correlation for community research can be .05 or smaller. Additionally, intraclass correlations for school research typically ranges from .05 and .15. An intraclass correlation of 10 percent indicated that significant variation existed on the community level making a two-level HLM appropriate. Additionally, the average ZCTA mean for housing need (need for housing assistance) was 9.56 (γ_{00}) (See Table 16). Since the minimum and maximum response for need for housing assistance were 1 and 24, respondents in the sample had moderately high housing need.

Table 16

Parameter Estimates and Model Fit for Need for Housing Assistance Model (Constant Only and Model 1)

Fixed Effects	Constant Only Model				Model 1- Level-1 Predictors Only			
	Coef.	SE	t-ratio	p	Coef.	SE	t-ratio	p
For Intercept (β_{0j})								
Intercept (γ_{00})	9.57	.56	17.01	.000	6.65	.50	13.297	.000
Distress (γ_{01})								
For Housing Burden slope (β_{1j})								
Housing Burden (γ_{10})					3.43	1.47	2.34	.022
For History of Homelessness slope (β_{2j})								
History of Homelessness (γ_{20})					6.58	.98	6.75	.000
For History of Substance Use slope (β_{3j})								
History of Substance Use (γ_{30})					2.40	.85	2.82	.007

Random Effects	Constant Only Model				Model 1 – Level-1 Predictors Only			
	SD	VC	X^2	p	SD	VC	X^2	p
For Intercept (β_{0j})	2.60	6.74	121.14	.001	1.12	1.25	25.64	.220
Housing Burden (γ_{10})								
Slope (u_{1j})					3.76	14.13	21.57	.425
History of Homelessness (γ_{20})								
Slope (u_{2j})					2.73	7.45	25.99	.207
History of Substance Use								
Slope (u_{3j})					1.42	2.01	20.55	>.500
Level - 1 (r_{ij})	8.00	64.06			7.10	50.48		
Model Fit	Dev.	Para.			Dev.	Para.	AIC	
	2715.15	3			2446.03	15	2476.03	

Model 1 – Individual Level Predictors

The first study question was how individual-level conditions (i.e., socio-demographic, housing situation, social history) influence housing needs among low-income PLWHA. Specifically, housing need was defined as a need for housing assistance. To answer this question, several sub-questions were asked: (a) How do the gender, race, age, race, and ethnicity influence housing need?; (b) How do housing burden, a potential rent increase, household composition, or a receipt of a housing subsidy influence housing need?; and (c) How do work status, history of homelessness, or history of mental health or substance use issues influence housing need? As discussed previously, through multiple regressions, it was determined that none of the socio-demographic conditions – age, gender, race, or ethnicity – were significant in predicting housing need. Additionally, of the housing situation conditions –household composition, potential rent increase, and receipt of housing subsidy – were also not significantly related to housing need. Lastly, of the social history conditions, a history of mental health issues was not significantly related to housing need. A final model was developed that included the housing history condition of housing burden and the social history conditions of work status, history of homelessness, and history of substance use issues as significant predictors for housing need (need for housing assistance). These four individual-level predictors represented the starting model for the HLM level-one analysis.

A level-one model (Model 1) was constructed with the individual-level predictors that were found to be significant predictors during the multiple regression analysis – housing burden (β_{1j}), work status (β_{2j}), history of homelessness (β_{3j}), and history of substance use issues (β_{4j}). In this model no level-two predictors were included; however the level-one intercept and slopes were allowed to vary across ZCTAs (as represented by the error terms u_{0j}, u_{1j}, u_{2j}…). Allowing

the intercept and slopes to vary was based on the theoretical construct that ZCTAs were different from one another and had varying effects on respondents. Housing burden, as the only continuous variable, was grand mean centered, which allowed for a meaningful zero point for final interpretation of the coefficient (Tabachnick & Fidell, 2007). To establish the "best fit" model, an evaluation of all four level-one predictors was conducted, thus the level-one equation was specified as:

Level-1:

Y_{ij} (Need for Housing Assistance) = β_{0j} + β_{1j} (Housing Burden $_{ij}$) + β_{2j} (Work Status $_{ij}$) + β_{3j} (History of Homelessness $_{ij}$) + β_{4j} (Substance Use History $_{ij}$) +rij.

Level 2:

$\beta_{0j} = \gamma_{00} + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

$\beta_{4j} = \gamma_{40} + u_{4j}$

Mixed-effects:

Y_{ij} (Need for Housing Assistance) = γ_{00}+ γ_{10} (Housing Burden $_{ij}$) + γ_{20} (Work Status $_{ij}$) + γ_{30} (History of Homelessness $_{ij}$) + γ_{40} (Substance Use History $_{ij}$) + u_{0j} + u_{1j} (Housing burden $_{ij}$) + u_{2j} (Work Status $_{ij}$) + u_{3j} (History of Homelessness $_{ij}$) + u_{4j} (Substance Use History $_{ij}$) + rij

Significant predictors ($p < .05$) were retained in the model, thus creating the "best fit" model at the individual level. Such model building is common in multilevel modeling (Li, 2005; Luke, 2004). Of the four predictor variables only housing burden ($\gamma_{10} = 3.43$, t=2.34, p <.05), history of homelessness (γ_{20} =6.58, t=6.75, p<.000), and history of substance use ($\gamma_{31} = 2.40$, t=2.82, p <.01) were significant in the model (See Table 16). Such findings indicate that for every percent increase in the average housing burden there is a 3.43 increase in housing need. Having a history of homelessness and a history of substance use increases the need for housing assistance by 6.58 and 2.40, respectively. Although work status was found to be significant during the multiple regression analysis, it was not significant in predicting housing need (need for housing assistance) when considering the community conditions. A model was rerun without work status. In the final version of Model 1, the estimate for (γ_{00}) is 6.65. This is interpreted as the expected value of the outcome variable (need for housing assistance) when all the predictors are set to zero (0) (Luke, 2004).

To determine model fit, the deviance was used. The deviance measures the lack of fit between the data and model (Luke, 2004; Tabachnick & Fidell, 2007). To compare two models, the difference of the deviances can be distributed as a chi-square statistic along with the difference in the degrees of freedom, this is referred to as the likelihood ratio test (Li, 2005; Luke, 2004). A significant difference between models suggests that the model is a better fit to the data. Through hypothesis testing in the HLM, the deviance and likelihood ratio was calculated to compare models. Comparing Model 1 to the constant only model, resulted in a significantly better model as seen through the likelihood ratio test, X^2 (13, N=384) = 2715.15-2446.03 = 266.59, p<.000). Notice the difference in deviance from the constant only model, 2715.15, and

the deviance from Model 1, 2446.03, plus the difference in the degrees of freedom were used to calculate the likelihood ratio. Thus, the predictors improved the model beyond that produced by considering only variability in respondents and ZCTAs. Luke (2004) suggests also figuring the Akaike Information Criterion (AIC) as another model fit test. Like the deviance, the AIC should both decrease as model fit improves. In this case, the AIC is lower than the constant only model (AIC: 2721.15), thus confirming the better model fit (See Table 16).

The random-effects variance components (u_{1j}, u_{2j}, u_{3j}) in Model 1 are all greater than zero, which suggested there was potential for un-modeled variability (See Table 1). Luke (2004) suggests adding addition variables on Level-2 to model some of this variability. It should also be noted that Luke (2004) cautions against interpreting significance tests of variance components. Because variances are bound by zero (0), they do not have a normal distribution. Further, the true meaning of significant variance components is not clear, since it is expected that variances will be non-zero. HLM uses chi-square to determine the significance of random effects.

Instead of using significance tests, like those in HLM, Luke (2004) recommends examining the effect size. Effect size is the total variance that is attributed to the model (Tabachnick & Fidell, 2007); however it has limited use in models with random slopes (Kreft & Leeuw, 1998). Because in this study random slopes were allowed, Luke (2004) recommends refitting the models without random slopes to determine effect size. By doing so, only two variance components are included in the model (a) within- ZCTA variance (level-1 (σ^2)) and (b) between ZCTA variance (level – 2 (τ_{00})). The formulas for determining the effect size are provided below:

Level 1:

$$\frac{\sigma^2 \text{Constant Only Model} - \sigma^2 \text{New Model}}{\sigma^2 \text{Constant Only Model}}$$

Level 2:

$$\frac{\tau_{00}^2 \text{Constant Only Model} - \tau_{00}^2 \text{New Model}}{\tau_{00}^2 \text{Constant Only Model}}$$

For Model 1 when three predictors were entered on level-one (housing burden, history of homelessness, substance use history), the within ZCTA variance was reduced by 16.47 percent. These predictors did help explain some portion of the variance in housing need (need for housing assistance). Thus, individual-level predictors were useful in explaining within-ZCTA between respondent variability of PLWHA's need for housing assistance. At level-two, the between ZCTA variance was reduced by 41 percent. For the remaining models, effect size was computed for each model and the results are reported for each model below (See Table 20).

Model 2 – Intercept Only Models

The second research question considered was how community-level conditions influenced housing need of low-income PLWHA. A series of sub-questions was considered including (a) How does living in a distressed ZCTA influence housing need? (b) How does living in a ZCTA with a higher degree of rurality influence housing need? (c) How does living in a ZCTA with greater social infrastructure (i.e., presence of HIV providers and affordable housing units) influence housing need? Because respondents are nested within ZCTAs, their data cannot be considered independent and so multiple regression is not an appropriate analysis for exploring the questions. To explore these questions, a second model (Model 2) was developed that

contained the community-level conditions of distress, degree of rurality, and social infrastructure. The community predictors were entered on the intercept of Model 1, thus this is called an intercept only model (Hox, 2002; Luke, 2004).

In the intercept model, the community conditions of distress, degree of rurality, and social infrastructure were each included in a model. The intent of the models was to determine the extent of ZCTA variability of need for housing assistance that can be explained by the community predictors. Instead of entering all the community conditions into one model, separate models were created for each predictor. Significant predictors were kept for inclusion into a full model. To review the newly formed equations, community distress is used as an example (Model 2 – Distress, Table 17):

Level-1:

Y_{ij} (Need for Housing Assistance) = β_{0j} + β_{1j} (Housing Burden $_{ij}$) + β_{2j} (History of Homelessness $_{ij}$) + β_{3j} (Substance Use History $_{ij}$) +rij

Level 2:

$\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Distress $_{j}$) + u_{0j}

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

$\beta_{4j} = \gamma_{40} + u_{4j}$

Mixed-effects:

Y_{ij} (Need for Housing Assistance) = γ_{00}+ γ_{01} (Distress $_j$) + γ_{10} (Housing Burden $_{ij}$) + γ_{20} (History of Homelessness $_{ij}$) + γ_{30} (Substance Use History $_{ij}$) + u_{0j} + u_{1j} (Housing burden $_{ij}$) + u_{2j} (History of Homelessness $_{ij}$) + u_{4j} (Substance Use History $_{ij}$) + rij

A similar approach was taken for the community predictors of degree of rurality (Model 2 – Rurality, Table 18) and social infrastructure (i.e., HIV providers) (Model 2 – HIV Providers, Table 19). It should be noted that two models were run for social infrastructure, one that included HIV providers and one that included affordable housing units. The predictor, affordable housing units, was not significant and so thus was not included; thus only a model for HIV providers is included (See Model 2 – HIV Providers, Table 19). The following is a review of each of these models.

Model 2 – Distress. To determine model fit, the deviance, AIC, and intraclass correlation coefficient was reviewed. Model 2 as a whole was significantly better than Model 1 in which only level-1 predictors were included, X^2 (1, N=384) = 2446.03 – 2441.44 = 4.59, p<.05) (See Table 2). The AIC (2473.44) was also lower than Model 1, again confirming that the model was a better fit. Distress was positively, significantly related to housing need (need for housing assistance). For every point increase in community distress, housing need (need for housing assistance) increased by .64 (γ_{01}=.60, t=2.20, p <.05). In comparing this model to the constant only model, the within ZCTA variance was reduced by 15.99 percent. The addition of distress as a community condition, helped to explain some of the variance in need for housing assistance. The between ZCTA variance (level-two) was also reduced by 56.12 percent. The results suggest

that community distress was very useful in explaining the need for housing assistance (See Table 17).

Model 2 – Degree of rurality. To determine model fit, the deviance, AIC, and intraclass correlation coefficient were reviewed. The model as a whole was not significantly better than Model 1 in which only level-1 predictors were included, X^2 (1, N=384) = 2446.03 – 2443.47 = 4.59, p=.105) (See Table 3). The AIC (2475.47) was also lower than Model 1, as was the deviance, suggesting the model was a better fit. Degree of rurality was positively, significantly related to housing need (need for housing assistance); however the coefficient was very low. For every percentage increase in community rurality, housing need (need for housing assistance) increased by .00085 (γ_{01}=.00085, t=2.44, p <.05). Because of the significant results of degree of rurality as a main effect (γ_{00}) and the lower deviance and AIC scores, although not significant, the rural model was still used in creating Model 3. In comparing this model to the constant only model, the within ZCTA variance was reduced by 15.08 percent. The addition of degree of rurality as a community condition, helped to explain some of the variance in need for housing assistance. The between ZCTA variance (level-two) was also reduced by 67.37 percent. The results suggest that community degree of rurality was very useful in explaining the need for housing assistance (See Table 18).

