TESTING A MODEL OF HEALTH-RELATED QUALITY OF LIFE IN PERSONS WITH HIV AND LIVER DISEASE

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Persons living with human immunodeficiency virus (HIV) are living longer and therefore are more likely to suffer significant morbidity due to potentially treatable liver diseases. Liver diseases alone have been shown to have a significant negative effect on one's health-related quality of life (HRQOL). Clinical evidence suggests that persons living with HIV and liver disease, a growing number of individuals, may have a poorer HRQOL than persons living with HIV who do not have liver disease. Thus, this study examined the multiple components of HRQOL by testing Wilson and Cleary's model in persons with HIV and in persons living with HIV and liver disease using structural equation modeling. This secondary analysis used de-identified baseline and medical record review data from a parent study testing interventions to improve medication adherence in persons living with HIV (R01 NR04749). The Wilson and Cleary model components include: biological/physiological factors (HIV viral load, CD4 counts), symptom status (Beck Depression Inventory II, Medical Outcomes Study HIV Health Survey [MOS-HIV] mental function), functional status (missed appointments, MOS-HIV physical function), general health perceptions (Perceived burden visual analogue scale, MOS-HIV health transition), and overall QOL (Satisfaction with Life Scale, MOS-HIV overall QOL). Characteristics of the individual and environment were also explored. The Wilson and Cleary (1995) model was found to be useful in linking clinical indicators to patient-related outcomes.

The findings provide the foundation for development and future testing of a targeted bio-behavioral nursing intervention to improve HRQOL in persons living with HIV and liver disease.

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PREFACE

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1.0 INTRODUCTION

Since the introduction of highly active antiretroviral therapy, persons living with human immunodeficiency virus (HIV) are living 20 to 30 years beyond the time of diagnosis (Tedaldi et al., 2003). The result is that persons living with HIV are more likely to suffer significant morbidity and mortality from other disorders such as liver disease and its related complications (anemia, end stage liver disease, lipodystrophy, and hepatocellular carcinoma) than from HIV (Tedaldi et al., 2003). Because of the toxic and metabolic effects of antiretroviral medications on the liver and co-infection with liver disease, the number of persons living with HIV and liver disease is increasing (W. R. Kim, 2002).

Estimates suggest that more than 50% of persons living with HIV are co-infected with liver disease related to Hepatitis C Virus (HCV). Quite possibly, the number of cases of HCV in the United States may be four to five times greater than the number of cases of HIV (Alter et al., 1999). The number of persons with liver disease is significantly higher than that of HCV alone, as liver disease includes a number of liver conditions (infectious, chronic, steatosis, and cirrhosis). These potentially treatable liver conditions have been shown to have a significant negative effect on persons' health-related quality of life (HRQOL) (Foster, Goldin, & Thomas, 1998). As the first goal of Healthy People 2010 (US DHHS, 2000) is to increase life expectancy and improve HRQOL of individuals of all ages, the challenge for researchers and practitioners is to determine what aspects of individuals' HRQOL are affected when they live with multiple co-

morbid conditions. There are few theory-driven studies that explore HRQOL and liver disease in persons living with HIV (Fleming et al., 2004). Thus, this study examined the Wilson and Cleary (1995) model of HRQOL in persons living with HIV and persons living with HIV and liver disease.

1.1 SIGNIFICANCE OF THE PROBLEM OF HIV AND LIVER DISEASE

The rate of liver-related complications is increasing in persons living with HIV and liver disease. This increase is due in large part to longer survival of persons with HIV, and toxic and metabolic effects related to long-term use of antiretrovirals (Soriano, Martin-Carbonero, Maida, Garcia-Samaniego, & Nunez, 2005). Moreover, HIV medication schedules and side effects are becoming less burdensome; however, larger doses of these medictions at less frequent intervals can be more liver-toxic. Newer antiretroviral medications are being linked to lipodystropy and steatosis (fatty liver) and have an impact on liver function and HRQOL (Sax & Gathe, 2005). Therefore, liver toxicity in persons living with HIV becomes magnified when co-morbid liver disease is present.

Chronic liver disease is one of the leading causes of morbidity and mortality in persons living with HIV. Estimates are that over four million people in the United States have infectious liver disease (NIH, 2002). The prevalence of co-infection (HIV and liver disease) is estimated to be between 70-90% in urban populations (Soriano et al., 2005). The co-infection epidemic emerged in the 1980s, and is expected to increase significantly in the next 15 years, in part due to the long duration from infection to negative health outcomes (Adler, Goubau, Nevens, & Van Vlierberghe, 2002; R. S. Brown & Gaglio, 2003) Approximately 30-90% of the one million

persons living with HIV in the United States are thought to be co-infected with HIV and liver disease; this number of persons with co-infection is increasing each year (Alter et al., 1999; NIH, 2002; United States Census Bureau, *State and County Quick Facts*, 2000). Approximately 85% of those with acute liver disease will develop chronic liver disease (Lawrence, 2000).

Factors that predict a worse clinical prognosis when liver disease is present include co-infection with HIV, obesity, nonalcoholic steatohepatitis syndrome, duration of illness, and viral genotype (Ortiz, Berenguer, Rayon, Carrasco, & Berenguer, 2002). The long-term consequences of chronic liver disease include decreased HRQOL, chronic fatigue and anemia, chronic viral hepatitis, cirrhosis, and hepatocellular carcinoma (Cosby, Holzemer, Henry, & Portillo, 2000). These outcomes may be augmented when combined with the potential complications and side effects of HIV, including decreased HRQOL, neuropathy, malnutrition, and lipodystrophy (Arey & Beal, 2002). Factors that have been identified to predict a worse prognosis in persons living with HIV include infectious liver disease viral genotype, lack of sustained viral response to treatment, poor adherence, decreased HRQOL, obesity, substance abuse, and advanced age at infection (Monto, Alonzo, Watson, Grunfeld, & Wright, 2002; Ortiz et al., 2002).

The prevalence of liver disease may be greatly underreported (Alter et al., 1999). Liver disease is more prevalent among ethnic minorities (3.2% African Americans, 2.1% Hispanic Americans) compared to the general United States population of Caucasians (1%) (Shiffman, 1998). Among the homeless or the incarcerated the prevalence of liver disease may be as high as 40% (W. R. Kim, 2002). Approximately 85% of those with acute liver disease will develop chronic liver disease (Lawrence, 2000). Chronic liver diseases of all types rate as one of the top 10 causes of death in the United States, with infectious liver disease comprising 77% of these

deaths (W. R. Kim, 2002). Approximately 25-30% of these cases are diagnosed due to long-term mild symptoms of chronic fatigue, anemia, and joint pain.

The impact of chronic liver disease accounts for significant absenteeism at work; estimates are that over one billion dollars were expended in US health care utilization for this disorder in 1998. Economists predict a four-fold increase in liver disease hospital expenditures from 1990 to 2015 and a continued rise in the future (W. R. Kim, 2002). Indirect cost estimates including lost wages and lost fringe benefits equated to approximately 3.7 billion dollars in 1997 (Leigh, Bowlus, Leistikow, & Schenker, 2001).

Co-infection with both HIV and liver disease yields a significant increase in disease progression for both diseases. Persons living with HIV are living longer since the institution of highly active antiretroviral therapies, but they are dying from liver-related complications. The consequences of liver disease are often debilitating far beyond the individual's current state of health while living with HIV as a chronic disease.

The empirical support measuring HRQOL in the liver disease population has, more often than not, been reported as overall quality of life or as components of quality of life (See manuscript in Appendix A). Many studies that have HRQOL as a primary outcome variable are not theory-driven (Fleming et al., 2004; Foster et al., 1998; Hauser, Holtmann, & Grandt, 2004; Hickman et al., 2004; Pojoga et al., 2004). While there have been studies on the effect of liver diseases on HRQOL, fatigue, and depression, specific recommendations for translating this research into clinical practice for persons living with HIV and liver disease have not been made.

The goals of measuring the multidimensional nature of HRQOL within the population of persons living with HIV and liver disease are to identify those areas of HRQOL that are negatively and positively associated with the disease and then to tailor bio-behavioral

interventions aimed at improving overall HRQOL in persons with HIV and liver disease, thus meeting one of the goals of Health People 2010 (US DHHS, 2000). The knowledge gained from persons with HIV and liver disease in this study may provide patients, researchers, clinicians, and policy makers with opportunities to collaborate in addressing the complex illness management issues that they may face. Targeted interventions have the potential to delay mortality, and decrease morbidity, healthcare costs, and the spread of resistant strains of HIV and potential future infections. HRQOL offers a comprehensive and potentially clinically meaningful outcome measure that is patient-defined (Lorenz, Cunningham, Spritzer, & Hays, 2006).

1.2 MODEL OVERVIEW

The framework chosen for this study to investigate the concept of HRQOL within the context of persons living with HIV and persons living with HIV and liver disease was the model developed by Wilson and Cleary (1995). Wilson and Cleary have conceptualized HRQOL as a multi-dimensional directional model encompassing five components including biological/physiological factors, symptom status, functional status, general health perceptions, and overall perceived quality of life. Each component of the model influences the next, yielding complex relationships that build upon each other to comprise the ultimate outcome of a well-fitted HRQOL model. The components may thereby predict and have the potential to directly influence the individual's overall quality of life (see Figure 1 and approval for use in Appendix B).

As a theoretically-driven study of HRQOL of persons living with HIV and liver disease is not yet available, the components that influence a potentially curable liver disease population, compared to those that influence a population that has had to learn to live with HIV as a chronic

disease, is not well understood (H. S. Wilson, Hutchinson, & Holzemer, 1997). Examination of the components of QOL within the framework of the Wilson and Cleary (1995) model has the potential to bridge the gap between biological/physiological indicators and individual perceptions of their overall quality of life, thereby modeling HRQOL. This theoretical model has been shown to be useful in understanding HRQOL in persons with HIV (see Chapter 2); however, it has not been studied in persons living with HIV and known liver disease.

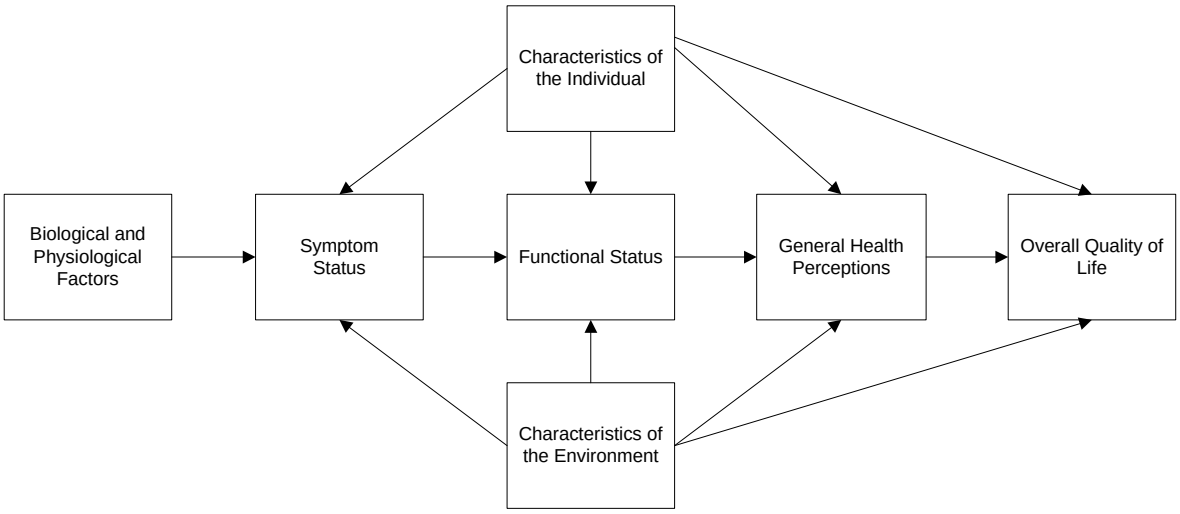


Figure 1. *Wilson and Cleary Model of Health-related Quality of Life*

Permission to include from: Wilson I. B., & Cleary, P. D. (1995). Linking clinical variables with health-related quality of life: A conceptual model of patient outcomes. *JAMA, 273*, 59-65. Copyright 1995, American Medical Association (see correspondence in Appendix B).

1.3 PURPOSE

The purpose of this secondary analysis was to test the fit of the Wilson and Cleary (1995) model of HRQOL in two groups of patients: persons living with HIV without liver disease and persons living with HIV and liver disease. Wilson and Cleary have theorized that HRQOL has five components: biological/physiological factors, symptom status, functional status, general health perceptions, and overall quality of life, and they have proposed a directional model.

1.4 SPECIFIC AIMS AND RESEARCH HYPOTHESIS

1.4.1 Primary Aim

The primary aim was to test the null hypothesis, wherein, the hypothesized model would hold true with the components (biological/physiological factors, symptom status, functional status, general health perceptions, and overall quality of life) in persons living with HIV without liver disease and in persons living with HIV and liver disease. The null hypothesis was that there would be no difference in the model in persons living with HIV without liver disease and in persons living with HIV and liver disease.

1.4.1.1 Primary Aim Research Questions

(1.) Does the Wilson and Cleary (1995) model of HRQOL hold true in persons living with HIV without liver disease?

(2.) Does the Wilson and Cleary (1995) model of HRQOL hold true in persons living with HIV and liver disease (HIV+LD)?

(3.) Is there a difference in the models between persons living with HIV with liver disease and in persons living with HIV+LD?

1.4.2 Secondary Aim

The secondary aim was to test the relationships proposed within Wilson and Cleary's (1995) directional model of HRQOL between biological/physiological factors, symptom status, functional status, general health perceptions, and overall quality of life among persons living with HIV without liver disease and persons living with HIV and liver disease. The hypotheses for the secondary aim were as follows:

1.4.2.1 Secondary Hypothesis 2.1

Biological/physiological factors have a direct effect on symptom status in persons living with HIV without liver disease and in persons living with HIV and liver disease.

1.4.2.2 Secondary Hypothesis 2.2

Symptom status has a direct effect on functional status in persons living with HIV without liver disease and in persons living with HIV and liver disease.

1.4.2.3 Secondary Hypothesis 2.3

Functional status has a direct effect on general health perceptions in persons living with HIV without liver disease and in persons living with HIV and liver disease.

1.4.2.4 Secondary Hypothesis 2.4

General health perceptions has a direct effect on overall quality of life in persons living with HIV without liver disease and in persons living with HIV and liver disease.

1.4.3 Exploratory Aim

The exploratory aim was to identify whether there were different relationships with regard to the characteristics of the individual (age, sex, ethnicity/race, and number of years of education) and the environment (social support and household income) between and among persons living with HIV without liver disease and persons living with HIV and liver disease.

1.5 DEFINITION OF TERMS

1.5.1 HIV

Human immunodeficiency virus (HIV) is an autoimmune disorder for which there is no cure. HIV is a retrovirus that attacks T lymphocytes, which are necessary to maintain immune function in humans. When a person living with HIV has suppressed immunity, he or she has less resistance to infections (McCance & Huether, 2006; Wahren et al., 1987). A history of HIV diagnosis was ascertained by self-reported data from the Co-morbidity Questionnaire, Center for Research in Chronic Disorders (CRCD), University of Pittsburgh School of Nursing (1999).

1.5.2 Liver Disease

For the purposes of this study, liver disease was defined broadly as any liver problem or pathology known to and identified by a person living with HIV, as self-reported on the Co-morbidity Questionnaire, CRCD, University of Pittsburgh School of Nursing, (1999) or recorded in the Medical Record Review (J. A. Erlen, personal communication, February 1, 2006), or Co-morbidity Conditions Problem list (CRCD, 2000). All persons living with HIV who self-reported a "liver problem" were included in the HIV and liver disease group regardless of whether objective medical record data were available. Furthermore, all persons living with HIV who had a liver disease noted in their baseline medical record were included in the liver disease group. Such noted liver diseases included but were not limited to infectious liver diseases, such as hepatitis A, B, or C; steatosis (fatty liver); alcoholic liver disease; cirrhosis; hepatocellular carcinoma; and liver toxicity (see questionnaires/tools in Appendix C).

1.5.3 Biological/Physiological Factors

Wilson and Cleary (1995) have conceptualized biological/physiological factors as any measurable function of the cells or organs of an individual. This component includes other clinical indicators such as measures of change in the function of the cell, organ, or organ system. HIV viral load and CD4 counts were the biological and physiological factors that were assessed. HIV viral load is the amount of HIV virus that is measurable in the peripheral blood stream of an individual. HIV viral load was reported categorically as detectable or undetectable (below laboratory norms for analysis). The retrovirus HIV suppresses the immunity of its host by attacking the CD4 T lymphocytes, which are necessary for immune response. The HIV targets

the CD4 receptor located on lymphocytes. Lymphocytes are white blood cells that help to fight viral infections. Indirectly, CD4 counts indicate the level of HIV disease progression (Strathdee, O'Shaughnessy, Montaner, & Schechter, 1996). Lower CD4 counts indicate a possible inability of the host to fight infections, thereby providing a proxy measure of immune status (Lauer & Walker, 2001; McCance & Huether, 2006). HIV viral load and CD4 count were ascertained from self-reported and medical record review data.

1.5.4 Symptom Status

Symptom status was described theoretically as any psychophysical, emotional, or cognitive state that influences the individual (Wilson & Cleary, 1995). Often depressive symptoms and mental health are included in this definition. Symptom status was operationally assessed using each subject's Beck Depression Inventory II (BDI-II) score and the Medical Outcomes Study HIV Health Survey (MOS-HIV) mental function summary score (Wu, Revicki, Jacobson, & Malitz, 1997). The BDI-II (Beck, Steer, & Brown, 1996) measured the emotional component specific to depressive symptoms. The MOS-HIV (Wu, Revicki et al., 1997) mental function summary score measured self-reported mental well-being more broadly, as it includes mental health, health distress, and cognitive function subscales.

1.5.5 Functional Status

Functional status was defined as one's ability to perform specific tasks such as going to work or making and keeping medical appointments (Wilson & Cleary, 1995). Functional status was measured with the MOS-HIV physical function summary score (Wu, Revicki et al., 1997) and

missed clinic appointments during the prior 6 months. The MOS-HIV physical function summary score (Wu, Revicki et al., 1997) was used to report self-perceived functionality. Missed clinic appointments were quantified using self-report or chart review data from the Medical Record Review (J. A. Erlen, personal communication, February 1, 2006) and were categorized as missed or not missed.

1.5.6 General Health Perceptions

General health perceptions were theoretically defined as how individuals perceive their own health, based on integration of biological/physiologic factors, symptom status, and functional status combined with the effect of the particular disease or organ state on the individual (Wilson & Cleary, 1995). General health perceptions were measured by the Perception of Illness Visual Analog Scale (J. A. Erlen, personal communication, February 1, 2006) and the MOS-HIV health transition score, a single item score (Wu, Revicki et al., 1997).

1.5.7 Overall Quality of Life

Theoretically, overall quality of life was described as how satisfied individuals are with all aspects of his or her life (Wilson & Cleary, 1995). Overall quality of life was measured with the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) and a single MOS-HIV item assessing overall HRQOL (Wu, Revicki et al., 1997).

1.5.8 Characteristics of the Individual

Characteristics of the individual were specific descriptors of the person (Wilson & Cleary, 1995). For the purpose of this study, secondary measures assessing the characteristics of the individual included age (measured in years), sex (categorized as male or female), ethnicity/race (categorized as white and non-white and further categorized based on self-report), and number of years of education. All of these characteristics were ascertained from the CRCD Socio-demographic Questionnaire, University of Pittsburgh, School of Nursing (1999) or the Medical Record Review (J. A. Erlen, personal communication, February 1, 2006).

1.5.9 Characteristics of the Environment

The characteristics of the environment theoretically included all of the individual's surroundings, including tangible or intangible available resources (Wilson & Cleary, 1995). An intangible resource that is often associated with health outcomes is social support. Social support was conceptually defined as a structural or functional resource provided by another individual (S. Cohen & Syme, 1985). For the purpose of this study, social support was limited to one measure of subjective and one measure of objective social support. The subjective measure of the extent to which individuals feel that they have interpersonal resources available to them was ascertained from the total score of the Interpersonal Support Evaluation List (ISEL) (S. Cohen, Mermelstein, Kamarck, & Hoberman, 1985). Income, as a potentially tangible supportive influence from an individual's environment, was measured by annual gross household income. Self-reported annual gross income was ascertained from the CRCD Socio-demographic Questionnaire, University of Pittsburgh, School of Nursing (1999).