Model 2 – HIV providers. To determine model fit, the deviance, AIC, and intraclass correlation coefficient were reviewed. The model as a whole was significantly better than Model 1 in which only level-1 predictors were included, X^2 (1, N=384) = 2446.03 – 2442.38 = 3.65, p<.05) (See Table 4). The AIC (2474.38) was also lower than Model 1, as was the deviance, suggesting the model was a better fit. The existence of HIV providers in the ZCTA was positively, significantly related to housing need (need for housing assistance); however the

coefficient was very low. For every increase in HIV providers housing need (need for housing assistance) increased by 1.07 (γ_{01}=1.07, t=2.85, p <.05). As stated earlier, another model including the second social infrastructure measure (affordable housing units) was examined; however housing units were not a significant predictor of housing need. In comparing this model to the constant only model, the within ZCTA variance was reduced by 16.41 percent. The addition of social infrastructure as a community condition, helped to explain some of the variance in need for housing assistance. The between ZCTA variance (level-two) was also reduced by 51.72 percent. The results suggest that community social infrastructure, the presence of HIV providers, was very useful in explaining the need for housing assistance (See Table 19).

A final intercept-only model was attempted that included each of significant community predictors (distress, degree of rurality, and HIV providers) in one model. In this model all the community predictors were non-significant, thus it was decided to continue modeling three separate models for each community predictor.

Model 3 – Intercept and Slopes

The third research question considered was how community- and individual-level conditions related together to influence housing need of low-income PLWHA. To explore this question, a third model (Model 3) was developed that contained the community-level conditions of distress, degree of rurality, and social infrastructure on the slopes. The community predictors were entered on the slopes of Model 2, thus this is called an intercept and slope model (Hox, 2002; Luke, 2004).

As demonstrated below in the equations, including the community predictors on the slopes is equivalent to modeling interaction affects between the level-one predictors and the level-two predictors. Each Model 2 for distress, degree of rurality, and social infrastructure were

modeled. For example, in Model 3 – Distress, distress was entered on the intercept and each slope. This was repeated with the other community variables (degree of rurality, HIV providers, affordable housing units) on the slopes, while keeping distress on the intercept.

To review the newly formed equations, community distress is used again as an example (Model 3 – Distress, Table 17):

Level-1:

Y_{ij} (Need for Housing Assistance) = β_{0j} + β_{1j} (Housing Burden $_{ij}$) + β_{2j} (History of Homelessness $_{ij}$) + β_{3j} (Substance Use History $_{ij}$) +rij

Level 2:

$\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Distress $_{j}$) + u_{0j}

$\beta_{1j} = \gamma_{10} + \gamma_{11}$ (Distress) +u_{1j}

$\beta_{2j} = \gamma_{20} + \gamma_{21}$ (Distress) + u_{2j}

$\beta_{3j} = \gamma_{30} + \gamma_{31}$ (Distress) + u_{3j}

Mixed-effects:

Y_{ij} (Need for Housing Assistance) = γ_{00}+ γ_{01} (Distress $_{j}$) + γ_{10} (Housing Burden $_{ij}$) + γ_{11} (Distress) (Housing Burden $_{ij}$) + γ_{20} (History of Homelessness $_{ij}$) + γ_{21} (Distress) (History of Homelessness $_{ij}$) + γ_{30} (Substance Use History $_{ij}$) + γ_{31} (Distress) (Substance Use History $_{ij}$) + u_{0j} + u_{1j} (Housing Burden $_{ij}$) + u_{2j} (History of Homelessness $_{ij}$) + u_{3j} (Substance Use History $_{ij}$) + rij

A similar approach was taken for the community predictors of degree of rurality (Model 3 – Rurality, Table 3) and social infrastructure (i.e., HIV providers and affordable housing units) (Model 3 – HIV Providers, Table 19). It should be noted that even though affordable housing units was not a significant main effect, it was still included on the slope to determine if it interacted with individual-level predictors. The following is a review of each of these models.

Model 3 – Distress. To determine model fit, the deviance, AIC, and intraclass correlation coefficient were reviewed. The model as a whole was significantly better than Model 2, X^2 (1, N=384) = 2441.44 – 2436.99 = 4.45, $p<.05$ (See Table 2). The AIC (2436.99) was also lower than Model 2, again confirming that the model was a better fit. Distress was positively, significantly related to housing need (need for housing assistance). For every point increase in community distress, housing need increased by .64 (γ_{01}=.64, t=2.34, p <.05). In addition, the social infrastructure predictor, affordable housing units, had a positive, highly significant interaction with individual-level history of homelessness (γ_{21} = 14.99, t=4.61, p <.000). Such a finding indicates that the increased presence of affordable housing units in a ZCTA increases the effects of having a history of homelessness. In comparing this model to the constant only model, the within ZCTA variance was reduced by 16.83 percent. The addition of distress as a community condition helped to explain some of the variance in need for housing assistance. The between ZCTA variance (level-two) was also reduced by 64.44 percent. The results suggest that community distress was very useful in explaining the need for housing assistance (See Table 17).

Model 3 – Degree of Rurality. To determine model fit, the deviance, AIC, and intraclass correlation coefficient were reviewed. The model as a whole was significantly better than Model 2 in which only level-1 predictors were included, X^2 (1, N=384) = 2443.47-2439.10 = 6.93, $p<.05$ (See Table 3). The AIC (2473.1) was also lower than Model 2, as was the deviance,

suggesting the model was a better fit. Degree of rurality was positively, significantly related to housing need (need for housing assistance); however the coefficient was very low. For every percentage increase in community rurality housing need (need for housing assistance) increased by .00094 (γ_{01}=.00094, t=2.34, p <.05. In addition, the social infrastructure predictor, affordable housing units, had a positive, highly significant interaction with individual-level history of homelessness (γ_{21} = 14.57, t=4.34, p <.000). Such a finding indicates that the increased presence of affordable housing units in a ZCTA increases the effects of having a history of homelessness. In comparing this model to the constant only model, the within ZCTA variance was reduced by 15.78 percent. The addition of degree of rurality as a community condition, helped to explain some of the variance in need for housing assistance. The between ZCTA variance (level-two) was also reduced by 76.52 percent. The results suggest that the degree of rurality in a ZCTA was very useful in explaining the need for housing assistance (See Table 18).

Model 3 – HIV Providers. To determine model fit, the deviance, AIC, and intraclass correlation coefficient were reviewed. The model as a whole was significantly better than Model 2 in which only level-1 predictors were included, X^2 (1, N=384) = 2442.38 – 2437.85 = 4.54, p<.05 (See Table 4). The AIC (2471.85) was also lower than Model 1, as was the deviance, suggesting the model was a better fit. The existence of HIV providers in the ZCTA was positively, significantly related to housing need (need for housing assistance). For every increase in HIV providers housing need (need for housing assistance) increased by 1.19 (γ_{01} = 1.19, t=3.12, p <.01). In addition, the social infrastructure predictor, affordable housing units, had a positive, highly significant interaction with individual-level history of homelessness (γ_{21} = 14.82, t=4.34, p <.000). Such a finding indicates that the increased presence of affordable housing units in a ZCTA increases the effects of having a history of homelessness. In comparing this model to

the constant only model, the within ZCTA variance was reduced by 17.49 percent. The addition of social infrastructure as a community condition, helped to explain some of the variance in need for housing assistance. The between ZCTA variance (level-two) was reduced by 56.77 percent. The results suggest that the social infrastructure in a ZCTA was very useful in explaining the need for housing assistance (See Table 19).

Based on the above models, only one community-level predictor (affordable housing units) was significantly related to an individual-level predictor (history of homelessness) on the slope, this held true for each model. Again using community distress as the example, this resulted in the following final equations:

Level-1:

Y_{ij} (Need for Housing Assistance) = β_{0j} + β_{1j} (Housing Burden $_{ij}$) + β_{2j} (History of Homelessness $_{ij}$) + β_{3j} (Substance Use History $_{ij}$) +r_{ij}

Level 2:

$\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Distress $_j$) + u_{0j}

$\beta_{1j} = \gamma_{10} + \gamma_{11} + u_{1j}$

$\beta_{2j} = \gamma_{20} + \gamma_{21}$ (Affordable Housing Units) + u_{2j}

$\beta_{3j} = \gamma_{30} + \gamma_{31} + u_{3j}$

Mixed-effects:

Y_{ij} (Need for Housing Assistance) = γ_{00}+ γ_{01} (Distress $_j$) + γ_{10} (Housing Burden $_{ij}$) + γ_{11} (Housing Burden $_{ij}$) + γ_{20} (History of Homelessness $_{ij}$) + γ_{21} (Affordable Housing Units)

(History of Homelessness $_{ij}$) + γ_{30} (Substance Use History $_{ij}$) + γ_{31} (Substance Use History $_{ij}$) + u_{0j} + u_{1j} (Housing Burden $_{ij}$) + u_{2j} (History of Homelessness $_{ij}$) + u_{3j} (Substance Use History $_{ij}$) + rij

Replacing distress with degree of rurality or HIV providers, respectively, this was the same equation for each of the other two models (Model 3 – Degree of Rurality and Model 3 – HIV Providers, See Tables 18 and 19).

The results of the HLM analysis revealed that both community- and individual-conditions influence the need for housing assistance among low-income PLWHA. The community-level conditions (distress, degree of rurality, HIV providers) each had significant main effects on the need for housing assistance; however these effects did not remain significant when considered together in one model. As to individual-level conditions, housing burden, history of homelessness, and substance use history were all significantly related to need for housing assistance. In considering the relationship of community- and individual-conditions to one another, only the presence of affordable housing units had a positive, significant influence on a respondent with a history of homelessness.

Table 17

Parameter Estimates and Model Fit for Need for Housing Assistance Model (Models 2 & 3 – Distress)

Fixed Effects	Model 2 – Distress				Model 3 – Distress			
	Coef.	SE	t-ratio	p	Coef.	SE	t-ratio	p
For Intercept (β_{0j})								
Intercept (γ_{00})	6.20	.58	10.63	.000	6.13	.58	10.57	.000
Distress (γ_{01})	.60	.27	2.20	.031	.64	.27	2.34	.022
For Housing Burden slope (β_{1j})								
Housing Burden (γ_{10})	3.68	1.48	2.49	.015	3.37	1.47	2.28	.025
For History of Homelessness slope (β_{2j})								
History of Homelessness (γ_{20})	6.84	1.00	6.81	.000	7.53	.94	8.03	.000
Affordable Housing Units (γ_{21})					14.99	3.25	4.61	.000
For History of Substance Use slope (β_{3j})								
History of Substance Use (γ_{30})	2.38	.86	2.77	.008	2.37	.85	2.82	.007

Random Effects	Model 2 – Distress				Model 3 – Distress			
	SD	VC	X^2	p	SD	VC	X^2	p
For Intercept (β_{0j})	.68	.47	22.17	.331	.64	.42	22.20	.329
Housing Burden (γ_{10})								
Slope (u_{1j})	3.79	14.38	21.43	.433	3.77	14.25	21.78	.412
History of Homelessness (γ_{20})								
Slope (u_{2j})	3.14	9.85	26.46	.19	2.81	7.89	26.18	.160
History of Substance Use								
Slope (u_{3j})	1.40	1.97	20.62	>.500	1.22	1.50	20.65	>.500
Level - 1 (r_{ij})	7.09	50.24			7.08	50.12		
Model Fit	Dev.	Para.	AIC		Dev.	Para.	AIC	
	2441.44	16	2473.44		2436.99	17	2470.99	

Table 18

Parameter Estimates and Model Fit for Need for Housing Assistance Model (Models 2 & 3 – Degree of Rurality)

Fixed Effects	Model 2 – Degree Rurality				Model 3 – Degree Rurality			
	Coef.	SE	t-ratio	p	Coef.	SE	t-ratio	p
For Intercept (β_{0j})								
Intercept (γ_{00})	6.34	.55	11.64	.000	6.28	.54	11.57	.000
Degree Rurality(γ_{01})	.00085	.00041	2.101	.039	.00094	.0004	2.341	.022
For Housing Burden slope (β_{1j})								
Housing Burden (γ_{10})	3.61	1.48	2.44	.017	3.34	1.48	2.26	.027
For History of Homelessness slope (β_{2j})								
History of Homelessness (γ_{20})	6.85	.98	6.99	.000	7.52	.91	8.26	.000
Affordable Housing Units (γ_{21})					14.57	3.35	4.34	.000
For History of Substance Use slope (β_{3j})								
History of Substance Use (γ_{30})	2.39	.86	2.79	.007	2.39	.84	2.85	.006

Random Effects	Model 2 – Degree Rurality				Model 3 – Degree Rurality			
	SD	VC	X^2	p	SD	VC	X^2	p
For Intercept (β_{0j})	.78	.60	22.68	.304	.75	.56	22.74	.301
Housing Burden (γ_{10})								
Slope (u_{1j})	3.56	12.70	21.20	.447	3.54	12.53	21.54	.427
History of Homelessness (γ_{20})								
Slope (u_{2j})	2.99	8.91	26.13	.201	2.69	7.22	25.85	.171
History of Substance Use								
Slope (u_{3j})	1.43	2.04	20.35	>.500	1.26	1.59	20.41	>.500
Level - 1 (r_{ij})	7.13	50.90			7.13	50.77		
Model Fit	Dev.	Para.	AIC		Dev.	Para.	AIC	
	2443.5	16	2475.5		2439.10	17	2473.1	

Table 19

Parameter Estimates and Model Fit for Need for Housing Assistance Model (Models 2 & 3 – Social Infrastructure: HIV Providers)

Fixed Effects	Model 2 – HIV Providers				Model 3 – HIV Providers			
	Coef.	SE	t-ratio	p	Coef.	SE	t-ratio	p
For Intercept (β_{0j})								
Intercept (γ_{00})	6.41	.53	12.11	.000	6.34	.53	12.03	.000
HIV Providers (γ_{01})	1.07	.38	2.85	.006	1.19	.38	3.12	.003
For Housing Burden slope (β_{1j})								
Housing Burden (γ_{10})	3.57	1.48	2.42	.018	3.25	1.48	2.19	.031
For History of Homelessness slope (β_{2j})								
History of Homelessness (γ_{20})	6.62	.98	6.76	.000	7.31	.91	8.07	.000
Affordable Housing Units (γ_{21})					14.82	3.41	4.34	.000
For History of Substance Use slope (β_{3j})								
History of Substance Use (γ_{30})	2.34	.87	2.68	.009	2.31	.86	2.69	.009

Random Effects	Model 2 – HIV Providers				Model 3 – HIV Providers			
	SD	VC	X^2	p	SD	VC	X^2	p
For Intercept (β_{0j})	.79	.63	21.89	.346	.83	.69	21.97	.342
Housing Burden (γ_{10})								
Slope (u_{1j})	3.93	15.49	21.46	.431	3.83	14.66	21.90	.405
History of Homelessness (γ_{20})								
Slope (u_{2j})	2.54	6.44	26.09	.203	2.09	4.38	26.01	.17
History of Substance Use								
Slope (u_{3j})	1.77	3.08	20.50	>.500	1.66	2.75	20.53	>.500
Level - 1 (r_{ij})	7.10	50.37			7.08	50.17		
Model Fit	*Dev.*	*Para.*	*AIC*		*Dev.*	*Para.*	*AIC*	
	2442.4	16	2474.4		2437.9	17	2471.9	

Table 20

Summary of Results for Proportion of Variance Explained

Variables	Constant Only Model	Model 1 Level-1 Predictors	Model 2 Intercept Only	Model 3 Intercept and Slopes
Variance at Level-1 (σ^2)	64.06 (--)	53.51 (16.47%)		
(Percentage explained)				
Distress			53.82 (15.99%)	53.28 (16.83%)
Degree of Rurality			54.40 (15.08%)	53.95 (15.78%)
HIV Providers			53.55 (16.41%)	52.86 (17.49%)
Variance at Level-2 (τ_{00})	6.74 (--)	3.99 (41%)		
(Percentage explained)				
Distress			2.96 (56.12%)	2.40 (64.44%)
Degree of Rurality			2.20 (67.37%)	1.58 (76.52%)
HIV Providers			3.25 (51.72%)	2.91 (56.77%)

Results of HGLM Analysis Predicting Stable Housing

The second outcome variable considered was housing need – stable versus unstable housing. Because the outcome variable was dichotomous (i.e., stable = 1; unstable = 0), a Hierarchical Generalized Linear Model (HGLM) (Raudenbush & Bryk, 2002) was used for examining this outcome variable. In HGLM, a Bernoulli distribution can be specified that uses a Logit link function, a common transformation of binary data. This is a similar approach to that used in logistic regression. All models are estimated using a *full penalized quasi-likelihood* (PQL) estimation procedure and *EM Laplace interactions*. Such estimation allows for calculation of deviances for model comparison (Raudenbush et al., 2004). The same research questions were considered, as before, including examining the influence of community and individual conditions on housing need among low-income PLWHA. Additionally, the study examined the influence of community conditions on individual conditions. The same multilevel model building process that was used to analyze need for housing assistance was used for the housing stability analysis.

Constant Only Model

Similar to the approach before, a constant only model with no level-one or level-two predictors was constructed. The equations were as follows:

$$\ln\left(\frac{p}{1-p}\right) = n_{ij}$$

Level-1

$$n_{ij} = \beta_{0j}$$

Level-2

$\beta_{0j} = \gamma_{00} + \gamma_{01}$

Mixed Equation

$n_{ij} = \gamma_{00} + \gamma_{01}$

In the constant only model, γ_{00} was the average log-odds of housing stability across all ZCTA, while τ_{00} is the variance between ZCTAs. The estimated results using Laplace estimation were $\gamma_{00} = 1.01$ (se = .1542), $\tau_{00} = .2063$. Thus, considering the ZCTA of residency, respondents had a 2.74 odds of being housing stable or a 27 percent probability of being housing stable. The deviance of the model was 1163.90, *df* 2. The deviance was used to compare model fit between the new models and the constant only model (See Table 21).

Table 21

Parameter Estimates and Model Fit for Housing Stability Model (Constant Only Model)

	Constant Only					*95% Confidence Interval*	
Fixed Effects	Coef.	SE	t-ratio	p	Odds Ratio	Lower	Upper
For Intercept (β_{0j})							
Intercept (γ_{00})	1.01	.1542	6.53	.000	2.74	2.02	3.72

Model 1 – Individual Level Predictors

The first study question was how individual-level conditions (i.e., socio-demographic, housing situation, social history) influence housing needs among low-income PLWHA. Specifically, housing need was defined as housing stability (i.e., stable versus unstable). To answer this question, several sub-questions were asked: (a) How do gender, race, age, race, and ethnicity influence housing need?; (b) How do housing burden, a potential rent increase, household composition, or a receipt of a housing subsidy influence housing need?; and (c) How do work status, history of homelessness, or history of mental health or substance use issues influence housing need? As discussed previously, through logistic regressions, it was determined that none of the socio-demographic conditions – age, gender, race, or ethnicity – were significant in predicting housing need. Additionally, of the housing situation conditions –household composition and potential rent increase – were also not significantly related to housing need. Lastly, of the social history conditions, a history of mental health or substance use issues was not significantly related to housing need. A final model was developed that included the housing history conditions of housing burden and housing subsidy and the social history conditions of work status and history of homelessness as significant predictors for housing need (housing stability). These four individual-level predictors represented the starting model for the HGLM level-one analysis.

A level-one model (Model 1) was constructed with the individual-level predictors which were found to be significant predictors during the logistic regression analysis – work status (β_{1j}), housing burden (β_{2j}), housing subsidy (β_{3j}), and history of homelessness (β_{4j}). In this model no level-two predictors were included; however the level-one intercept and slopes were allowed to vary across ZCTAs (as represented by the error terms u_{0j}, u_{1j}, u_{2j}…). Allowing the intercept and

slopes to vary was based on the theoretical construct that ZCTAs were different from one another and had varying effects on respondents. Housing burden, as the only continuous variable, was grand mean centered. To establish the "best fit" model, an evaluation of all four level-one predictors was conducted, thus the level-one equation was specified as:

Level-1:

n_{ij} (Housing Stability) = β_{0j} + β_{1j} (Housing Burden $_{ij}$) + β_{2j} (History of Homelessness $_{ij}$) + β_{3j} (Substance Use History $_{ij}$)

Level 2:

$\beta_{0j} = \gamma_{00} + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

$\beta_{4j} = \gamma_{40} + u_{4j}$

Mixed-effects:

n_{ij} (Housing Stability) = γ_{00}+ γ_{10} (Work Status $_{ij}$) + γ_{20} (Housing burden $_{ij}$) + γ_{30} (Housing Subsidy $_{ij}$) + γ_{40} (History of Homelessness $_{ij}$) + u_{0j}

+ u_{1j} (Work Status $_{ij}$) + u_{2j} (Housing burden $_{ij}$) + u_{3j} (Housing Subsidy $_{ij}$) + u_{4j} (History of Homelessness $_{ij}$)

Significant predictors ($p < .05$) were retained in the model, thus creating the "best fit" model at the individual level. Of the four predictor variables only housing burden ($\gamma_{10} = 2.07$, $t = 2.18$, $p < .05$) and history of homelessness ($\gamma_{20} = -1.83$, $t = -3.23$, $p < .01$) were significant in the model (See Table 6). A final model was created, removing the non-significant level-1 predictors which resulted in a final model with only history of homelessness as a significant level-l predictor. First considering the ZCTA of residency, the inclusion of the predictor history of homelessness increased the intercept coefficient, ($\gamma_{00} = 1.68$, $t = 6.75$, $p < .000$). The intercept is the predicted probability of housing stability when the (history of homelessness) $_{ij} = 0$, that is for a low-income PLWHA with no history of homelessness living in a ZCTA. The odds of housing stability are 5.36 or an 83.3 percent probability compared to PLWHA with a history of homelessness. The model suggests that a history of homelessness decreased the odds of housing stability, ($\gamma_{10} = -1.63$, $t = -4.86$, $p < .000$) or decreased the probability of housing stability by 16.4 percent as compared to PLWHA with no history of homelessness. To determine model fit, the deviance, was reviewed. The model as a whole was significantly better than the constant only model, X^2 (3, N=384) = 1163.90 – 1069.47 = 94.43, p=.000) (See Table 22)

Table 22

Parameter Estimates and Model Fit for Housing Stability Model (Model 1)

Model 1 – All Predictors						95% Confidence Interval	
Fixed Effects	Coef.	SE	t-ratio	p	Odds Ratio	Lower	Upper

For Intercept (β_{0j})							
Intercept (γ_{00})	.9896	.3899	2.54	.013	2.69	1.24	5.84
For Work Status slope (β_{1j})							
Work Status (γ_{10})	1.67	1.12	1.50	.136	5.29	.585	47.90
For Housing burden slope (β_{2j})							
Housing burden (γ_{20})	2.02	.92	2.18	.032	7.15	1.197	47.18
For Housing Subsidy slope (β_{3j})							
Housing Subsidy (γ_{30})	2.90	1.92	1.52	.134	18.20	.403	822.03
For History of Homelessness slope (β_{3j})							
History of Homelessness (γ_{30})	-1.83	.57	-3.23	.002	.1600	.052	.494

Final Model						95% Confidence Interval	
Fixed Effects	Coef.	SE	t-ratio	p	Odds Ratio	Lower	Upper
For Intercept (β_{0j})							

Intercept (γ_{00})	1.68	.249	6.75	.000	5.36	3.269	8.799
For History of Homelessness slope (β_{3j})							
History of Homelessness (γ_{30})	-1.63	.3358	-4.86	.000	.1957	.100	.382

Model 2 – Intercept Only Models

The second research question considered was how community-level conditions influenced housing need of low-income PLWHA. A series of sub-questions was considered including (a) How does living in a distressed ZCTA influence housing need? (b) How does living in ZCTA with a higher degree of rurality influence housing need? (c) How does living in a ZCTA with greater social infrastructure (i.e., presence of HIV providers and affordable housing units) influence housing need? To explore these questions, a second model (Model 2) was developed that contained the community-level conditions of distress, degree of rurality, and social infrastructure. The community predictors were entered on the intercept of Model 1, thus this is called an intercept only model (Hox, 2002; Luke, 2004).

In the intercept model, the community conditions of distress, degree of rurality, and social infrastructure were each included in a model. The intent of the models was to determine the extent of ZCTA variability of need for housing assistance that can be explained by the community predictors. Instead of entering all the community conditions into one model, separate models were created for each predictor. None of the community predictors were significant in the model, suggesting the community-level predictor variables were not useful in predicting housing stability.

Model 3 – Intercept and Slopes

The third research question considered was how community- and individual-level conditions related together to influence housing need of low-income PLWHA. To explore this question, a third model (Model 3) was developed that contained the community-level conditions of distress, degree of rurality, and social infrastructure on the slopes. The community predictors were entered on the slopes of Model 1, thus this is called an intercept and slope model (Hox, 2002; Luke, 2004).

The third model (Model 3) included the community-level predictors only on the slopes, since none of the community-level conditions were significant on the intercept. Including the community predictors on the slopes is equivalent to modeling interaction effects between the level-one predictors and the level-two predictors. Again using Laplace estimation, none of the community predictors had significant interactions with the level-1 predictor of homelessness.

The results of the HLM analysis revealed that only individual-level and not community-level conditions influenced the probability of housing stability among low-income PLWHA. The community-level conditions (distress, degree of rurality, HIV providers) were not significant main effects on determining the probability of housing stability. As to individual-level conditions, history of homelessness was the only significant predictor decreasing the probability of housing stability among low-income PLWHA. In considering the relationship of community- and individual- conditions to one another, there were no significant interactions when predicting housing stability.

CHAPTER 5

DISCUSSION

In the recent HIV/AIDS housing research, very little attention has been given to the community conditions that influence housing need among low-income persons living with HIV/AIDS (PLWHA), especially in rural areas. The focus of this study was to use a two-level Hierarchical Linear Model (HLM) to examine the community- and individual-level conditions that influence housing need among low-income PLWHA. The question of how community- and individual-level conditions might interact with one another and influence housing need was also examined. This chapter reviews the research questions examined and discusses the study's results. Implications for social work practice, policy, and future research are also discussed.

Research Theory and Questions

Community Research Model

The community research model discussed in Chapter 2 was the theoretical framework used for this study (see Figure 2). In this framework, both individual- and community-level conditions were posited influences on the housing need of low-income PLWHA. Housing was seen as a place for intervention. If housing need can be reduced, the health outcomes of PLWHA could be better, a position supported by many studies discussed earlier. Although this study did not consider the health outcomes of PLWHA, it did bring the community conditions and their

influence on housing need into examination. Not only were community conditions examined as main effects on housing need, but also the interaction of community conditions and individual conditions was studied. The examination of community conditions and their interactions was possible through HLM. Since there is limited research on individual and community conditions and their influence on HIV/AIDS housing need, especially related to rural areas, this study offers an exploratory examination. The following discussion reviews each research question in the context of the community research model (see Figure 2) and compares the findings to available research.