2.0 LITERATURE REVIEW

This chapter provides an overview of the literature pertaining to quality of life (QOL) and health-related quality of life (HRQOL) in persons with HIV and liver disease and in persons with HIV without liver disease. After initial discussion of QOL and QOL models, this review explores the literature specific to the use of the Wilson and Cleary (1995) model of HRQOL in persons with HIV with or without liver disease. Further relevant literature pertaining to the latent constructs and factor relationships within the Wilson and Cleary model are described. Literature regarding physiological/biological factors and the latent constructs in the model (i.e., symptom status, functional status, general health perceptions, and overall quality of life) are reviewed. Finally, the roles that characteristics of the individual (age, sex, ethnicity/race, and number of years of education) and characteristics of the environment (social support and income) have in regard to the theoretical underpinnings of the Wilson and Cleary (1995) model are described.

2.1 FOUNDATION FOR QUALITY OF LIFE MODELS

The World Health Organization (1996) defines health as not only a state of the absence of illness or disease, but also the positive sense of well-being. The state of perceived health and its effect on the person is termed QOL. Measures for QOL are person-centered with overall perceptions of QOL varying from person-to-person depending on what is important to the particular

individual's existence (Cella, 1992; Murrell & Kenealy, 1999). As individuals with chronic diseases are living longer, the significant effects of illness and health on QOL have suggested to researchers that the term health-related quality of life (HRQOL) may be more appropriate (Corless, Nicholas, & Nokes, 2001). Many HRQOL models include measures that focus on the health status or disease condition of the person (Dalgard, Egeland, Skaug, Vilimas, & Steen, 2004; Hyland & Kenyon, 1992; Sousa, Holzemer, Henry, & Slaughter, 1999; Taillefer, Dupuis, Roberge, & Le May, 2003; Vidrine, Amick, Gritz, & Arduino, 2005; Wettergren, Bjorkholm, Axdorph, & Langius-Eklof, 2004; Wilson & Cleary, 1995).

The phenomenon of QOL is hypothesized to be multidimensional and therefore has several domains (Dew & Simmons, 1990; Hornquist, 1992), including physical, cognitive, psychosocial, and spiritual well-being (Cella, 1994; Clingerman, 2004; Croog, 1990; Cummins, 2005; Dew & Simmons, 1990; Evans, 1994; Felce & Perry, 1995; Hornquist, 1992; Rapkin & Schwartz, 2004; Zhan, 1992). Overall semantic clarity regarding the phenomenon of QOL is lacking. Thus, there is debate over the exact definition of QOL and its domains (Cummins, 2005; Dupuis, Taillefer, Hardy, Pellerin, & LeMay, 2000).

A limitation to findings of studies focused on QOL is that researchers have not always approached QOL using a similar definition of the concept (Brod, Stewart, & Sands, 1999; Horstkotte, 1992; Larsson et al., 1994; Van Dijk, 2000; Viney et al., 1993). Most theorists generally define global QOL as a phenomenon that cannot be directly observed. Rather, they contend that this phenomenon can be examined through the use of conceptual models, conceptual frameworks, or theoretical frameworks (Fawcett, 1999, pp. 91-94).

Currently, there are multiple QOL and HRQOL theories and models; differences exist among disciplines such as the social sciences, nursing, medicine, and economics (Cummins,

2005; Milbrath, 1982; Shye, 1989; H. S. Wilson et al., 1997; Zhan, 1992). Global QOL includes, but is not limited to, satisfaction (general or life); performance; goal attainment; and functioning, well-being, and health (Taillefer et al., 2003). An individual's self-perceived "well-being" is often used as the definition of QOL within a theoretical model (Andrews & Withey, 1976; Becker, 1998; Brod et al., 1999; V. Brown, 1995; Bubolz, Eicher, Evers, & Sontag, 1980; Cantril, 1965; Cella, 1994; Cowan, Graham, & Cochrane, 1992; Evans, 1994; Felce & Perry, 1996; Hornquist, 1992; Kaplan & Anderson, 1996; Nelson, Wiltshire, Hall, Peirson, & Walsh-Bowers, 1995; Ormel, Lindenberg, Steverink, & Vonkorff, 1997; Sarvimaki & Stenbock-Hult, 2000).

There are three primary QOL models. The first, hereafter referred to as the Toronto Model, is socially rooted and defines QOL as the degree to which an individual enjoys and engages in the important possibilities in his or her life (University of Toronto, 2004). A second model, conceptualized by Cella (1994), hereafter referred to as Cella's conceptualization of QOL (1994), is an example of a model that defines QOL in terms of domains of well-being. The final model described by Wilson and Cleary (1995), and hereafter referred to as such, includes the addition of health-related and social factors and defines QOL in terms of the person's perceived health.

2.2 CONCEPTUAL ISSUES

There are three different types of theoretical models used in describing QOL: conceptual models, conceptual frameworks, and theoretical frameworks. Conceptual models are considered to be the least sophisticated of the three aforementioned theoretical models. Conceptual models specify

domains and subcomponents of the concept of QOL, such as functional, social, physical, and emotional (Fawcett, 1999, p. 130). A weakness of conceptual models is the potential lack of clarity as to how the conceptual model actually operates (Cummins, 2005). Conversely, conceptual frameworks are organized in such a way that the nature and direction of the relationships within the model and among the domains are indicated. In contrast, theoretical frameworks offer not only the nature and direction of relationships, but also the structure of components within the hypothesized model (Akinsanya, Crouch, Fletcher, & Cox, 1994). Additional strengths of theoretical frameworks are the added specifications of potential causality. The causal variables measure the processes that ultimately generate the outcome, whereas, the constant or indicator variable is the measured outcome.

2.3 TORONTO AND CELLA QUALITY OF LIFE MODELS

This section examines the Toronto Model (2004) and the Cella (1994) conceptualization of QOL. The subsequent section describes the Wilson and Cleary (1995) model of HRQOL, which focuses primarily on health-related issues and QOL.

The Toronto Model (2004) is socially rooted in personal goal attainment including social and role functions, similar to other QOL models (Becker, 1998; Browne et al., 1994; Campbell, Converse, & Rodgers, 1976; Cella, 1994; Dupuis, Taillefer, Etienne et al., 2000; Felce & Perry, 1995; Gerin, Dazord, Boissel, & Chifflet, 1992; Horstkotte, 1992; Maas, 1991; MacFarlane, Brown, & Bayer, 1989; Milbrath, 1982; Ormel et al., 1997; Shye, 1989; University of Toronto, 2004; Wilson & Cleary, 1995). The Toronto Model (2004) theorizes QOL in terms of three socially rooted domains: being, belonging, and becoming. Being is defined as one who is. The

subcategories of this domain include physical being (physical health, personal hygiene, nutrition, exercise, grooming and clothing, and general physical appearance), psychological being (psychological health and adjustment, cognitions, feelings, self-esteem, self-concept and self-control), and spiritual being (personal values, personal standards of conduct, and spiritual beliefs). The domain of belonging is defined as the connections one has with one's environments. The subcategories of the belonging domain are physical belonging (home, workplace/school, neighborhood, and community), social belonging (intimate others, family, friends, co-workers, neighborhood and community), and community belonging (adequate income, health and social services, employment, educational programs, recreational programs, community events and activities). The third domain is becoming, which is defined as achieving personal goals, hopes, and aspirations. The subcategories included in this domain are practical becoming (domestic activities, paid work, school or volunteer activities, and seeing to health or social needs), leisure becoming (activities that promote relaxation and stress reduction), and growth becoming (activities that promote the maintenance or improvement of knowledge and skills, and adapting to change).

When examining the Toronto Model (2004), an existence of self is necessary to be, belong, and become. That self, or being, is influenced by and influences the other dimensions within a social, physical, and cultural context. Instruments used to measure, the domains of this QOL model may not contain the core of the person's perceived existence. As being is defined as one who is, "being" may not be easily measured if the negative state of what someone is not is not also assessed. It may be easier for the researcher to measure what someone is not; in terms of lack of functional, social, physical, and emotional well-being; but that may be measuring nothing at all if it is not specific to the individual's existence. Although the components that

make up this QOL model are generally accepted within the social sciences, they do not provide clear direction for interventions as the person's current health status is not included. The model does not consider the interaction of the social indicators with medical co-morbidities, such as HIV and liver disease. Furthermore, being, belonging, and becoming are considered to be on a continuum with relationships to each other that are not directional or summative in nature. In other words, one could perceive themselves as fully belonging in a physical, social and community context, but have no sense of their place or purpose in those environments. Therefore, the Toronto Model (2004) lacks sufficient health-related domains to be instructive in research addressing health-related outcomes as a function of or related to QOL.

Cella (1992) describes three basic purposes for assessing QOL in patients (i.e., cancer); "(1) to assess rehabilitation needs, (2) as an endpoint in evaluation of treatment outcome, and (3) as a predictor to future treatment"(Cella, 1992, p. 9). Cella's (1994) conceptualization of QOL focuses on well-being and includes four domains: functional well-being, social well-being, physical well-being, and emotional well-being. Cella (1994) notes that the functional well-being domain of QOL correlates with the physical well-being domain; however they are conceptually and empirically distinct from one another. Although Cella's (1994) conceptualization does not have a causal process, the model does suggest that the domains impact one's subjective QOL. There is no noted indication as to the level of significance or amount of each of the domains that comprise overall QOL. Likewise the linkages between the domains are not specified. An additional limitation to Cella's conceptualization of QOL (1994) is the exclusion of symptom indices and symptom duration measures (see Preliminary Data section in Chapter 4 for results of a pilot study using Cella's (1994) conceptualizatoin of QOL).

The Toronto Model (2004) and Cella's conceptualization of QOL (1994) each have their own inherent strengths. However, both models lack a distinct conceptual framework and the inclusion of health-related factors.