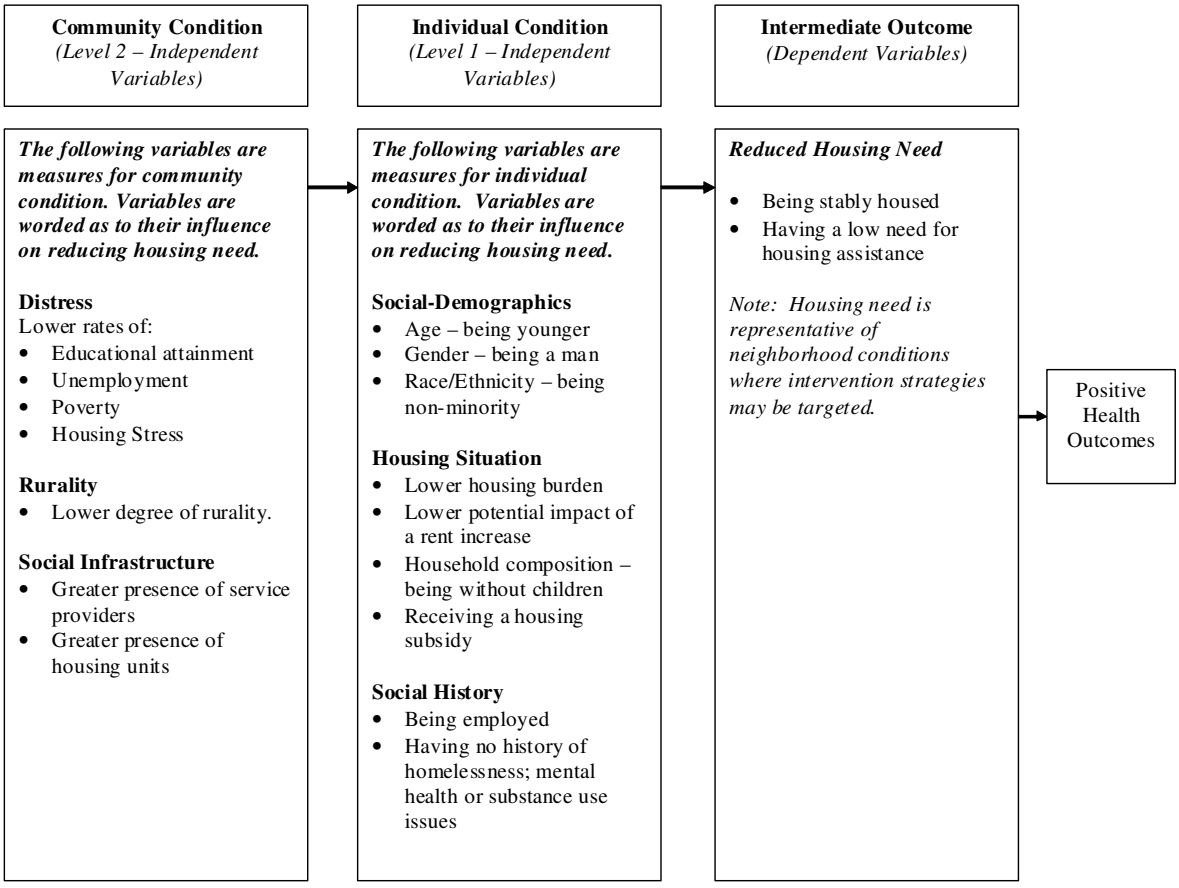

Figure 2. Community research model

Research Questions and Comparison to Current Research

The present study asked three overarching research questions: (a) How do individual-level conditions (i.e., socio-demographics, housing situation, social history) influence the housing needs of low-income PLWHA?; (b) How do community-level factors (i.e., distress, degree of rurality, social infrastructure) influence housing needs of low-income PLWHA?; and (c) How do community- and individual-level conditions relate to each other and to housing need across ZIP Codes among PLWHA? The following provides a review of the results of the analysis discussed in Chapter 4, reviews the findings as they relate to the community research model, and compares the findings to current research.

Housing Need & Comparison Studies

Before reviewing the findings associated with each research question, it is useful to briefly discuss the different constructs represented by each housing need outcome variable. Housing need was studied through two variables (a) need for housing assistance, a continuous variable measuring the degree of need regardless of the place of residence, and (b) stable versus unstable housing, a dichotomous variable measuring where a person lives. Stably housed were those individuals living in their own home. Each variable measured a different aspect of housing need at different levels of measurement. For example, stable housing is a self-report measure of whether an individual lives in his/her own home (a room, a rental, or an ownership unit); whereas need for housing assistance measures the degree of need for help paying rent, utilities, security and/or utility deposits, or for permanent housing. Need for housing assistance does not depend on where the individual lives. Rather, it is a self-report of need for assistance in obtaining, maintaining, or improving the housing situation.

In considering the interpretation of the findings, it may be useful to consider that survey respondents potentially fall into four categories of housing need: (a) stably housed with no need for housing assistance, (b) stably housed with need for housing assistance, (c) unstably housed with no need for housing assistance, and (d) unstably housed with need for housing assistance (see Table 23). The degree of housing need can vary within categories (b) and (d). Although analysis was not conducted in this way, it provides a helpful way to consider the differences found in individual and community influences. Even though the majority of respondents lived in their own homes (stably housed), they still had a need for housing assistance.

Table 23

Housing Need by Housing Stability and Need for Housing Assistance

	Individuals	
Variable	Stable (%)	Unstable (%)
Need for Housing Assistance	206 (53.6)	93 (24.2)
No Need for Housing Assistance	67 (17.4)	18 (.047)
Total	273 (71.1)	111 (28.9)

Definitions of housing need similar to the ones used in this study have been evolving over the last several years; however variations in housing need definitions make comparison of research findings difficult. In this study, 71 percent of respondents were found to be stably housed; defined as living in their own home. Using a similar housing stability definition, Bica et al. (2003) found 91.2 percent of HIV-positive persons surveyed (N= 2,013, across 642 participants) were stably housed; however Masson et al. (2004) found among HIV-positive persons with substance use issues (N=190) the rate of housing stability fell to 19 percent. Smith

et al (2000), in their examination of housing status of low-income PLWHA in New York (N=1,445), found 69.5 percent of respondents were stably housed. None of these studies considered housing needs other than the current place of residence in their housing definitions (e.g., they did not consider such needs as help paying rent).

In their study of HIV-positive individuals in New York City (N=1,661), Aidala et al. (2007) found that when housing need was defined by both current living situation and need for housing assistance, unstably housed respondents ranged from 45-54 percent. Stewart et al. (2005), again using the dual definition, found a lower rate of unstable housing, 20 percent, among HIV-positive persons in Alabama (N=401). A housing need of 77.8 percent (stable and unstable with housing need), as found in the present study, is higher than that found in other studies; however this study sample included only low-income persons living with HIV and included rural residents, two factors that make housing need greater. In addition, a noted limitation of this study is the significant amount of missing data reported on unstable housing situations; thus the estimate of unstably housed people could be conservative. A further discussion of housing need definitions and recommendations for their use in future research is presented later in this chapter.

Leaver et al. (2007) in their review of HIV/AIDS housing research examining health outcomes, identified twenty-nine studies that adequately measured housing need and a health outcome. Using this review as well as other identified studies, studies were selected as comparison studies for the present research based on (a) their use of a common definition of housing need (i.e., stable housing; need for housing assistance); (b) their examination of housing need as an outcome; and (c) their use of statistical analysis to determine relationships between independent variables and housing need.

Of the studies reviewed that examined housing need using definitions similar to those used in this study, only five studies examined the relation of individual conditions to housing need (Aidala et al., 2007; Aidala, Cross, Stall, Harre, & Sumartojo, 2005; Aidala & Lee, 2000; Arno, Bonuck, Green, Fleishman, & et al, 1996; Smith, 2000). Of these studies, only (Aidala et al., 2007) define housing need by considering both current residence and need for housing assistance. The remaining studies all use current residence as their definition, similar to the housing stability measure used in the present study. Additionally, Aidala et al. (2007) consider neighborhood poverty as a condition related to housing need; however this is the only community condition considered in any of the studies.

Limitations of these studies should be noted when comparing findings to those of the present study. First, the difference in housing definitions used throughout the HIV/AIDS housing research causes some difficulty in comparing results. In the following discussion of the present study's findings compared to current research, these differences in definitions should be noted. Second, the studies focus primarily on urban areas. Third, only one study considers individual housing situation variables (e.g., receipt of a housing subsidy). Four, only one study considers community condition (i.e., neighborhood poverty) when studying influence on housing need. Even with these limitations, these five studies will be used as the primary comparison studies when discussing the present study's research questions and their respective findings.

Influence of Individual Conditions

The first study question considered how individual-level conditions (i.e., socio-demographic, housing situation, social history) influenced housing needs among low-income PLWHA. To answer this question, several sub-questions were asked: (a) How do gender, race, age, and ethnicity influence housing need?; (b) How do housing burden, the impact of a potential

rent increase, household composition, or a receipt of a housing subsidy influence housing need?; and (c) How do work status, history of homelessness, or history of mental health or substance use issues influence housing need? In the community research model it was posited that age, race/ethnicity, and gender influenced housing need (see Figure 2).

Housing need was defined with two outcome variables: (a) an individual's need for housing assistance and (b) whether the individual was stably or unstably housed. To study the first housing need outcome, need for housing assistance, a two-level hierarchical linear model (HLM) was used. For the second outcome variable, stable housing, a two-level hierarchical generalized linear model (HGLM) was used.

Influence of individual socio-demographic conditions. How do gender, race, age, and ethnicity influence housing need? None of these predictors (age, gender, race, and ethnicity) was statistically significantly related to either housing need outcome (housing stability and need for housing assistance) in the final HLM.

In the multiple regression models examining the predictors of need for housing assistance, being white was significantly associated with a lower need for housing assistance. Race was also a significant predictor of housing stability. In the logistic regression models, a black respondent was more likely not to be housing stable when compared to non-black respondents. However, when race was considered in models containing individual housing situations or social history predictors, it was no longer a statistically significant predictor of either housing need outcome. In the presence of other factors like a history of homelessness, race no longer statistically significantly predicted housing need. As a result of these regression models, none of the socio-demographic predictors was included in the HLM or HGLM analysis.

In the community research model (Figure 2), socio-demographic characteristics were posited to be related to housing need. Specifically, older individuals, individuals of minority status, and women were thought to have greater housing need; however none of these variables were significant predictors in this study. In their studies of PLWHA in New York City, Aidala et al. (2007; 2005), found non-minority persons and males were less likely to have housing need. Arno et al. (1996) in their study of PLWHA throughout the U.S., found that women and minorities were more likely to be unstably housed. Such findings may raise questions about why socio-demographic factors were not found to be significantly related in this study.

There are several reasons for differences in the study results. First, the present study was based on data collected to examine the housing need of PLWHA. In their review of HIV/AIDS housing research, Leaver et al. (2007) found that housing was not the main focus of many of the HIV/AIDS housing studies reviewed, a fact that makes this research unique. In the HIV/AIDS housing research reviewed, only one of the studies includes any indicators of individual housing situation as independent variables (Aidala & Lee, 2000). In the present study, data were available to include housing situation and other social history characteristics that have been linked to housing need and, as the findings indicate, were stronger predictors of housing need. Second, it should be noted that the sample represents only low-income PLWHA engaged in care and in some form of housing. Individuals experiencing homelessness were not represented in the sample as they were in the studies of Aidala et al. (2007; 2005) and Arno et al. (1996). Socio-demographic characteristics may become more important when considering the full variety of housing situations possible for an individual – homeless, unstable, or stably housed. A broader sample that includes those who are homeless, and more respondents who are unstably housed, may shed light on the socio-demographic influences, if they exist.

Influence of individual housing situation. How do housing burden, the impact of a potential rent increase, household composition, or a receipt of a housing subsidy influence housing need? In the community research model, the housing situation predictors of housing burden, household composition, potential rent increase, and receipt of a subsidy were all posited as having influence on housing need. Higher housing burden, larger household size, potentially experiencing a rent increase, and not having a subsidy all were posited as having adverse affects on housing need. In this study only housing burden was significantly related to the housing need outcome - need for housing assistance – in the multiple regressions and HLM. As housing burden (percentage of income devoted to housing costs) increased, so did the need for housing assistance. This finding was consistent with the community research model. Of the HIV/AIDS housing studies reviewed, only Aidala and Lee (Aidala & Lee, 2000) considered any housing situations (i.e., receipt of a housing subsidy) when studying their influence on housing need. The lack of studies using housing situation conditions makes it difficult to compare finding of this study with other HIV/AIDS housing studies.

The finding that housing burden is a statistically significant predictor of need for housing assistance points to the important connection between housing costs and income among low-income PLWHA. Low-income individuals engaged in care may need housing assistance, even though they are receiving other services. Especially among PLWHA, any health crisis can result in job interruption or loss which can almost immediately jeopardize their ability to pay housing or utility costs. In considering the community conditions in the HLM analyses, housing burden remained a statistically significant individual-level predictor of need for housing assistance.

In considering housing stability in the logistic regression, household composition and the potential impact of a rent increase were not statistically significant predictors of housing

stability. However, housing burden and the receipt of a housing subsidy were both significant predictors. As housing burden increased so did the likelihood of being stably housed. At first this finding may seem troubling and inconsistent with the community research model. Individuals' housing burden increases when they are stably housed? However, going back to the operational definition of housing stability – individuals living in their own place including a room, rental or ownership unit – it seems reasonable that stably housed respondents are more likely to experience a housing burden than their unstably housed counterparts. These findings suggest that low-income PLWHA living in their own homes are more likely to be paying over thirty percent of their income toward their housing costs. The greater the percentage of their income allocated to housing costs, the more precariously housed are low-income PLWHA.

The receipt of a housing subsidy also increased the likelihood of being housing stable among low-income PLWHA. This finding was not surprising and supports the belief that lowering individual housing costs through a housing subsidy can help low-income PLWHA be housing stable. It is also consistent with findings from Aidala and Lee (2000) that determined that among PLWHA in New York City, the receipt of a housing subsidy increased the likelihood of being stably housed. However, the receipt of a housing subsidy did not remain a significant predictor in the HGLM analysis. This is most likely due to the influence of the community-level conditions which we not considered by Aidala and Lee (2000).

In considering household composition and rent increase, none of the HIV/AIDS housing studies reviewed considered these conditions when studying influences on housing need. Rent increase is an indicator of unstable housing (Bennett et al., 2007). In their study of PLWHA in New York City , the Hudson Planning Group (2005) found that variations in household composition (i.e., living with family members or with non-related individuals) could positively

and negatively influence housing stability. One reason why household composition and rent increase were not significant predictors in the present study could be the inclusion of housing burden. Housing burden has not been considered in previous studies and, as suggested by the present study, it may be a stronger predictor of housing need than other housing situations. Further research should explore the differences in housing situation measures.

Although both housing burden and the receipt of a housing subsidy were significant predictors in the logistic regression, they did not remain significant predictors in the HGLM analyses. This is most likely due to the influence of the community-level conditions which are discussed later in this chapter.

Influence of individual social history. How do work status, history of homelessness, or history of mental health or substance use issues influence housing need? In the community research model (see Figure 2), all these social history conditions were posited to have negative influence on housing need.

In considering the housing outcome variable, need for housing assistance, work status, history of homelessness, and substance use history were all significant predictors in the final multiple regression model. These findings are consistent with the community research model. Working decreased the need for housing assistance, whereas having a history of homelessness and/or a substance use history both increased the need for housing assistance. Substance use and mental illness histories were both found to be significantly related to housing need among PLWHA living in New York City (Aidala et al., 2007). Aidala et al. (2007), however, did not consider a history of homelessness or work status as predictors of housing need. Their study sample included homeless individuals, which may be the reason this predictor variable was not

included. The inclusion of a history of homelessness may have been a stronger predictor than mental illness history; thus resulting in the statistical non-significance of this predictor.

In the HLM analysis, both history of homelessness and substance use history remained significant predictors of need for housing. In considering the influence of the community, work status was no longer a significant predictor of need for housing assistance. In comparing to the community research model, only history of homeless and substance use influenced housing need.

In examining the housing stability outcome through logistic regression, a mental health and/or substance use history were not found to be significantly related to housing stability. Being employed increased the likelihood of being housing stable. Additionally, having a history of homelessness decreased the likelihood of being housing stable. In the HGLM analysis, however, only a history of homelessness remained a significant predictor of housing stability. In reviewing the community research model, a history of homelessness was the only social history that had a statistically significant influence on stable housing.

These findings are not consistent with the reviewed HIV/AIDS housing research; where a history of homelessness and substance use history were both related to increased housing instability. Further, substance use history (Aidala et al., 2007; Aidala & Lee, 2000; Arno et al., 1996) and a mental illness history (Aidala & Lee, 2000) were related to increased housing instability. In the present study a history of homelessness was a stronger predictor than mental illness or substance use history of stable housing. Two reasons are offered as possible explanations of these findings. First, the difference in findings may due to be the dissimilarity in constructs of the mental illness/substance use variables. For example, although Aidala et al (2007; 2000) use multiple questions to determine mental illness/substance use history, the present study used only one self-report question to determine mental illness history and two self

report questions to determine substance use history. The studies may have captured different aspects of or degrees of mental illness or substance use history of a PLWHA. Second, the HIV/AIDS studies do not include a history of homelessness as a predictor of stable housing. Most of the HIV/AIDS research studies have included homeless individuals in their sampling, which may be reason this variable has not be included as a predictor.

Additionally, the HIV/AIDS housing studies reviewed did not use work status as a predictor of housing stability; however work status has been linked to stable housing among PLWHA (Hudson Planning Group et al., 2005). Note the definition of stable housing in the Hudson Planning Group study is length of time in housing, a condition not considered in the present study nor in other HIV/AIDS studies reviewed. Related to unemployment, lower incomes have been linked to housing need among PLWHA (Aidala et al., 2007). The non-significance of work status in the present study may be a result of community influence in the HGLM.

Overall, when considering the influence of individual-level conditions on housing need, it certainly should be noted that an individual's housing situation and his or her social history are important predictors. In the HLM analyses, the predictors of housing burden, history of homelessness, and substance use history were all significant individual-level predictors of housing need. Additionally, the HGLM analysis for the outcome housing stability found a history of homelessness was the sole significant negative predictor of housing stability.

Influence of Community Conditions

An advantage of multilevel modeling is the ability to examine the influence of community conditions on individuals. Such an examination is not possible when using multiple or logistic regression since the assumption of independence is violated when the same community variable values are "attached to" multiple cases. Since the second research question

considered how community-level conditions influenced housing need of low-income PLWHA, HLM analyses were employed.

In examining the influence of community conditions, several sub-questions were considered: (a) How does living in a distressed ZIP Code Tabulation Area (ZCTA) influence housing need?; (b) How does living in a ZCTA with a higher degree of rurality influence housing need?; (c) How does living in a ZCTA with greater social infrastructure (i.e., presence of HIV providers and affordable housing units) influence housing need? Again reviewing the community research model (see Figure 2), increased distress and rurality were posited to have adverse affects on housing need. Greater social infrastructure was posited to be related to lower housing need. To explore these questions, an HLM analysis was used to study the influence of the community context on the need for housing assistance. To examine the second housing need outcome, housing stability, an HGLM, a multi-level model similar to logistic regression, was used.

Of the HIV/AIDS housing studies reviewed, only one considered a community condition and its influence on housing need. Using ZIP Code of address to define neighborhood poverty, Aidala et al. (2007) found that a poverty neighborhood of PLWHA was significantly positively related to housing instability. Part of the focus of the present study is to explore the community condition and its influence on housing need among low-income PLWHA.

Influence of community distress. How does living in a distressed ZIP Code Tabulation Area (ZCTA) influence housing need? The community condition of distress was defined as a ZCTA with higher than average rates of low-educational attainment, unemployment, poverty, and housing stress. Of the seventy-eight ZCTAs in the study, sixty-four percent had some level of distress. In examining the influence of community distress on need for housing assistance,

community distress had a significant main effect. Such a finding suggests that community distress does influence housing need among low-income PLWHA. As community distress increases, so does the level of housing need among low-income PLWHA. As posited in the community research model, greater community distress is associated with higher housing needs among low-income PLWHA.

Considering that community distress represents the community conditions of low educational attainment, unemployment, poverty, and housing stress, it is hard to compare the statistically significant finding of community distress to the findings of the HIV/AIDS housing studies reviewed as these factors were considered on the individual- and not the community-level. The HIV/AIDS housing studies have shown that PLWHA with low educational attainment (Aidala et al., 2007; Aidala et al., 2005; Smith, 2000), low incomes (Aidala et al., 2007; Kidder, Wolitski, Campsmith et al., 2007; Smith, 2000), and living in a impoverished areas (Aidala et al., 2007) are more likely to be unstably housed. The connection of these studies to educational attainment and poverty indicate that PLWHA are living in distressed areas.

In considering housing stability, community distress was not a significant community predictor; however the variables were positively related. In an attempt to understand this finding, a post hoc multiple regression analysis was conducted using distress as the outcome variable and the degree of rurality and the presence of HIV providers and affordable housing units as predictors. In the model, both HIV providers and affordable housing units were statistically significant positive predictors. As the number of provider organizations and units of housing increased, so did the degree of distress. The findings may suggest that stably housed respondents are more likely to live in distressed areas that are near services or perhaps services are located in areas with the most need. Remembering that stably housed was operationalized as an individual

living in his/her own home, there is a variety of reasons why PLWHA would move to, or remain in, distressed areas including lower housing costs, access to services, proximity to family or friends, or familiarity with the surroundings. Stably housed respondents still may need housing assistance as shown by Aidala et al. (2007); thus it should not be assumed that the community conditions have no effect on housing need.

HIV/AIDS research has linked HIV infection rates, especially in the South, to areas of distress (Ellerbrock et al., 2004; Hall et al., 2005; Peterman et al., 2005). The findings from this study suggest that distress is also associated with housing need of low-income PLWHA. Although this study considered only association and not causation, even association offers insight for community practitioners and policy makers when they consider interventions to meet the housing and service needs of PLWHA. Communities of distress may be the communities to target to reach those individuals experiencing the greatest housing need. U.S. Census data can offer HIV/AIDS practitioners the ability to identify communities of distress in which to target interventions. Further, comparisons between Census data and available client level data may provide greater insight into myriad housing needs that PLWHA may be facing.

Influence of community rurality. How does living in a ZCTA with a higher degree of rurality influence housing need? The community condition of rurality was defined as the percentage of rural population living in a ZCTA. Of the seventy-eight ZCTAs in the study, thirty-two percent had rural residents. In examining the influence of community rurality on need for housing assistance, the degree of rurality of the community had a significant main effect. This finding suggested that community rurality does influence housing need among low-income PLWHA. As predicted by the community research model, higher rurality is associated with greater housing need among low-income PLWHA: individuals living in more rural areas

experience higher housing need. Of the HIV/AIDS housing studies reviewed, most focused on larger urban areas and did not examine rural versus urban differences. This study builds upon previous research that has identified housing for rural PLWHA as a need (AIDS Housing of Washington, 1998d; Bennett, 2005a).

In considering housing stability, however, the degree of rurality was not a significant community predictor. Considering the need for housing assistance increased in rural areas, it should not be assumed that PLWHA in stable housing have no housing need. A post hoc multiple regression was conducted to better understand the findings of the HGLM. In this model, the degree of rurality was predicted using the distress and the presence of HIV/AIDS provider organizations and affordable housing units. In the model, distress was positively, although not statistically significantly, related to the degree of rurality. The presence of HIV providers and affordable housing units were both negatively related; however only housing units was statistically significant. The findings suggest that rural areas do have some level of distress; although the level of distress does not vary significantly from one area to the next. Rural areas, however, seem to be lacking social infrastructure. In this case, more urban areas had a higher number of housing units. This suggests that PLWHA may have fewer options for both services and housing in rural areas, as is supported by rural HIV research (AIDS Housing of Washington, 1998d; Bennett, 2005a; McKinney, 2002).

There is a dearth of research that has examined HIV/AIDS housing within the rural context. Rather research has focused on urban areas, primarily because researchers have greater access to PLWHA in urban areas. As HIV/AIDS has increased in areas outside metropolitan centers, so have the opportunities to examine rural versus urban conditions. This study examined the rural versus urban difference within a metropolitan statistical area (MSA) and found that the

degree of rurality was a significant predictor of housing need. From this finding two things should be highlighted. First, research studies can be designed to measure rural conditions even in metropolitan areas. Pockets of rurality do exist within metropolitan areas and, as pointed out in this study, this rurality has an impact on housing need. Second, the study illustrates that rural and urban differences exist. Differences in the availability of rural HIV/AIDS housing and services do exist (AIDS Housing of Washington, 1998b; Bennett, 2005a; McKinney, 2002; Southern AIDS Coalition, 2003). Such differences need to be recognized, especially when policymakers are considering the delivery of housing and services to low-income PLWHA. This study builds upon this earlier work and clearly demonstrates the degree of rurality is a significant predictor of housing need.

Influence of community social infrastructure. How does living in a ZCTA with greater social infrastructure (i.e., presence of HIV providers and affordable housing units) influence housing need? The community condition of social infrastructure was defined as a ZCTA with HIV/AIDS provider organizations and affordable housing units located within it. The community research model posited that increased social infrastructure would be associated with lower housing need. Community social infrastructure was not a focus of any of the HIV/AIDS housing studies reviewed, thus specific comparisons with other HIV/AIDS housing research on the influence of social infrastructure on housing need cannot be made.

Of the seventy-eight ZCTAs in the study, eighty-nine percent had some level of social infrastructure potentially helpful to PLWHA, as defined in this study. In examining the influence of community social infrastructure, only the presence of HIV/AIDS provider organizations located in the ZCTA had a significant main effect on need for housing assistance. The presence of HIV/AIDS provider organizations increased the need for housing assistance. This finding is

inconsistent with the community research model. Actually, the research model posited that the presence of provider organizations would reduce the need for housing assistance on the assumption that provider organizations might be delivering housing and services to PLWHA. This original assumption may actually be correct, but with slightly different consequences. In her review of service delivery models in rural areas, McKinney (2002) discusses the migration of PLWHA to urban areas for care and treatment. Additionally, in their examination of rural AIDS housing, PLWHA often moved to more urban areas to locate services (AIDS Housing of Washington, 1998d). In this study, of the twenty-five rural ZCTAs, only five had provider organizations located within the ZCTA. The findings of this study suggest that low-income PLWHA in need of housing assistance may migrate toward areas where services are available.

In considering housing stability, social infrastructure was not a significant community predictor. The findings suggest that social infrastructure (the presence of service providers or units) does not have a statistically significant influence on stable housing. Again such a finding needs to be considered in light of the fact that even individuals who are defined as housing stable still have may have a need for housing assistance (Aidala et al., 2007).