2.4 WILSON AND CLEARY HEALTH-RELATED QUALITY OF LIFE

HIV and liver diseases have been shown to significantly impact individuals' HRQOL. There are multiple interpretations and conceptual frameworks for HRQOL, most of which consider HRQOL to be a multidimensional phenomenon in which the components make up the whole. HRQOL is defined as the state of perceived health and its effect on the person (Chadwick, 1994; Horstkotte, 1992; Hyland & Kenyon, 1992; Kaplan & Anderson, 1996; Levy & Guttman, 1975; Testa & Simonson, 1996; Ware, 1984; Wilson & Cleary, 1995). The Wilson and Cleary (1995) model of HRQOL includes health-related and social factors. As a causal model Wilson and Cleary allows for identification of potential causal factors in the overall HRQOL paradigm. The model links biomedical and social science paradigms; therefore it has the potential to bridge the gap between physiological indicators and patients' perceptions of their overall QOL.

After pilot testing (see Chapter 3) Cella's conceptualization of QOL (1994), the potential for measurement error due to the high correlation of the domains became evident to this researcher (Henderson, Caruthers, & Erlen, 2005). Given the aforementioned limitations of the Toronto Model (2004) and Cella's conceptualization of QOL (1994), this dissertation was shaped by Wilson and Cleary's (1995) model of HRQOL, which focuses on dimensions that culminate in perceived HRQOL (See Figure 1, model overview, and definition of terms in Chapter 1).

2.5 QUALITY OF LIFE MODELS IN HIV AND LIVER DISEASE

Liver disease has been shown to have significant negative effects on an individual's QOL (Foster et al., 1998). The available empiric support measuring QOL in persons with liver disease reports overall QOL or has QOL domain subscale scores. Recent research on QOL in liver disease defines QOL as an outcome (Fleming et al., 2004; Foster et al., 1998; Hickman et al., 2004; Nicholas, Kirksey, Corless, & Kemppainen, 2005; Pojoga et al., 2004); however, the studies are not theory-driven (Fleming et al., 2004; Foster et al., 1998; Hauser et al., 2004; Hickman et al., 2004; Pojoga et al., 2004). For example, Foster et al. (1998) showed that adults with chronic liver disease have impaired physical and social functioning compared to population norms. Although there is literature regarding the effect of liver disease on QOL, fatigue, and depression (Foster et al., 1998), specific recommendations to translate this research into clinical practice have not been made.

The ultimate goal of methodically modeling HRQOL and its domains within the population of those co-infected with HIV and liver disease is to empirically identify those areas of HRQOL that are negatively affected and then to tailor interventions specifically to individuals to aid them toward an improved overall HRQOL. While there has been considerable research with the use of the Wilson and Cleary (1995) model of HRQOL in persons living with HIV, the model has not been used in a sample of persons living with HIV and liver disease. This dissertation addresses this gap in the existing literature.

2.6 RESEARCH EXAMINING THE WILSON AND CLEARY MODEL IN HIV

Wilson and Cleary's (1995) model of HRQOL has been applied to multiple disease processes including HIV/AIDS (Clingerman, 2004; Phaladze et al., 2005; Sousa et al., 1999; Sousa & Kwok, 2006; Vidrine et al., 2005), heart failure (Heo, Moser, Riegel, Hall, & Christman, 2005), gastrointestinal bleeding (Sousa & Williamson, 2003), diabetes (Chia, 2007), and Hodgkin's lymphoma (Wettergren et al., 2004). The use of Wilson and Cleary's (1995) model of HRQOL specifically in persons living with HIV is presented in this section.

One of the first studies to use the Wilson and Cleary (1995) HRQOL model in HIV was preformed by Sousa and colleagues (1999) who tested the model in a sample (N=142) of persons with a diagnosis of AIDS. The authors performed a series of multiple regression analyses with single measures for each of the seven dimensions (biological/physiological factors, symptom status, functional status, general health perceptions, overall QOL, characteristics of the individual, and characteristics of the environment) of the HRQOL model as proposed by Wilson and Cleary (1995). AIDS-specific physiological variables were collected and combined to make a modified acute physiology and chronic health evaluation score that measured the biological/physiological factor. These variables included temperature, heart rate, respiration rate, mean blood pressure, blood urea nitrogen, creatinine, albumin, hematocrit, sodium, glucose, and white blood cell count. Symptom status in the model was measured with the HIV–Problem Checklist (Holzemer, Henry et al., 1999; Holzemer, Henry, Reilly, & Slaughter, 1994). Functional status was measured with the HIV Quality Audit Marker (Holzemer, Henry, Stewart, & Janson-Bjerklie, 1993). General health perceptions (In general your health is…?) and overall QOL (Your QOL during the past 4 weeks has been…?) were measured with separate single item scores from the MOS-30 (A. W. Wu et al., 1991). Characteristics of the individual included age,

sex, and ethnicity, while characteristics of the environment included living arrangements, health insurance status, and employment status. The authors found that 32% of the variability in overall QOL was explained by the total Wilson and Cleary HRQOL model. Symptom status, functional status, and general health perceptions together explained 20% of the variability in the model. The authors noted that the dummy coding of categorical variables may have placed limitations on their analysis because an aggregated path coefficient was replaced with change in R^2 as the categorical variables were entered into the model. Categorical variables are generally not normally distributed nor are the residual terms associated with them. Therefore, standard assumptions of linearity of multiple data points may be biased, making it less likely for researchers to find a significant influence of the dummy coded categorical variable in the analysis (J. Cohen, 2003).

Clingerman (2004) conducted a descriptive study guided by the Wilson and Cleary model in a sample of 78 persons (90% male) living with HIV in a community setting. This cross-sectional study examined three dimensions in the Wilson and Cleary model: functional status (physical activity), social support, and overall QOL. Physical activity was measured with the Physical Activity Questionnaire (Ainsworth et al., 1999; Jones et al., 1999), while social support was measured with the Norbeck Social Support Survey (Norbeck, 1995). Overall QOL was measured with the Medical Outcomes Study HIV Health Survey (MOS-HIV) (Wu, 1996) with the single-item overall QOL score. Standard multiple regression analysis was performed to assess the ability of the independent variables (physical activity and social support) to predict the dependent/outcome variable (HRQOL). Together physical activity (weekly, 30-minute participation in moderate to vigorous activity) and social support (friend support) were significantly related to HRQOL, ($p<.01$), predicting 37% of the variability in HRQOL.

Sousa and Kwok (2006) further tested Wilson and Cleary's (1995) model of HRQOL using patients living with AIDS (*N*=917) from the AIDS Time-Oriented Health Outcomes Study conducted in outpatient clinics in California. In this study, structural equation modeling was used to test the five main concepts (biological/physiological factors, symptom status, functional status, general health perceptions, and overall QOL) in the model. The authors noted that 395 of the 917 patients had available CD4 count data for inclusion of the biological/physiological factor in the data analysis. Symptom status as the higher order general factor was measured with a revision of the Sign and Symptom Checklist for Persons with HIV disease (Holzemer, Henry et al., 1999). The second-order factor structure of symptom status included six HIV-specific symptoms: malaise/fatigue, confusion/distress, fever/chills, and gastrointestinal pain, shortness of breath, and nausea /vomiting. Functional status as the higher order general factor was measured with the Health Assessment Questionnaire-Disability Index (Singh et al., 1991). The second-order factor structure of functional status included eight functional components: activities, reach, grip, eating, dressing, hygiene, walking, and arising. General health perceptions were measured in two ways: (1) the first using a 100 mm visual analog scale that was double-anchored with "very poor health" and "very healthy", and (2) an ordinal scale that reversed the scoring of the anchors, with 1 being "excellent" and 5 being "poor." The two items were then standardized into the same scale. Overall QOL as a higher order general factor was derived by combining two specific second-order factors including mental health and health worry (Sousa & Chen, 2003). The results of the study showed that Wilson and Cleary's (1995) model of HRQOL fit the data, with each of the relationships between the higher order general factors being significant ($p<0.05$). The authors were able to specify an alternative model that linked symptom

status directly to general health perceptions and overall QOL. Alternative models have been generated to identify better fitting models that are more parsimonious.

Vidrine and colleagues (2005) tested a modified Wilson and Cleary (1995) model in a sample of 348 outpatients living with HIV in south central United States. In this cross-sectional descriptive study, four of the five factors in the model were operationalized as follows: biological/physiological factors by self-reported nadir CD4 count, symptom status by the New England Medical Center pain scale (Rogers, Wittink, Wagner, Cynn, & Carr, 2000), functional status by the Household and Leisure Time Activities Questionnaire (Vidrine, Amick, Gritz, & Arduino, 2004), and overall QOL by the MOS 12-item short form health survey (Ware, Kosinski, & Keller, 1996). The characteristics of the individual included socioeconomic status that was measured by two educational variables (years of education and educational attainment) and one occupational variable (a six-item ordinal hierarchy of occupational functionality as defined by the 1970 United States Census Bureau). The authors' model modifications were theoretically influenced by Brenner, Curbow, and Legro (1995) to include the additional variable of individual risk behaviors to the Wilson and Cleary (1995) model of HRQOL. These individual risk behaviors included smoking status (mean number of cigarettes/day), alcohol use (mean number of drinks/day), and illicit drug use (total number of uses in the past month). Using structural equation modeling (SEM), the authors simultaneously tested all of the causal relationships among the factors that comprise HRQOL. The analysis conducted with LISREL 8.54 included descriptive statistics, correlations, SEM, direct and indirect effects, squared multiple correlation, root mean square error of approximation, and full information maximum likelihood estimations. The researchers found that the conceptualized adapted model was

supported and well fitted, χ^2 (44) = 57.62, p=0.08, though the behavioral variables were highly correlated between .94 and .99 and may have yielded some measurement error.