The role of social infrastructure and its influence on housing need and stability should be further studied. Aidala et al (2000) have found that supportive housing programs were effective in helping PLWHA maintain health care. Additionally, housing programs have been linked to positive individual and community outcomes (Cohen & Phillips, 1997; Cohen, Phillips, Mendez, & Ordonez, 2004). Additional research is needed to further understand community social infrastructure as it relates to housing need among PLWHA.

Influence of Community Conditions on Individual Condition

Another advantage of multilevel modeling is the ability to examine the interaction between community-level and individual-level conditions. Since the third research question considered was how community-level conditions interacted with individual-level conditions to influence housing need of low-income PLWHA, HLM analyses were again well suited. The community research model posited that community and individual level conditions interact to affect housing need. The interaction effects of community conditions and individual conditions were modeled by placing the community condition as a predictor on the slope of each individual predictor variable.

Only the presence of affordable housing units in a ZCTA had a significant interaction with history of homelessness. Greater numbers of affordable housing units within a ZCTA were associated with a greater likelihood that an individual had a history of homelessness and had higher need for housing assistance. Similar to findings discussed earlier, a plausible explanation for this finding seems to be that the presence of affordable housing attracts individuals in need of housing (AIDS Housing of Washington, 1998d). Additionally, low-income individuals with histories of homelessness benefit from the affordable housing and other services that may be connected to such housing (Aidala et al., 2000; Hannigan & Wagner, 2003). This interaction effect should be further explored in future research studies. No interaction effects were found in the HGLM analyses predicting stable housing.

The difference in community effects on each housing need outcome variable may be related to the definition of stable housing and need for housing assistance. Using a combined definition, similar to that used by Aidala et al (2007), may provide greater understanding of how

community-level conditions influence housing need among PLWHA. This will be further discussed later in this chapter.

Study Limitations

Several limitations to this study should be noted. First, the original study that was the source of data for this study was conducted in a metropolitan statistical area (MSA), which creates some problems for examining rural areas. A similar study conducted in a more rural environment where HIV/AIDS incidence rates are rising might yield different results. Nevertheless, degree of rurality was found to be a significant predictor of housing need within the ZCTAs located in the MSA, suggesting that similar findings will hold true in examining areas that are defined as traditionally rural.

Second, the sample primarily represents individuals engaged in care. Thus, individuals not in care or who may not know their HIV status are not included in the study. Further, the sample does not include individuals who are homeless, who definitely are in an extreme state of housing need. These limitations make this study's findings even more startling. Since the sample represents individuals engaged in care and in some type of housing, it should be of interest to know that even these clients are experiencing housing need. Further, challenges like housing burden can have adverse effects on the housing need of clients who are currently being served. The findings of this study, however, are limited to PLWHA engaged care and may have access to service and/or housing assistance which could affect their housing need.

Also concerning the sample, as discussed in Chapter 3, 131 cases were excluded from the study. Errors in ZIP Code reporting may have reduced the number of rural respondents. Additionally, 33 cases were excluded based on failure to report income; although missing data

can bias results, in the present study it may not be problematic. Estimating income would have potentially inflated the income of respondents artificially decreasing their housing burden.

An additional limitation is the community data utilized in the study. The most readily available community data are those of the U.S. Census; however these data are more than six years older than the HIV/AIDS Survey data. Community conditions could have shifted, thus rates of poverty, unemployment, educational attainment, and housing stress may have been substantially different when the HIV/AIDS Survey was conducted. Additionally, it should be noted that out of the full range of possible community variables only a few were examined. Additional community variables such as community viability, ethnic mix of the population, or economic conditions may influence housing need differently. In the future, it would be preferable for researchers to collect community-level data at the same time they collect client level data. None of these findings diminish the fact that both individual- and community-level conditions have an influence on housing need among low-income PLWHA. Housing need should be seen as a multifaceted issue that has many related factors. Understanding this, practitioners and policy makers cannot look solely at individual conditions in determining housing need. They must also consider characteristics of the communities in which people live. Using both perspectives will aid in developing comprehensive programs and policies that can effectively reduce housing need among PLWHA, and promote positive health outcomes.

Implications for Social Work Practice

The design of the study allowed for not only examining the individual predictors of housing need, but also the community conditions associated with it. The findings of this study thus provide some important insights for micro-, mezzo-, and macro-social work practice. In

considering implications for micro-practice, this study's findings are very applicable to the delivery of case management services to low-income PLWHA. Among HIV/AIDS provider organizations there is often a separation between HIV housing providers and HIV medical providers (Stewart et al., 2005). These disconnects are most notable in their intake and assessment processes. Among HIV medical providers, housing assessment is not often a substantial part of intake. Questions may be limited to a client's current living location, address, or whether or not the housing is permanent. However, the findings from this study suggest that other factors may be more helpful in understanding an individual's housing need or housing stability. Considering, for example, an individual's housing burden by determining the amount of income devoted toward rent and utilities may be a better indicator of a client's housing need. Often verification of income is completed by provider organizations; however information about specific housing costs is not collected. Such information could be added to intake and assessment forms so case managers would have the information available to calculate housing burden. Additionally case managers should assess clients' histories of homelessness or substance use during intake. Assessment of such social histories can not only help to identify clients in need of housing assistance, but also help in determining what supportive services may be needed to help a client remain stably housed.

HIV provider organizations should review their intake and assessment procedures to determine how the housing need of their clients is assessed. Including questions that determine a client's housing burden, history of homelessness, or substance use history, may help HIV/AIDS provider organizations to identify those clients at the greatest risk of housing need. Further, by identifying such housing need or the potential risk of housing need earlier, case managers can

more thoughtfully plan for the supportive services that can prevent clients from experiencing a housing crisis that can jeopardize their health outcomes.

On the organization level (mezzo-practice), the findings of this study point to the role that community conditions can play in influencing housing need among low-income PLWHA. Rural HIV/AIDS provider organizations often face a shortage of trained and knowledgeable staff, limited resources, and large service areas. Often faced with the dilemma of whether to provide more services to their clients or devote precious resources to planning, most provider organizations opt for the former. However in light of the influence that community conditions can have on housing need, provider organizations can use community level information to direct limited staff and financial resources to areas with the greatest need. By using available data, like U.S. Census data, provider organizations can determine community conditions and use this information to better direct resources.

Beyond planning and resource allocation, this study further emphasizes the importance of including housing into the overall prevention, care, and treatment of PLWHA. Housing need has both individual and community influences. Understanding these different relationships can help provider organizations begin the process of discussing housing as a part of their overall delivery of services. Through training, staff of provider organizations can gain a better understanding of the predictors of housing need and how housing, as an intervention, can increase the health and well-being of their clients. The provision of housing itself may be best suited for organizations with the skills and wherewithal to undertake such efforts; however understanding the predictors of housing need and the consequences of housing instability on the on-going care and treatment of PLWHA needs to be discussed within all HIV/AIDS provider organizations.

The integration of housing into the language and culture of HIV/AIDS provider organizations begins to move social work practice from the mezzo-level to the macro-level. In this discussion, macro-level practice will be limited to the work of the HIV/AIDS provider organizations within the larger community. Implications for policy will be discussed later in this chapter. The findings of this study suggest that community conditions (distress, degree of rurality, social infrastructure) are associated with housing need among low-income PLWHA. This finding, in some ways, can be daunting news. For most provider organizations, the community conditions in which they exist and structural issues like extreme poverty, high unemployment, or pervasive housing stress are targets of intervention that are far from their organizational missions and limited resources to fully address. However, if these issues are to be addressed, it will take the work of HIV/AIDS provider organizations and their community partners to be the catalysts of change. It is because the community conditions are broader than any one organization, that HIV/AIDS provider organizations must embrace community building efforts that establish collaborative interventions and strategies that may not specifically target low-income PLWHA, but will certainly benefit them.

Community development approaches like locality development or asset-based development are promising approaches, especially in rural areas (Locke & Winship, 2005). Building community collaboration through partnership, collective visioning, and joint goal setting can make locality development a promising tool to focus community provider organizations on a common path. The need for affordable housing and its connection to positive health outcomes is a message that can be easily translated to groups beyond those serving PLWHA to those serving other populations with special needs, including those with mental illness, substance use issues, or the elderly. The need for stable, affordable housing can be the

starting place to bring community partners to the table to begin conversations to address the myriad community conditions that influence housing need. Further, appropriate housing can be seen as a community asset that can help reduce adverse community conditions that lead to housing need (Green & Haines, 2002b). Thus, the focus on affordable housing serves not only to bring community providers together toward a common goal, but also as the catalyst to address adverse community conditions.

In summary, in considering the implications for social work practice, the findings from this study call for more in-depth housing assessments to increase case managers' understanding of client housing needs. HIV/AIDS provider organizations must integrate housing into their organizations' language and culture, understanding that housing is an important indicator of positive health outcomes and a critical overall intervention for PLWHA. Further, HIV/AIDS provider organizations need to move beyond themselves and the services they provide to understand the broader community conditions that adversely impact their clients. Using this understanding to bring other community providers to the table to vision and plan for collective community change, HIV/AIDS provider organizations and their leaders can be at the forefront of addressing community conditions that have adverse effects on the housing needs of citizens, especially low-income PLWHA.

Implications for Policy

Up to this point, discussion of the implications of this research has focused primarily on social work practice within HIV/AIDS provider organizations. As consideration moves toward implications for policy, the findings from this study should be broadly considered in light of current U.S housing, rural, and HIV/AIDS policy. Although this study did not specifically examine or include some of the policy recommendations in its design (i.e., increased funding),

such a discussion links the findings of this study to current policy issues facing housing, HIV/AIDS, and rural advocates. By doing so, it is hoped that this study's findings can help influence some of the broader structural issues that make the delivery and provision of housing difficult for those trying to serve low-income PLWHA.

Since the Reagan administration there has been a federal disinvestment in the development of new affordable housing (Bennett, 2005b; Dolbeare et al., 2004). U.S. housing policy, if it can be called that, has focused on home ownership as the ultimate American housing solution; the potential for which is outside the realm of possibility for many low-income Americans. The findings from this study should bring caution to those who consider owning a home or renting a unit as an indication of housing stability. Housing need is much broader than a need for a place to live. Housing policy that focuses on getting someone in homeownership or in a rental unit neglects the other challenges that an individual may face that may jeopardize his/her stability. There has also been limited direction or support from the federal government for developing policies for housing with services (Granruth & Smith, 2001), which the findings of this study suggest low-income PLWHA need (i.e., histories of homelessness and substance use). Housing policy makers need to recognize that housing must be connected to services.

A similar argument can be made when discussing rural development policy. In many ways, the federal government has disinvested in rural America. U.S. rural policy continues to focus on the needs of farmers, with little attention given to the myriad other challenges faced in rural areas (Bonnen, 1992). This study highlights that living in a rural area is a significant predictor of need for housing assistance among low-income PLWHA. The study supports statements by the Southern AIDS Coalition (2003; 2008) that rising infection rates of HIV/AIDS in rural areas of the Southeast are causing HIV/AIDS providers to deal with the challenges of

delivering services in rural areas. However, throughout the Southeast, many of these areas lack even the basic infrastructure (e.g., transportation, housing, services), making service delivery difficult and expensive.

Lastly, HIV/AIDS policy and funding has not shifted to address the rising need in the Southeast and rural areas (Southern AIDS Coalition, 2003, 2008). Further, HIV/AIDS housing and its implications for improved care and treatment for PLWHA must be included within HIV/AIDS policy conversations. In many communities, HIV/AIDS housing providers and medical providers are separated by different funding sources and planning mechanisms. As demonstrated by this study, housing need is more complex than simply putting someone in housing, thus policies must integrate housing into the mainstream care and treatment of PLWHA.

Although this study does not point to successful affordable or supportive housing strategies, it does clearly indicate that both adverse individual and adverse community conditions can negatively influence housing need. Previous research has demonstrated that lower housing need is positively related to access to and maintenance of care among PLWHA (Aidala et al., 2007; Kidder, Wolitski, Campsmith et al., 2007; Leaver et al., 2007; Smith, 2000). By understanding not only the implications of increased housing need but also the individual and community predictors that influence it, policy makers and advocates can work to enhance affordable housing, rural, and HIV/AIDS policy in this country. To this end, several policy recommendations are made.

First, the provision of affordable housing and services must be in the forefront of the policy conversations. Increasingly, affordable housing units are disappearing across the U.S (Collings, 1998). Housing is a critical component to the overall care and success of PLWHA.

With limited federal direction and with limited resources on the state level, many providers have trouble providing both housing and services to their clients. Development of housing with services often falls to nonprofit providers. However, the development process can be difficult to navigate especially for novices. Providers have to rely on multiple and often inconsistent funding streams to provide housing, services, and medical care (National Low Income Housing Coalition, 2006). Most importantly, housing and service provision should not be focused on urban areas; rural communities should be equally targeted.

This leads to the second recommendation, a dedicated funding stream. If new housing and services are to be provided, new funding streams have to be created for that purpose. Adverse community conditions, like those in this study, are areas in need of greater, not fewer, resources. Housing can be seen as a community asset that enhances the community condition (Cohen & Phillips, 1997; Green & Haines, 2002b). Housing is a community development tool that not only benefits a community, but also individuals. Funding streams that match-up housing provision and supportive services funding can better enable provider organizations to create housing models that address the multiplicity of community and individual needs.

Most important is the flexibility of the funding source that allows community provider organizations to tailor their housing and services programs to fit their communities. When considering rural areas and PLWHA, smaller developments (i.e., duplexes) might be more conducive to the community and help to lower the risk of stigma associated with larger facilities and larger number of residents with special needs. Additionally, funding should allow provider organizations to provide community events and resources with the goal of increasing community partnership and collaboration. Such community building efforts would be especially beneficial in

highly distressed and rural areas. Lastly, flexibility in funding is needed to allow provider organizations to address multiple housing needs that may keep PLWHA from being truly stable.

A third recommendation is the inclusion of housing in HIV/AIDS prevention, care, and research policies. This study demonstrates that the housing needs of PLWHA are influenced by the communities in which they live. The community condition has to be brought back into the conversation related to the prevention, care, and treatment of PLWHA. In many communities, the planning and implementation of HIV/AIDS programs are divided by their funding streams; mainly Ryan White and HOPWA funding. Ryan White provides the primary care and treatment funding, while HOPWA provides for housing. Federal policy should create community incentives for community visioning and goal setting that strives to integrate housing, services, and healthcare into a comprehensive community initiative. Such incentives will help to close the chasm between healthcare and housing.

In closing, what is truly needed for affordable housing, rural, and HIV/AIDS housing policy is a clear vision. Unfortunately, there is no clear policy direction for any of these areas and as a consequence provider organizations receive inadequate and poorly directed funding. In the end, HIV/AIDS provider organizations are left with shrinking housing stock, inadequate funding for housing and services, and myriad community conditions that adversely impact their clients. This only serves to hurt those with the greatest need.

Implications for Future Research

The field of HIV/AIDS housing, although an issue since the first emergence of AIDS, is still a topic that has much room for further exploration. Current research has focused on housing as an intervention that promotes access to and maintenance of care among PLWHA. This study

took a step back and examined the individual and community conditions that influence housing need. Examining community conditions has been largely unexplored, especially in relation to rural versus urban differences. This study has shown that community is important and that community conditions of distress, the degree of rurality, and social infrastructure all influence housing need. Even with these findings, there is much that still needs to be studied. In considering future research, several recommendations are offered including improving definitions of housing need, further exploring community conditions, utilizing multilevel modeling, and developing longitudinal and intervention research studies.

In this study two definitions of housing need were used – stable versus unstably housed and need for housing assistance. Each was used as a separate housing need outcome in the data analyses. The approach attempted to measure both "objective" and "subjective" housing experiences as suggested by Aidala et al. (2007); however a stronger housing need outcome may be one that combines factors into one outcome variable. Because of the definitions used in the study, it was difficult to create one measure of housing need, thus it was decided to model both outcome variables. This was a helpful process as it separated two housing conditions – mainly if someone was living in their home and if they had a need for housing assistance. These are two overlapping conditions of housing need which should be explored jointly as illustrated in Table 23.

Individuals' living situations, like those measured in the stable versus unstable housing variable, do not reflect the full housing challenges individuals may be facing. For example, in this study housing burden, the receipt of a housing subsidy, a history of homelessness, or a substance use history all were significant predictors of housing need. Such predictors explain more of the conditions that affect housing need than just the current living situation. Future

research should consider housing need definitions that include the current living situation, yet add additional "subjective" housing conditions that further explain a person's housing need. This will create a richer definition of housing need that may help to explain the various housing situations in which PLWHA live.

In recommending such a definition, it is also recommended that current living situation be further studied. Where an individual lives is not necessarily the same as their need for housing assistance. Understanding better the housing need of individual living in their own homes (owner or renter) will help further enhance housing interventions. American culture promotes homeownership as the pinnacle of housing success; however this might not be the case for low-income PLWHA. Additionally, understanding more fully the community influences that may influence current living situations may better enable practitioners to develop programs that help move individuals to stable environments.

This leads to a last recommendation in discussing the terminology of housing stability. In this study as well as other HIV/AIDS housing research studies citied earlier, the definition of housing stability has included the current living situation and in some cases other housing needs. It may be misleading to define housing stability solely on current living situation. Future research should use caution in using this term, recognizing that many factors constitute housing stability. Researchers should focus on the development of common definitions of housing need and housing stability that more adequately reflect the nuances of these constructs.

An important contribution of this research is the examination of the community conditions and their influence on housing need among low-income persons living with HIV/AIDS. The factors of distress, degree of rurality, and social infrastructure variables considered only touch the surface of the many community conditions that may be related to

housing need. Much still needs to be explored to understand how these conditions relate to one another and how they may work collectively to influence housing need. For example, the study did not explore the interrelatedness of distress and the degree of rurality. Rural research suggests that rural areas are void of resources and services that can benefit persons with HIV/AIDS, yet at the same time research suggests that informal social networks are quite strong. The finding from this study that individuals living in rural areas have higher housing needs suggests that housing and services may not be available; however why this is the case and if informal services are available still needs to be explored.

Additionally, the degree of rurality in this study was determined by the percentage of rural population living in a ZIP Code Tabulation Area (ZCTA); however rurality can be multifaceted. Future studies should examine additional characteristics of the rural community like employment, proximity to urban areas, and population density. Some of these characteristics were considered in the distress indicator; however the insignificance of distress and the degree of rurality when placed together in the HLM says little about their influence or connection to one another. Including other community conditions that provide a deeper understanding of the community could help practitioners and policy makers more fully understand the influence of community conditions on housing need.

The role of social infrastructure was only minimally explored in this study by examining the influence of the presence of HIV/AIDS provider organizations and affordable housing units. The results suggest that the presence of HIV/AIDS provider organizations may draw PLWHA to areas to seek services. If this is the case, what implications does this have for rural practice? If providers intensified services in rural areas, would that increase the number of clients engaged in care? Exploring other facets of social infrastructure like the existence of other community assets,

social involvement or engagement, community cohesion, or informal helpers may offer better understanding to the findings of this study. Asset building approaches like those that increase social infrastructure and physical capital (i.e., housing) have been noted as promising community interventions in rural areas (Locke & Winship, 2005). Because asset building may have positive implications for low-income PLWHA, this should be considered in future community-level research.

In this study, data from Census, HUD, USDA, and other available sources were used to construct the community-level variables. In most cases, such data is very useful in describing community conditions and are very accessible to community providers and advocates. However, such community data may not offer the best picture of the community especially when examining the nuances of such concepts as distress, rurality, or social infrastructure. Researchers may find these multi-faceted communities constructs hard to define or operationalize with Census data alone. In-person community assessments may offer additional information and detail to make readily available data more meaningful. This may be a particularly useful process for provider organizations as they plan to deliver housing or services in new areas. Including community assessments within a research model may offer rich insight into community conditions that can further explain the influence such conditions have on housing need.

Further research should continue to use multilevel modeling procedures because they allow for the studying the relationship between community conditions and individual outcomes. Before this study, limited research had been conducted that examined the influence of community conditions on the housing need of PLWHA. Researchers have tended to look only at individual situations and conditions as the basis for housing need. Advanced multilevel models, like HLM used in the study, allow researchers to explore the influence of community conditions

on individual housing need as well as on health outcomes. Future studies should use multilevel modeling to further explore not only the influence of community conditions, but also how these community conditions interact with individual conditions, to impact housing and health outcomes among PLWHA. Also, replicating this study in areas that are defined as more traditionally rural (i.e., outside metropolitan areas) may offer greater insight about the issues of rurality, distress, and social infrastructure.

Last, longitudinal studies are recommended for future research examining this topic. Examining housing need over time and how the individual- and community-level conditions may influence housing need and health outcomes would be helpful in designing future interventions. Longitudinal design would help researchers to better understand how housing need changes over time, especially when considering the progression of HIV/AIDS. Perhaps even more helpful would be intervention studies to help identify key housing strategies that reduce housing need and increase positive health outcomes among PLWHA. For example, studies that examine how the provision of safe, decent, and affordable housing affects health outcomes are needed.

In conclusion, the options for future research are plentiful. Focusing on developing a consistent and more comprehensive definition of housing need will strengthen future research. Additionally, exploring further the community conditions and their influence on housing need and ultimately health outcomes among PLWHA and other special needs populations should help enhance the level of care available to them. Research should focus on testing models and interventions that address the housing needs of PLWHA. If successful, these models can be replicated in other areas, ensuring that all PLWHA have access to necessary supportive services and healthcare.

Conclusion

This study shows that housing need among low-income PLWHA is multifaceted. Practitioners and policy makers must be aware of both individual- and community-conditions that can influence housing need. Interventions and policies must be tailored with the goal of alleviating housing need among PLWHA. A failure to do so could have adverse affects on the health and wellbeing of low-income PLWHA.

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APPENDICES

HIV/AIDS HOUSING SURVEY

June, 2006

If you are a person living with HIV disease, we need your input. The current level and availability of housing and services in the 4-county area of Tampa is being assessed. We want to identify what is needed to permanently house you and your family. Please answer the following questions as accurately as possible. If you are unsure about or uncomfortable with any of the questions, please feel free to skip. Your assistance will help countless individuals and families living with HIV. ***If you have already filled out this survey, please do not do so again. It will harm the results.*** **Thank you!**

1. In what county do you live?
(If you do not live in or access healthcare from one of these counties, please don't fill out this survey)
☐ **Hernando** ☐ **Pasco** ☐ **Hillsborough** ☐ **Pinellas**

2. In what county do you access healthcare?
☐ **Hernando** ☐ **Pasco** ☐ **Hillsborough** ☐ **Pinellas**

3. What is your zip code? _____

4. How old are you? _____

5. What is your gender identity? ☐ **Female** ☐ **Male** ☐ **Transgender**

6. What is your race?
☐ **Black** ☐ **White**
☐ **Asian** ☐ **Native American**
☐ **Pacific Islander** ☐ **Multi-racial**
☐ **Other** _____

7. Are you Hispanic? ☐ **Yes** ☐ **No**

8. What one language do you prefer to speak at home?

☐ **English** ☐ **Tagalog** ☐ **Russian**
☐ **Spanish** ☐ **Vietnamese** ☐ **Portuguese**
☐ **Chinese** ☐ **Italian** ☐ **French**
☐ **Korean** ☐ **Creole** ☐ **Other**_____

9. How long have you known you were infected with HIV? _____ Years_____Months

10. How many times have you moved since you became HIV-positive?_____

11. In the past year, how many times have you <u>NOT</u> had a place of your own in which to live?

_____ times in the past year.

12. If you spent any days on the street with no place to live since you became HIV-positive, how many total days would you estimate that you spent on the street?

_____

13. *Including you*, how many people live in your household? (A household can be a single individual or family/group of 2 or more persons living in a housing unit and sharing costs.)

	How Many HIV Positive	How Many HIV Negative
Adults (18 or older)		
Children		

14. Thinking about all of the ways that you get money, about how much total money comes into your household each <u>month</u>?

$_____

15. How much do you and/or your household members contribute monthly to the rent or mortgage? [Not the total amount of your rent, but how much you and your household members actually pay].

$_____

16. Which of the following <u>best</u> describes your work situation? (Please choose just one.)

- ☐ **Working full time**
- ☐ **Working part time**
- ☐ **Permanently unable to work**
- ☐ **Temporarily unable to work**
- ☐ **Other _____**
- ☐ **Unemployed – looking for work**
- ☐ **Unemployed – not looking for work**
- ☐ **Retired**

17. Where do you live right now? (Pick one that best describes where you live.)

- ☐ **Your own place – a room, apartment or house that is your home**
- ☐ **Staying in someone else's house (staying but not paying regular rent)**

☐ **A group home/community residence (in which common areas, such as the living and dining rooms, are shared by other residents.)**
☐ **Temporary or transitional housing program**
☐ **A shelter**
☐ **Abandoned building, other public place, or on the street**
☐ **In drug or alcohol treatment facility**
☐ **Hospital**
☐ **Prison / Jail (If you checked this, please select one of the choices below)**
☐ **I have a place to live upon release** ☐ **I do not have a place to live upon release**
☐ **In a facility for recently discharged inmates from prison**
(if so, were you convicted of a felony ☐ **Yes** ☐ **No)**
☐ **Other _____**

18. Approximately how long have you lived there?

☐ **Less than one month**	☐ **6 months to 1 year**
☐ **1 to 2 months**	☐ **More than 1 year**
☐ **3-5 months**	☐ **Don't know**

19. How happy are you with where you live right now?

Very	**Somewhat**	**Somewhat**	**Very**
___Unhappy	**___ Unhappy**	**___Happy**	**___Happy**

Tell us some of the reasons you are happy or unhappy with your present housing:

_____
_____
_____
_____
_____

20. Are you currently receiving a housing subsidy (such as a Section 8 voucher, HOPWA voucher or Shelter+Care) or living in public housing?