A descriptive, cross-sectional study conducted in 2002 in sub-Saharan Africa tested the Wilson and Cleary (1995) model in a sample of 743 persons (39% male) living with HIV (Phaladze et al., 2005). Data were collected via a self-report instrument that was administered in face-to-face interviews. Biological/physiological factors were measured by self-report of presence of any co-morbid conditions and a history of an AIDS diagnosis. Symptom status was measured as the number of current daily symptoms and symptom intensity using the Revised Sign and Symptom Checklist for persons with HIV disease (Holzemer, Hudson, Kirksey, Hamilton, & Bakken, 2001). Functional status was measured in three ways: the HIV/AIDS-Targeted QOL tool (Holmes & Shea, 1997, 1999), subjective reports of spending more than 80% of the day in bed, and history of receiving home health visits. Separate subscales of the HIV/AIDS-Targeted QOL Tool (Holmes & Shea, 1997, 1999) were used to measure general health perceptions (health worries subscale) and overall QOL (life satisfaction subscale). The analysis included separate stepwise multiple regressions to identify significant predictors in the model when each measure was entered according to the proximal-distal or a left-to-right organized Wilson and Cleary (1995) model (see Figure 1 in Chapter 1). The model explained 53% of the variance in overall QOL, with over 30% uniquely derived from reported functional status. An additional 10% of the variance was attributed to financial worries as a measured characteristic of the environment in the model. An interesting finding in this study was that the average number of daily symptoms reported was over 17; however, when functional status was entered into the regression model (B=-.432, r^2=.492), symptom status was no longer significant (B=-.028, r^2=.186). This finding may be due to a potential measurement issue in that the two

variables may have been a measuring similar phenomenon, thus over-saturating the regression model. This over-saturation of variables may imply that the symptom and functional status variables were measuring similar constructs, not that functional status overrode symptom status, but that there was no unique contribution of functional status when symptom status was already significant in the model.

In summary, the Wilson and Cleary (1995) model of HRQOL has been shown to be useful in modeling the multiple domains of HRQOL in individuals living with HIV. The aforementioned studies used different measures and various samples across a variety of settings, but in each study the model was found to be well-fitted to the data (see Table 1).

Table 1. *Measures and Outcomes for Components of the Wilson and Cleary Model for Studies Involving the HIV Population*

Author (Year) Sample	Biological/ Physiological Factors	Symptom Status	Functional Status	General Health Perceptions	Overall Quality of Life
Clingerman (2004) N=78	n/a	n/a	Physical Activity Questionnaire	n/a	MOS-HIV; R^2 = 37%
Phaladze et al. (2005) N=743	Co-morbidity; AIDS diagnosis	Symptom intensity; Total number of symptoms-Revised Sign and Symptom Checklist for Persons with HIV Disease	HIV/AIDS-Targeted Quality of Life – overall function; Bed time; Received home visits	HIV/AIDS-Targeted Quality of Life-Health worries	HIV/ AIDS-Targeted Quality of Life- Life satisfaction; R^2 = 53%
Sousa, Holzemer, Henry, & Slaughter (1999) N=142	Acute physiology & chronic health evaluation	HIV Symptom Checklist	HIV Quality Audit Marker	MOS-SF-30	MOS-SF-30; R^2 = 32%
Sousa & Kwok (2006) N=917	CD4	Sign and Symptom Checklist for Persons with HIV	Amended Health Assessment Questionnaire Disability Index	Visual Analog health perception scale	Mental health question & health worry question; RMSEA=.075
Vidrine, Amick, Gritz, & Arduino (2005) N=348	CD4	New England Medical Center Pain Scale	Household and Leisure Time Activities	n/a	MOS SF-12 mental and physical summary scores; RMSEA=.03

Note. n/a = not applicable, R^2 = Percent in regression model, MOS-HIV= Medical Outcomes Study HIV Health Survey, MOS-SF-30= Medical Outcomes Study-Short Form 30 item, RMSEA = root mean-square error of approximation.

2.7 FACTORS INFLUENCING HRQOL

Each of the components in the Wilson and Cleary model (biological/physiological factors, symptom status, functional status, general health perceptions, and overall QOL, see Figure 1 in Chapter 1) have been addressed separately in numerous studies. To the extent that these studies were relevant to HIV and liver disease and to the operationalized Wilson and Cleary (1995) model of HRQOL (Figure 2) that provided the basis for this dissertation, they were reviewed.

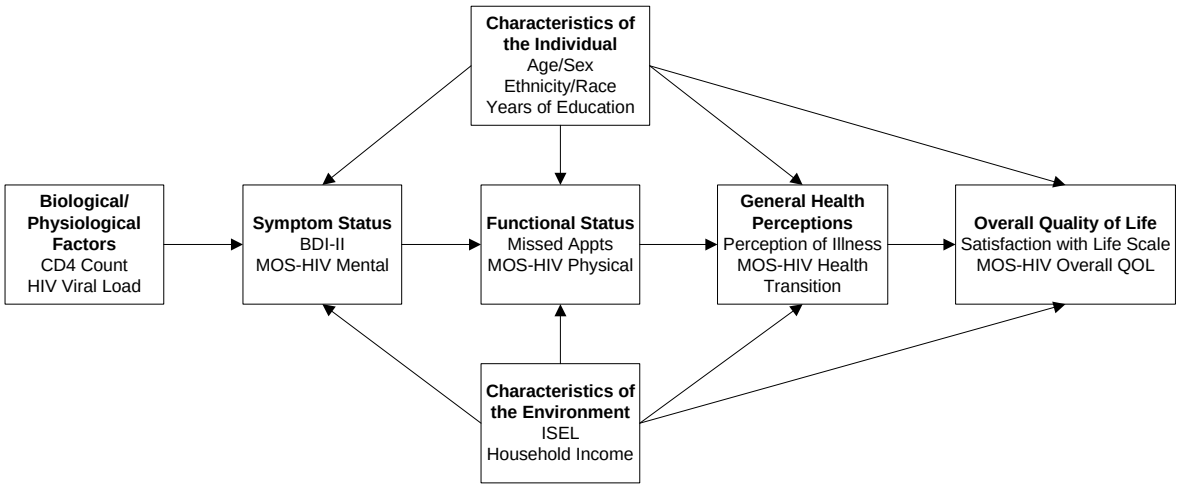


Figure 2. *Operationalized Wilson and Cleary Model*

Modified from: Wilson, I. B. & Cleary, P. D. (1995). Linking clinical variables with health-related quality of life: A conceptual model of patient outcomes. *JAMA 273*, 59-63. Copyright 1995, American Medical Association.

2.7.1 Relationship between Biological/Physiological Factors and Symptom Status

According to the Wilson and Cleary (1995) Model of HRQOL, biological/physiological factors are hypothesized to have a direct effect on symptom status. Biological/physiological factors often include a measurable function of the cells or organs of an individual. These components include other clinical indicators such as measures of change in function of the cell, organ, or organ system. Symptom status is described theoretically as any psychophysical, emotional, or cognitive state that influences the individual. Often depressive symptoms and mental health are included in this definition. The following is a review of the empirical support for the relationship between biological/physiological factors and symptom status.

2.7.1.1 Results from HIV Studies

In persons living with HIV, clinically meaningful biological/physiological factors that serve as indicators of disease status have been HIV viral load and CD4 count. Holzemer, Corless, and colleagues (1999) found continuous measures of CD4 counts to predict HRQOL in persons living with HIV using the Wilson and Cleary (1995) model. The sample (*N*=420) included persons living with HIV (80% male) from seven cities around the United States. The participants' mean CD4 count was 321 mm^3, and those with lower CD4 counts and higher viral loads were likely to have more depressive symptoms and miss more medical appointments than those with higher CD4 counts and lower viral loads.

Numerous investigators have found relationships between biological/physiological factors (CD4 count, HIV viral load) and HRQOL using different measures of HRQOL and different analytic approaches. A prospective, Italian cohort study by Murri and colleagues (2003) included 809 persons (68% male) with HIV who were taking highly active antiretroviral

therapy. Data were collected at baseline and six months. HRQOL was measured with the MOS-HIV Health Survey (A. W. Wu, 1996) physical and mental health summary scores (Revicki, Sorenson, & Wu, 1998). Fifteen possible symptoms were scored by an investigator-generated symptom tool that queried severity of symptoms in the preceding four weeks. A backward sequential logistic regression model was used with an alpha of .05 set for inclusion in the analysis. The MOS-HIV physical and mental summary scales were initially scored with the standardized algorithm (Revicki et al., 1998), then further dichotomized into high and low groups, thus enabling the logistic regression analysis. Baseline variables included age, gender, stage of HIV disease, mode of HIV transmission, CD4 count and HIV viral load, type of HIV medication, physical and mental health summary scores, symptom score, hospitalization history within past 3 months, education, monthly income, and employment status. The authors found that CD4 counts and symptoms were independently related to the MOS-HIV physical function composite score. Additionally, the symptom score was highly negatively related to the mental health summary score, such that the more symptoms a person reported the lower the mental health summary score. Thus, in this study there was a significant relationship between biological/physiological factors and symptom status as hypothesized in Wilson and Cleary (1995) model of HRQOL.

2.7.1.2 Results from HIV and Liver Disease Studies

The biologic/physiologic co-morbidity of liver disease, liver toxicity, and/or hepatitis has direct impact on the synthetic function of the liver. When the liver's basic function of signaling bone marrow to produce red blood cells is compromised, many systems of the human body are in turn also affected. That is, when the liver is inflamed, it is unable to filter out toxins from the blood and keep the body in homeostatis (McCance & Huether, 2006). Additionally, when the liver is

not functioning properly, HIV medications can have augmented toxic effects at a relatively low dose (Monto et al., 2002; Shiffman, 1998; Tedaldi et al., 2003). Hepatitis A, B, and C are viral infections that attack the liver, causing inflammation as the body attempts to fight the infection; proliferative changes ensue (Lauer & Walker, 2001; McCance & Huether, 2006). Individuals with liver disease can be asymptomatic or have mild symptoms. Serum laboratory values may indicate altered liver transaminases. Synthetic function can be abnormal or normal, yielding altered blood coagulation, hemoglobin and hematocrit, and albumin and iron values. Clinically the liver may be palpable and tender; ascites may be present. Jaundice with altered bilirubin values may occur with acute or severe chronic liver infections or liver toxicity. Many persons with liver disease have no symptoms. They do not present for treatment until they are in fulminate liver failure or cirrhosis; at this point prognosis is poor (Lauer & Walker, 2001).

Other biologic/physiologic influences on HIV and liver disease progression are obesity and visceral adiposity (Hickman et al., 2004; NIH, 2002; Ortiz et al., 2002). Obesity can result in non-alcohol fatty liver disease, which can lead to liver fibrosis without the co-morbidities of HIV or liver disease being superimposed to potentially further damage the liver (Ortiz et al., 2002). Additionally, drug metabolism can be altered due to increased weight. Safe weight-based guidelines are not in place for individuals greater than certain weights (NIH, 2002). Hickman and colleagues (2004) found that overweight patients with chronic liver disease who had engaged in physical activity and had a modest weight loss experienced sustained improvements in alanine aminotransferase, fasting insulin, and QOL. In contrast, interferon treatment can impact the nutritional status of patients by making them have a decreased appetite, thereby contributing to weight loss, anemia, and fatigue (Hickman et al., 2004).