☐ **Yes** ☐ **No**

21. How much of an increase <u>per month</u> in rent or mortgage would cause you to have to find a new place to live?

☐ **$1 to $25**	☐ **$76 to $100**	☐ **An increase of $200 or more**
☐ **$26 to $50**	☐ **$101 to $150**	☐ **Doesn't apply, I don't have rent or mortgage**
☐ **$51 to $75**	☐ **$151 to $200**	

22. Do you currently need assistance finding housing that you can afford?

☐ **Yes** ☐ **No**

23. If you had your choice, what type of housing would you prefer?

Right Now:	**In 5-10 Years:**
☐ **Rent your own apartment or house**	☐ **Rent your own apartment or house**
☐ **Rent a single room**	☐ **Rent a single room**
☐ **Buy/own your own home**	☐ **Buy/own your own home**
☐ **Stay with family or friends**	☐ **Stay with family or friends**
☐ **A group home/community residence**	☐ **A group home/community residence**
☐ **A transitional housing program**	☐ **A transitional housing program**
☐ **Other (describe) _____**	☐ **Other (describe) _____**

24. Would you prefer to live in a community with other individuals living with HIV/AIDS?

☐ **Yes** ☐ **No** ☐ **Not Sure**

25. When was the last time you went to a doctor for any reason?

☐ **Less than a week ago** ☐ **6 to 8 months ago**
☐ **1 to 3 weeks ago** ☐ **9 to 12 months ago**
☐ **1 to 2 months ago** ☐ **More than a year ago**
☐ **3 to 5 months ago** ☐ **Don't know** ☐ **I do not have a medical doctor**

26. How often do you go to the clinic or medical center for HIV/AIDS care?

I go to the clinic/medical center _____ times each _____ (year, month, week)

27. When was the last time you had contact with a case manager?

☐ **Less than a week ago** ☐ **6 to 8 months ago**
☐ **1 to 3 weeks ago** ☐ **9 to 12 months ago**
☐ **1 to 2 months ago** ☐ **More than a year ago**

☐ **3 to 5 months ago** ☐ **Don't know** ☐ **I do not have a case manager**

28. Have you ever seen a mental health professional such as a counselor, psychologist, or social worker to talk about stress, depression, or any other mental health issue?

☐ **Yes** ☐ **No (if you check "no" then you can go on to question number 30.)**

29. If you said yes to number 28 above, please tell us when the last time it was that you saw a mental health professional.

☐ **Less than a week ago**
☐ **1 to 3 weeks ago**
☐ **1 to 2 months ago**
☐ **3 to 5 months ago**
☐ **6 to 8 months ago**
☐ **9 to 12 months ago**
☐ **More than a year ago**
☐ **Don't know**
☐ **I do not have MH Professional**

30. Do you feel or have you ever been told that you might need help for a drug or alcohol problem?

☐ **Yes** ☐ **No**

31. Have you ever received help for alcohol or drug problems?

☐ **Yes** ☐ **No (if you check "no" than you can go to question number 33.)**

32. If you said Yes to number 31, please tell us how many times you have been treated for alcohol and/or drug problems:

Alcohol:_____times **Drugs:_____times**

33. Listed below are services that people need from time to time. Please tell us how much you need these services <u>right now</u> by rating them on the scale from 1 to 7 with 1 being not needed and 7 being most needed. Please circle the number that best matches your need

		Not Needed						Very Much Needed
A	Alcohol and/or drug abuse treatment	1	2	3	4	5	6	7
B	Case management – Social worker	1	2	3	4	5	6	7
C	Daycare for your children	1	2	3	4	5	6	7
D	Dental services	1	2	3	4	5	6	7
E	Enrollment with a doctor for HIV care	1	2	3	4	5	6	7
F	Food: Meals and/or groceries	1	2	3	4	5	6	7
G	Help paying rent	1	2	3	4	5	6	7
H	Help paying utilities	1	2	3	4	5	6	7
I	Help with preparing meals	1	2	3	4	5	6	7
J	Help paying security and/or utility deposits	1	2	3	4	5	6	7
K	Help finding a job or job training	1	2	3	4	5	6	7
L	Help getting benefits (Social Security, TANF, Food Stamps, Rental assistance)	1	2	3	4	5	6	7
M	Emergency housing – if you are homeless	1	2	3	4	5	6	7
N	Permanent housing – if your housing is not long term	1	2	3	4	5	6	7
O	Mental health services or counseling	1	2	3	4	5	6	7
P	Someone coming to your home to help with day to day activities	1	2	3	4	5	6	7
Q	Transportation for needed services	1	2	3	4	5	6	7
R	Support groups with other HIV positive persons	1	2	3	4	5	6	7
S	Medication for HIV disease	1	2	3	4	5	6	7
T	Other Medications	1	2	3	4	5	6	7
U	Other _____	1	2	3	4	5	6	7

34. Which three services listed in the chart above do you need the most at this time?

	Letter of service
#1 most needed service	
#2 most needed service	
#3 most needed service	

35. Tell us about any other services you need that are not listed.

_____

_____

_____

36. What help do you need to become or stay housed? (Check all that apply)

☐ **Rental Subsidy** ☐ **Home delivered meals** ☐ **On site mental health care**
☐ **Employment** ☐ **On site physical care** ☐ **Childcare**
☐ **Translation services** ☐ **Assistance with daily living**
☐ **Transportation to services**
☐ **To live in a drug-free neighborhood**
☐ **Other**_____

Thank you for your assistance. For your help, we would like to give you a gift certificate. Please see the person who gave you the survey to receive the certificate.

THANK YOU

Note: This survey was developed to collect information that will help the City of Tampa develop a plan to meet the permanent supportive housing needs for person living with HIV disease in Hillsborough, Pinellas, Pasco and Hernando counties.

APPENDIX B: IRB PROPOSAL

Request for Approval of Research Involving Human Subjects

Title of Research: Individual and Community Factors that Determine Housing Need Among Low-Income Persons Living with HIV/AIDS
Researcher: Russell L. Bennett, PhD Program, School of Social Work

Faculty Chair: Lucinda Roff, Ph.D.
Request for Exemption: Based on the exempt criteria found The University of Alabama's website which states:

> *(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.* (See http://osp.ua.edu/site/irb_info.html)

I am requesting that this study be exempt from IRB approval. This request is justified on the basis that this study is utilizing existing data and the information is recorded in a manner that subjects cannot be identified. Additional information justifying this request is provided in the research study procedures and design found below.

Research Procedures:

1. Study Purpose and Design:

1.1. Summary. The proposed dissertation study is a cross-sectional, secondary analysis of data collected in 2006 for the HIV/AIDS Housing Survey conducted in the Tampa, Florida Eligible Metropolitan Statistical Area (EMSA). The EMSA consists of a four-county area that receives funding under the federal Housing Opportunities for Persons with AIDS (HOPWA) program. The purpose of the proposed is to determine the best predictors of housing need by examining individual characteristics (i.e. socio-demographics, housing history, social history) of Persons Living with HIV/AIDS (PLWHA) and community-level characteristics (i.e. distressed, degree of rurality, assets).

1.2. Method. Secondary data analysis will be conducted on existing data collected through the HIV/AIDS Housing Survey. The original survey collected data from 515 low-income HIV-positive individuals and examined their current housing and supportive services needs. The survey was conducted as a part of a community needs assessment and planning process through which a community-wide housing plan and program improvements were developed. The survey respondents provided the information anonymously and the data set contains no identifiers that link the data to the survey respondents. In addition to the survey data, secondary data analysis will also be

conducted on U.S. Census data which will be used to examine community-level variables (i.e., poverty, unemployment).

A two-level Hierarchical Linear Model (HLM) will be used to examine the relationship among three types of individual characteristics (socio-demographic, housing history, and social history) and housing need. Level two of the model will examine the association among community-level characteristics (distress, rurality, and assets) and housing need.

1.3. Implications. This study will add to the HIV/AIDS housing research by examining the relationship of individual and community-level characteristics in predicting housing need. Such an understanding will inform community social work practitioners, researchers, and policy makers and aid in the development of new interventions or advocacy efforts to decrease housing need, especially in hard to serve rural, distressed areas.

2. Participant Recruitment and Selection: N/A
3. Research Site: N/A
4. Research Procedures with Participants: N/A
5. Copy of Materials: N/A
6. Debriefing Process: N/A

Informed Consent: N/A

Risks and Benefits: N/A

APPENDIX C: RELATIONSHIP OF SURVEY QUESTIONS TO EACH VARIABLE

Level of Analysis	Independent/Dependent	Variable	Coding	Operational Definition
Outcome	Dependent	Housing Need: Stable vs. Unstable	1=stable 0=unstable	Living situation was operationalized as a respondent's current living situation categorized into the following: 1) Unstable - if living in a abandoned building, other public place, on the street, shelter, if living in someone else's home, group home, temporary housing, treatment facility, halfway house, hospital, or jail; 2) stably housed –if living in own place including a room, rental, or ownership unit. (Survey question: 17)
Outcome	Dependent	Housing Need: Need for Housing Assistance Scale	0-24 range score	Need for housing assistance was operationalized as the sum of the participants' responses to a 4-item, 6-point scale (*0= not needed and 6= very much needed*) assessing the current need for housing assistance. Participants were asked to report if they currently needed the following: 1) help paying rent, 2) help paying utilities, 3) help paying security and/or

				utility deposits, and 4) permanent housing. Responses to each question were summed, resulting in a range of scores from 0-24, with higher scores representing greater housing need. (Survey question: 33g, 33h, 33j, and 33n)
Individual	Independent	Socio-demographics. Gender	female (1=yes, 0=no) male (1=yes, 0=no)	Participant's gender: male/female (Survey question: 5)
Individual	Independent	Socio-demographics: age	Age in years	Respondent's age in years (Survey question: 4)
Individual	Independent	Socio-demographics: race	black (1=yes, 0=no) white (1=yes,0=no) other (1=yes, 0=no)	Respondent's race (Survey question: 6)
Individual	Independent	Socio-demographic: ethnicity	1= yes 0= no	Participant Hispanic (Survey question: 7)
Individual	Independent	Housing Situation: Housing Burden	Housing Burden (continuous)	Participant housing burden which was operationalized as the percentage of reported monthly income used for rent or mortgage payments. (Survey questions: 14 and 15)
Individual	Independent	Housing Situation: Household Composition	single – one adult person (1=yes, 0=no), adults – 2 or more adults (1=yes, 0=no), single with children (1=yes, 0=no), adults with children	Participant's household composition. (Survey question: 13)

			(1=yes, 0=no)	
Individual	Independent	Housing Situation: Receipt of housing subsidy	1= yes, 0= no	Participant's receipt of housing subsidy including Section 8, Shelter Plus Care, HOPWA voucher, or public housing. (Survey question: 20)
Individual	Independent	Housing Situation: Rent Increase	7=$1 to $25, 6= $26 to $50, 5 = $51 to $75, 4 = $76 to $100, 3 = $101 to $150, 2 = $151 to $200 1 = An increase of $200 or more 99 = Doesn't apply, I don't have rent or mortgage	Participant's reported monthly rent increase that would require a move. (Survey question: 21)
Individual	Independent	Social History: Work Status	1 = working, 0 = not working	Participant's work status (Survey question: 16)
Individual	Independent	Social History: History of Homelessness	1 = yes 0 = no	Participants were asked if they had ever been homeless in the past year. (Survey question: 11)
Individual	Independent	Social History: Mental illness history	1 = yes, 0 = no	Participants were asked if they have ever seen a mental health professional such as a counselor, psychologist, or social worker to talk about stress, depression, or any other mental health issue. (Survey question: 28)

Individual	Independent	Social History: Substance Use History	1 = yes, 0 = no.	Participants were asked if they felt or had been told that you might need help for a drug or alcohol problem and asked if they ever received help for alcohol or drug problems. If a respondent answered affirmative to either questions the respondent was considered to have a substance use issue. (Survey questions: 30 and 31)
Community	Independent	Distressed ZCTA: 4-item scale	0-4 score; higher score = more distressed	Distressed ZCTA was operationalized as the sum of responses to a 4-item scale where items are dichotomized (1 = yes, 0 = no) and summed. A higher score (score range: 0-4) represents a higher distressed ZCTA. Using the USDA County Typology Codes as a basis, the following indicators were used in the scale.
Community	Independent	Distressed ZCTA Scale: Housing Stress	1= yes; 0=no	A ZCTA with higher than average (mean of all ZCTAs) of owner- and renter-occupied housing units had at least one of the following conditions: lacked complete plumbing, lacked complete kitchen, had 1.01 or more occupants per room, and housing costs as a percentage of income greater

				than 30 percent. (Source: U.S. Census)
Community	Independent	Distressed ZCTA Scale: Low Education	1= yes, 0 = no	A ZCTA with higher than average percent of residents 25 years old or older had neither a high school diploma or GED in 2000 U.S. Census. (Source: U.S. Census)
Community	Independent	Distressed ZCTA: Unemployment	1= yes, 0 = no	A ZCTA with a higher than average rate of residents 16 years old and older were unemployed and in the labor force. Those in the labor force include only individuals that Census classifies in the civilian labor force and in the U.S. Armed Services. This does not include retirees, students, or other seasonal workers. (Source: U.S. Census)
Community	Independent	Distressed ZCTA: Poverty	1= yes, 0 = no	A ZCTA with a higher than average rate of residents living in poverty according to the 2000 U.S. Census. (Source: U.S. Census)
Community	Independent	Rural ZCTA	Percentage of Rural Residents	A rural ZCTA was operationalized as a ZCTA with a percentage of its population designated as rural. Using 2000 Decennial data, the percentage of rural population for each ZCTA

				was figured by dividing the reported rural population by the total population of the ZCTA (continuous). The higher the percentage, the more rural the ZCTA was considered.
Community	Independent	Social Infrastructure in a ZCTA: HIV/AIDS Service Providers	Number of service providers in ZIP Code.	A ZCTA will HIV/AIDS housing or service provider organization located within it. HIV/AIDS housing or service providers were defined as organizations that receive funding under the Housing Opportunities for Persons with AIDS (HOPWA) program as reported by the City of Tampa or organizations that receive funding through the Ryan White HIV/AIDS Treatment Modernization Act as reported by the State of Florida.
Community	Independent	Community Assets: Affordable Housing Inventory	Number of affordable housing complexes in ZIP Code.	A ZCTA will affordable housing units located within it. Affordable housing is defined as federal housing programs targeted to low-income individuals, defined as 80 percent of Area Median Income, including public housing.