A significant potential influence on negative liver-related outcomes is the amount of alcohol consumption. A daily intake of more than 50 grams of alcohol yields significant differences of liver fibrosis upon biopsy. The risk for liver cirrhosis and altered synthetic liver function increases with consumption of greater than 60 grams of alcohol per day in men and 40 grams per day in women (Herrine, 2002). Alcohol intake and hepatitis C viral load are inversely related to responsiveness to interferon therapy.

There are limited reports addressing individuals with HIV and liver disease that link biological/physiological factors with symptom status. However, there is evidence that biologic/physiologic factors have little influence on symptom status among individuals with liver disease. For example, Hauser et al. (2004) conducted a study in Germany using a sample of patients (*N*=204) with various stages of liver disease. These researchers examined the effect of chronic liver diseases on HRQOL by using the socio-demographic questionnaire of the Competence Network Bowel Disease, morbidity list of the German Pain Questionnaire, the German version of the Hospital Anxiety and Depression Scale, and the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) as generic HRQOL instruments; they used the German version of the Chronic Liver Disease Questionnaire (CLDQ) as a disorder-specific HRQOL-instrument. Their findings showed that active medical and psychiatric co-morbidities (including depression) and not the severity of biological/physiological factors of liver disease corresponded with decreased HRQOL (Hauser et al., 2004). Therefore this study of patients with liver disease demonstrated that biological/physiological factors were not predictive of symptom status as hypothesized by the Wilson and Cleary (1995) model of HRQOL. However symptom status as measured by self-reported depressive symptoms did predict overall QOL.

2.7.2 Relationship between Symptom Status and Functional Status

According to the Wilson and Cleary (1995) Model of HRQOL symptom status is hypothesized to have a direct effect on functional status. Symptom status is described theoretically as any psychophysical, emotional, or cognitive state that influences the individual. Often depressive symptoms and mental health are included in this definition. Functional status is defined as an individual's functional capacity to carry out social roles like attending school or work and maintaining relationships. Functional status includes physical abilities to perform tasks such as activities of daily living and the ability to attend medical appointments. The following studies provide empirical support for the relationship between symptom status and functional status.

Depression is classified by the DSM IV criteria as a Major Depressive Disorder if one is down, sad, or blue everyday for two weeks (First, Frances, & Pincus, 2002). Additionally, if an individual has four or more symptoms associated with depression including, but not limited to, change in appetite, sleep disturbances, decreased energy, altered concentration, altered self-motivation, and motor affects, then a depression classification is warranted (First et al., 2002). The BDI-II (Beck et al., 1996) and the Center for Epidemiologic Studies-Depression Scale (Radloff, 1977) are the most commonly used instruments to assess for depressive symptoms in persons living with HIV. Several researchers have reported between 30-50% of persons living with HIV to have significant depressive symptoms (see Table 2) as assessed with the BDI-II (Gibbie et al., 2006; Judd et al., 2005; S. C. Kalichman, Rompa, & Cage, 2000; Weiser et al., 2006).

Table 2. *Use of the BDI-II to Assess Depressive Symptoms in Persons Living with HIV*

Author	Year	Sample size	Sample Description	Findings
Gibbie et al.	(2006)	N=129	HIV + 95% male, 18 years and older, able to read and write, receiving HAART.	34.8% scored ≥ 14 on the BDI, suggestive of depressive symptoms.
Hinkin, van Gorp, Satz, Weisman, Thommes, & Buckingham	(1992)	N=54	HIV + mostly symptomatic homosexual/bisexual males aged 20-60	Depression as determined by BDI does not necessarily lead to a decrease in neuropsychological function.
Judd, Mijch, McCausland, & Cockram,	(1997)	N=192	HIV + outpatient treatment facility	95 patients resulted in ≥ 14 on the BDI, and of these 33% were identified as having a depressive disorder.
Kalichman, Graham, Luke, & Austin	(2002)	N=241	HIV + 163 men and 78 women not receiving antiretroviral treatment.	Individuals not receiving antiretroviral treatment were 0.9 times more likely to have cognitive depression (a subscale of the BDI-II) than those who were treated after adjusting for ethnicity and education
Kalichman, Rompa, & Cage	(2000)	N=357	HIV +	When assessing depression in patients with AIDS, removing the somatic symptoms from tools such as BDI makes the tool more sensitive.
Weiser, Riley, Ragland, Hammer, Clark, & Bangsberg	(2006)	N=239	HIV + homeless and marginally housed men	134 respondents scored ≥ 14 on the BDI, indicating depressive symptoms.

2.7.2.1 Results from HIV Studies

Symptom status has been linked to functional status in multiple studies involving persons living with HIV (Albert et al., 1995; Anandan, Braveman, Kielhofner, & Forsyth, 2006; Breitbart et al., 1996; Crystal, Fleishman, Hays, Shapiro, & Bozzette, 2000; Henderson, Erlen, Sereika, & Schlenk, 2007; Hudson, Lee, & Portillo, 2003; Hughes, 2004; Murri et al., 2003; Phaladze et al., 2005; Sousa et al., 1999; Sousa & Kwok, 2006; Vidrine et al., 2005; Voss, 2005; Wilson & Cleary, 1995; Wu, Revicki et al., 1997). For example, Sousa and colleagues (1999) found that there was a negative correlation between symptoms and functional status (r=-.34, p<.05) in a sample (N=142) of persons living with an AIDS diagnosis. The more symptoms with greater intensity that were reported as measured by the HIV-Problem Checklist (Holzemer et al., 1994), the lower the self-reported functional self-care ability as measured by the HIV Quality Audit Marker (Holzemer et al., 1993).

There are other similar findings evident in the literature; however, researchers used different measures of symptom status and functional status. For example, Hudson and colleagues (2003) conducted a study of women living with HIV (n=104) that explored fatigue symptoms and functional ability to care for their home and/or family. Symptoms were inversely related to functional status (r=-.24, p=.01), indicating that the more self-reported fatigue the lower the women's perceived ability to care for their home and/or family. Voss et al. (2005) had similar findings in that there was a significant relationship of symptoms of fatigue (p=.006) and depression (p<.0001) toward predicting MOS-HIV physical status. However, the MOS-HIV mental status scores were not significantly related to the fatigue status scores (p=.77) in the sample (N=372) of ethnically diverse persons living with HIV. This could be due in part to

measurement error, as fatigue was measured as a symptom and as a component that cross-loads on both the mental and physical summary scores of the MOS-HIV (Revicki et al., 1998). This lack of correlation is important when considering unique contributions of each variable.

Two other studies (Murri et al., 2003; Powers et al., 2006) examined the relationship of HIV symptoms to physical and mental health summary scores (Revicki et al., 1998) from the MOS-HIV(Wu, 1996). Powers and colleagues (2006) examined the effects of continuous versus long-cycle, structured, intermittent highly active antiretroviral therapy on HRQOL and symptom distress in 46 adults living with HIV who received care at an outpatient clinic associated with the National Institutes of Health. The sample was predominately male (93%); all subjects had undetectable HIV RNA levels in the plasma (less than 50 copies/ml). A repeated measures design was used; the study was not theory-driven. HRQOL was measured with the MOS-HIV, with computation of the subscale scores into two summary scores (physical and mental function). Symptom distress was measured with the Symptom Distress Scale (McCorkle, Cooley, & Shea, 1998; McCorkle & Young, 1978). The questionnaires were completed at baseline and 4, 12, and 40 weeks. The authors used separate mixed ANOVAs for each of the three outcome variables (symptom distress and both physical and mental function summary scores) to assess differences between the two groups of patients over time. The findings showed a significant decline in the mental function summary score for those persons with HIV in the structured, intermittent medication group. There was a significant effect of the aforementioned intervention on the symptom distress score or the physical function summary score over time. The authors attributed the change in mental function summary scores to the medication schedule change in the treatment group. They hypothesized that changing a medication regime to a structured intermittent routine from continuous daily routine may yield a decline in subjectively-reported

mental function. The authors did not consider other potential rationales for the decrease in mental function. For example, intermittent higher dosing of antiretrovirals has been found to be more liver toxic and alterations in liver function have been associated with altered cognitive function in persons living with HIV (Ena, Amador, Benito, Fenoll, & Pasquau, 2003). Although, as previously noted, Murri et al. (2003) used different measures of HIV symptoms than Powers et al. (2006). Murri and colleagues also reported significant ($p<.05$) relationships between high symptom scores and poor physical and mental health status [n =175, OR = 9.60, 95% CI = (6.24-14.77); n =199, OR= 7.02, 95% CI = (4.88-10.09)].

In a sample (N=420) of individuals living with HIV, Holzemer, Corless, and colleagues (1999) reported that higher depression scores are positively related to likelihood of missing HIV clinic appointments. This finding supports the relationship between measures of symptom status and functional status hypothesized in the Wilson and Cleary (1995) Model of HRQOL. Functional status measures by missed clinic appointments have also been linked to symptom status in multiple studies involving persons living with HIV. These studies are listed in Table 3 and indicate the relationship with increased symptom status and decreased functional status. For example, the higher the self-reported depression scores the more likely individuals with HIV were to miss medical appointments (Holzemer, Corless et al., 1999).

Table 3. *Relationship between Symptom Status and Functional Status (Missed Appointments)*

Author	Year	Sample Size	Sample Description	Findings
Aloisi, Arici, Balzano, Noto, Piscopo, Filice et al.	(2002)	*N* = 366	HIV + on retroviral therapy in Italy	Age and current drug use were significantly associated with nonadherence, including missed appointments.
Beach, Keruly, & Moore	(2006)	*N* = 1,743	HIV+	Better provider relationships were significantly related to fewer missed appointments (p<.001)and lower HIV viral loads (p<.001).
Berg, Safren, Mimiaga, Grasso, Boswell, & Mayer	(2005)	*N* = 995	HIV+ in urban community healthcare	Missed appointments were a significant predictor of lower CD4 counts.
Giordano, White, Sajja, Graviss, Arduino, Adu-Oppong et al.	(2003)	*N* = 354	HIV+ entering care in Texas	Missed appointments (OOR=5.85, p < .001), CD4 count ≥ 200cells/uL (OR = 2.50, p =.001), female sex (OR = 2.53, p = .001) were independent predictors of not receiving HAART.
Holzemer, Corless, Nokes, Turner, Brown, Powell-Cope et al.	(1999)	*N* = 420	HIV+, mean age 39, 20% women, 51% white, mean CD4 count 321 mm3.	Higher depression scores were positively related to missed appointments.
Nacher, El Guedj, Vaz, Nasser, Randrianjohany, Alvarez et al.	(2006)	*N* = 1,213	HIV+ in French Guiana	Younger age groups and patients with CD4 counts more than 400/mm^3 were more likely to miss appointments.
Weiser, Riley, Ragland, Hammer, Clark, & Bangsberg	(2006)	*N* = 239	HIV + homeless and marginally housed men	30.1% of patients missed medical appointments within 90 days.

2.7.2.2 Results from HIV and Liver Disease Studies

There are many potential interrelationships between symptom and functional status and HIV and liver disease; however, there is limited evidence describing the relationship between symptom and functional status in this population. The chronic disease symptoms associated with depression (e.g., fatigue, lack of energy or vitality) in persons with HIV and liver disease may be related to liver diseases or altered physiologic function of the liver. In the case of individuals with HIV and liver disease who have symptoms of depression, baseline psychological assessment prior to treatment for hepatitis is recommended (NIH, 2002). Furthermore, the autoimmune features associated with the replication of the infectious liver disease viruses have been documented to include painful disorders like rheumatoid arthritis (RA), cryoglobulinemia, polyarteritis nodosa, anti-phospholipid syndrome, systemic lupus erythematosus, and Sjogren's syndrome. The manifestions in individuals with liver disease may include arthralgias, arthritis, muscular involvement, cutaneous involvement, and peripheral neuropathy (Ramos-Casals, Trejo, Garcia-Carrasco, & Font, 2003). The perceived pain features in persons with liver disease are divided between mental anguish symptoms associated with the depression and pain associated with the disease that alters physical functioning (Ramos-Casals et al., 2003).

Fleming and colleagues (2004) studied the effect of co-infection with HIV and/or Hepatitis C Virus (HCV) on HRQOL. The goal of their study was to evaluate HRQOL in an urban cohort (N=299) of individuals co-infected with HIV and HCV. The authors compared the HRQOL of those with both HIV and HCV (n=136) with the HRQOL of urban individuals with either HIV (n=53) or HCV alone (n=110). Then all three groups were compared to an adjusted

United States sample to compare the differences in HRQOL. The generic SF-36 physical and mental summary scales were used in order to compare with United States normative data for the general population without known HIV or HCV. All three groups had significantly lower physical and mental health summary scores when compared to the general population; however, there was no statistical difference between the co-infected and single virus-infected group scores. In this analysis, HCV, as a form of liver disease, did not have a significant impact on HIV.

Mandatory clinical laboratory reporting of HCV did not begin until 2002 in the United States. HCV was discovered in 1989 and had previously been included in the Non-A, Non-B group of hepatitis. The Fleming and Christiansen study timeline includes data collected between 2000 and 2002, which may have influenced the number of persons recruited who were newly diagnosed with HCV. Additionally, there may have been measurement issues in that the generic SF-36 (Ware, Snow, Kosinski, & Gandek, 1993) that was used for the Fleming and Christiansen study has been adapted for the HIV population with some of the questions reformulated and validated in an HIV-specific SF-tool (A. W. Wu, 1996). The limitation of the smaller sample size in the HIV-only group may be a potential concern for measurement error; the significance of the findings may have been misinterpreted without weighting the scores. The short duration of diagnosis of HCV may have also influenced the results of this study.

The impact of HIV/HCV co-infection on HRQOL is not well understood; the literature is contradictory. The gap in the knowledge is that HCV HRQOL has been described in multiple studies prior to and after treatment for HCV; however, increasing numbers of individuals are co-infected with HIV; have significant depression, co-morbidities, and/or substance abuse; and are often excluded from such clinical trials, thus making their HRQOL unknown. Studies that are

theory-driven and use valid and reliable instruments that measure HRQOL in the co-infected population are needed.

Adults perceive both mental and physical pain as a manifestation of liver disease and treatment side effects. Henderson and colleagues (2006) measured QOL in a chronic liver disease sample (n=80) and found that their decreased QOL scores were more significantly related to mental domains than physical functioning or bodily pain (see Chapter 3). Conversely, a study of emotional distress in patients with infectious liver disease not receiving antiviral therapy by Fontana et al. (2002) found that elevated perceived severity of disease was highly correlated with SF-36 summary scores of mental and physical function (p<.001). Thus, the interrelationship of symptom status with functional status in persons with HIV and liver disease is unclear.

Henderson and colleagues (2006) conducted a cross-sectional secondary data analysis in persons living with HIV and taking highly active antiretroviral therapy as outpatients (see manuscript in Appendix A). The sample (N=215) included 119 persons with HIV and 96 persons with HIV and liver disease. Persons with HIV and liver disease had significantly lower MOS-HIV cognitive function subscale scores (Wu, 1996) than persons with HIV and no known liver disease (Henderson et al., 2006). The factor analysis supported the use of the MOS-HIV as a valid instrument in both the HIV group and the HIV and liver disease group. Two higher order factors were extracted from the ten subscales, including mental and physical factors. Cognitive function loaded highly on the mental function summary score and pain loaded highly on the physical function summary score. Thus, these findings justify that mental function symptoms are separate from ability to physically function and can therefore be operationalized in the Wilson and Cleary (1995) model of HRQOL as such.

Chronic hepatitis and its treatment regimens may directly cause altered cognitive function (Steiner, 2004). Conversely, Cordoba and colleagues (2003) studied mental symptom status and QOL in adults at differing stages of liver disease and found a decrease in QOL without major mental symptoms being noted. The aforementioned studies are limited given the convenience samples and exclusion of those failing the cognitive mental exams used for screening.

In an attempt to address some of the identified limitations, Henderson et al. (2007) conducted a pilot study guided by the Wilson and Cleary (1995) model of HRQOL. The primary aim was to examine the differences between persons with HIV with and without liver disease by assessing the differences between groups in biological/physiological factors, symptom status, functional status, and selected socio-demographic characteristics. The variables in the Wilson and Cleary (1995) model of HRQOL were operationalized as follows: biological/physiologic factors (documented liver disease/HIV viral load/CD4 count), symptom status (Beck Depression Inventory II [BDI-II], Medical Outcomes Survey [MOS-HIV] cognitive subscale), and functional status (missed HIV clinic appointments, MOS-HIV physical subscale). This cross–sectional analysis used baseline data from the parent study (R01 NR04749, Erlen). Analysis included descriptive statistics, correlations, chi-square, independent sample t-tests, and path analysis. The sample included 215 participants with HIV, 44.7% (n=96) with HIV and liver disease, 68% male, and 62% Caucasian. The average age was 40.63$\pm$7.60 years. There was a significant prediction of functional status (missed appointments) by presence of liver disease, $\chi^2(1) = 5.598$, p=.018, exp(B)=1.998, suggesting individuals with documented liver disease were approximately 2 times more likely to report missed clinical appointments. Documented liver disease was related to increased symptom status, as measured by lower self-reported MOS-HIV cognitive scores, z= -2.987, β=-.161, p=.017, and decreased functional status, as measured by the MOS-

HIV physical subscale, z=4.850, β =.364, p<.001. There was a significant indirect relationship between functional status, as measured by self-reported missed appointments, and documented liver disease. There was a significant negative relationship between symptom status, as measured by the MOS-HIV cognitive subscale, and functional status, as measured by the MOS-HIV physical subscale. There were no significant differences between the groups with regard to age, race, or gender. There was no direct path from usual biological/physiological factors (HIV viral load or CD4 count) to symptom status (BDI-II, MOS-HIV cognitive subscale) as conceptualized in the model, regardless of group. Thus, the pilot study supported the relationship between symptom status and functional status, but not between biological/physiological factors and symptom status as hypothesized in the Wilson and Cleary (1995) Model of HRQOL. These findings support the complexities associated with understanding the factors associated with HRQOL in patients with HIV and liver disease. Future research as described herein was needed with a larger, more diverse sample and more focused measures in order to better understand the multifaceted issues that affect individuals with HIV and documented liver disease.

2.7.3 Relationship between Functional Status and General Health Perceptions

Functional status is defined as an individual's functional ability to carry out roles like attending school or work (Wilson & Cleary, 1995). Functional status includes physical abilities to perform tasks such as activities of daily living and ability to attend medical appointments. General health perceptions are theoretically defined as the individual's perception of the state of their own health, based on the integration of biological/physiologic factors, symptom status, and functional status combined with the effect of the particular disease or organ state on the individual. The

following is a review of the empirical support for the relationship between functional status and general health perceptions.

2.7.3.1 Results from HIV Studies

Reynolds et al. (2004) conducted a multi-center study with a sample of individuals living with HIV (N=980). These researchers found that favorable general health perceptions scores were related to lower depression scores (p<.001) and higher functional status (p<.001). Similar findings were reported by Lorenz et al. (2006) in a study of (N=2,867) individuals living with HIV in the United States who participated in the HIV Cost and Services Utilization Study (1997-1998). Decreased HIV health symptoms over-time, as measured by tabulating the number of selected symptoms out of a list of 13 potential HIV symptoms, strongly influenced individuals' general health perceptions (p<.001) and overall QOL (p<.001), as measured by two single-item global questions, after adjusting for demographic and biological/physiological factors. These studies support the relationship between functional status and general health perceptions as hypothesized in the Wilson and Cleary (1995) model of HRQOL.

2.7.3.2 Results from HIV and Liver Disease Studies

A study of emotional distress in patients with infectious liver disease not receiving antiviral therapy by Fontana et al. (2002) revealed that elevated perceived severity of disease was highly correlated with SF-36 summary scores of mental and physical function (p<.001). Given that this is the sole investigation located for this review, the interrelationship of functional status and general health perceptions in persons with HIV and liver disease remains unclear.

2.7.4 Relationship between General Health Perceptions and Overall Quality of Life

General health perceptions are theoretically defined as how individuals perceive their own health, based on the integration of biological/physiologic factors, symptom status, and functional status combined with the effect of the particular disease or organ state on the individual (Wilson & Cleary, 1995). Theoretically, overall QOL is described as how satisfied an individual is with all aspects of his or her life and is a subjective judgment. The following is a review of the empirical support for the relationship between general health perceptions and overall QOL.

2.7.4.1 Results from HIV Studies

In multiple studies among person with HIV, general health perceptions have been measured by the health transition single-item from the MOS-HIV (Wu, Revicki et al., 1997). As previously indicated, studies show a significant relationship between general health perceptions and overall QOL (Clingerman, 2004; Phaladze et al., 2005; Sousa et al., 1999; Wu, Revicki et al., 1997). These studies support the relationship between general health perceptions and overall QOL as hypothesized in the Wilson and Cleary (1995) model of HRQOL; however, the researchers used different measures for general health perceptions and overall QOL (see Table 1 in Chapter 2).

2.7.4.2 Results from HIV and Liver Disease Studies

There are limited studies that address the relationship between general health perceptions and overall QOL in persons with HIV and liver disease. One noted study by Mrus et al. (2006) assessed whether individuals' perception of illness as reflected in health values differed among three groups (N=203): persons with HIV, persons with HIV and HCV, and persons with HCV. The framework for this study was investigator-generated based on the Wilson and Cleary (1995)

model and the authors' prior work (Tsevat, 2000). Perceived health values measures included the standard gamble, time tradeoff, and a health values rating scale (Froberg & Kane, 1989; Torrance, 1986) Additional data were obtained for religiosity, risk attitude, social support (ISEL) (S. Cohen & Syme, 1985), symptom distress, depressive symptoms, health status SF-12 physical and mental summary scores (Ware et al., 1996), self-esteem, spirituality, and demographic and clinical data. Preliminary bivariate analysis with alpha set *a priori* at .10 was conducted, and significant variables were entered into the model. The analysis included backwards elimination modeling, with significant variables ($p<.05$) retained in the final models. The health values rating scale is a computer-assisted, one-question, visual analog scale that asks participants to rate their health state from 0 (death) to 100 (excellent health). The health status rating scale scores were associated significantly with sexual orientation, depressive symptoms, spirituality, and SF-12 physical and mental summary scores and accounted for approximately 61% of the variance in HRQOL. Group membership, defined as infection type, was not significant in the main model. Therefore, there was no significant difference in the perception of illness as reflected in perceived health values among the three groups (HIV, HIV and HCV, or HCV). The model specifications based on the authors' predictions may have been biased by the study's small sample size in that the study may not have been adequately powered for the multi-method analysis.

Bonkovsky and Woolley (1999) found an increase in HRQOL after 24 weeks of interferon treatment for 41 out of 642 patients with liver disease. These 41 individuals had a sustained viral response to interferon treatment. The authors also found that prior to treatment there were statistically significant differences ($p<.001$) in all eight categories of HRQOL, as measured by the SF-36 (Ware et al., 1993), when compared to healthy controls.

2.7.5 Relationship between Characteristics of the Individual and Other Model Concepts

The characteristics of the individual have the potential to influence symptom status, functional status, general health perceptions, and overall QOL according to the Wilson and Cleary (1995) model of HRQOL. Any of the characteristics of the individual (age, sex, ethnicity/race, and education) could potentially influence the model and its components, or any combination of characteristics of the individual (i.e., age and sex).

2.7.5.1 Results from HIV Studies

Age, sex, ethnicity/race, and number of years of education are potential influences on HRQOL of individuals living with HIV. Two recent studies report that younger individuals are more likely to miss HIV medical appointments, as a measure of functional status (Aloisi et al., 2002; Nacher et al., 2006). Women have been reported to be less likely to receive treatment for HIV/AIDS (OR=2.53, p=.001) (Giordano, White, Sajja, Graviss, Arduino, Adu-Oppong et al., 2003).

2.7.5.2 Results from HIV and Liver Disease Studies

Similarly, age, sex, ethnicity/race and number of years of education are potential influences on HRQOL in individuals living with HIV and liver disease. African Americans have the highest prevalence of liver disease in the United States, are poorly represented in clinical trials, are older and weigh more at initiation of treatment. For unknown reasons, African Americans with liver disease have a significantly poorer response to treatment (Howell, Jeffers, & Hoofnagle, 2000). An earlier diagnosis of liver disease has been positively correlated with better health outcomes (Dalgard et al., 2004). Independent associations with co-infection of HIV and liver disease

included low socioeconomic status at the level of poverty, less than 12 years of education, and a history of being separated or divorced (Alter et al., 1999).

2.7.6 Relationship between Characteristics of the Environment and Other Model Concepts

The characteristics of the environment have the potential to influence symptom status, functional status, general health perceptions, and overall QOL according to the Wilson and Cleary (1995) model of HRQOL. Social support and income, as social inequalities, have been shown to have significant relationships with survival and disease progression in persons living with HIV (Dray-Spira & Lert, 2003; McFarland, Chen, Hsu, Schwarcz, & Katz, 2003; Rapkin & Schwartz, 2004).

2.7.6.1 Results from HIV Studies

Social support and household income have been shown to potentially influence HRQOL in persons living with HIV (Clingerman, 2004; Gonzalez et al., 2004; Phaladze et al., 2005; Sousa et al., 1999; Sousa & Kwok, 2006; Sousa & Williamson, 2003; Vidrine et al., 2005, 2004; Wu, Revicki et al., 1997). The aforementioned studies have typically controlled for social support and income as covariates in the analyses.

It has been well established that higher self-reported social support is related to lower self-reported depressive symptoms (S. Cohen & Wills, 1985). Specifically, Gonzalez and colleagues (2004) found in a sample of persons (n= 90, 67.8% male) living with HIV in Florida that depressive symptoms, as measured by the BDI, were significantly negatively related to social support (B=-.21, p<.01), as measured by the Social Provisions Scale (Cutrona & Russell, 1985).

In a study conducted in India by Luszczynska, Sarkar, and Knoll (2007), the relationship of social support to positive general health perceptions and physical functioning was assessed in a sample of 104 (63.5% female) persons with HIV. More positive general health perceptions were found if individuals living with HIV found benefit in being infected with HIV and was measured with the Benefits Scale (Antoni et al., 2001). Positive general health perceptions were significantly related to social support (r=.34, p<.001). In the same study, greater self-reported social support was found to be related to better self-reported physical functioning (r=.30, p<.001), as measured by the MOS-SF-20 physical functioning subscale (Wu, Hays, Kelly, Malitz, & Bozzette, 1997).

However, Clingerman (2004), as previously indicated, did not control for social support but rather treated social support as an independent variable. This researcher examined three dimensions of the Wilson and Cleary (1995) model including measures for social support, physical activity, and overall QOL. Clingerman (2004) found that social support, as measured with the Norbeck Social Support Survey (Norbeck, 1995), and physical activity (weekly, 30-minute participation in moderate to vigorous activity) were significantly related to HRQOL, (r=.49, p <.01), predicting 37% of the variability in HRQOL.

Household income is an important characteristic of the environment, as many individuals living with HIV have limited financial resources (Worthington & Krentz, 2005). The Institute of Medicine reports that the majority of persons living with HIV in the United States have personal income levels below $20,000 annually (2001). Worthington and Krentz (2005) found in a Canadian study of 308 (91% male) persons living with HIV that income was a significant independent predictor (p<.05) of HRQOL, as measured with the MOS-HIV mental health and health distress subscales (Wu et al., 1991). This study used the eleven MOS-HIV subscale

scores without collapsing the subscales into summary scores as recommended by Revicki and colleagues (1998).

2.7.6.2 Results from HIV and Liver Disease Studies

Using the MOS-SF-36, Foster et al. (1998) found adults with chronic liver disease to have impaired social and physical functioning compared to population norms (Ware et al., 1993). Patients (*N*=72, 46% male) with liver disease indicated that the symptom of fatigue negatively affected their functional status both socially and physically.

Tsui, Bangsberg, Ragland, Hall, and Riley (2007) studied 216 (17% female) marginally housed or homeless individuals living with HIV in or around San Francisco California, and found the prevalence of co-infection with HCV was 56%, as measured by a positive HCV antibody test and detectable HCV in serum. The researchers found that both the HIV group and HIV with HCV groups had significantly lower self-reported social function, as measured with the MOS-SF-36 social functioning subscale scores, compared to normative US data (Ware, Kosinski, & Gandek, 2004). Furthermore, the HIV group had significantly higher MOS-SF-36 social function subscale scores (*M*=71, *SD*±27) than the HIV with HCV group (*M*= 63, *SD*±29) [$t(214)=2.15$, $p=.03$]. Previous authors have shown that a 3-5 point difference in SF-36 scores is minimally clinically significant and a difference of 10 points indicates moderate clinical significance (Samsa et al., 1999).

2.7.7 Other Possible Relationships

Ferrans, Zerwic, Wilbur, and Larson (2005) proposed a revision of the Wilson and Cleary (1995) model of HRQOL; they eliminated the directional arrows in the model and deleted non-medical

factors. By making the directional arrows bi-directional, the cause and effect or temporal relationships, as hypothesized by Wilson and Cleary (1995), would not exist. This revision may be somewhat controversial, as it has not yet been confirmed. Chia (2007) tested the proposed Ferrans et al. (2005) modification using a structural equation model in a sample of individuals (*N*=321) with type-2 diabetes and hypertension and or/ hyperlipidemia. The researcher found that the Ferrans et al. (2005) modification was only supported after significant model modifications were made to allow for other possible paths not included in the hypothesized model. Other previously mentioned studies (Sousa & Kwok, 2006) have found more parsimonious models for HRQOL. These models include a direct path from symptom status to general health perceptions and overall QOL, providing further support for this relationship set forth in the Wilson and Cleary (1995) model of HRQOL.

2.8 SUMMARY

HIV has clear effects on biological/physiologic indicators, symptom status, functional status, general health perceptions, and overall QOL. However, liver disease has potentially similar but ultimately different effects. The literature is inconsistent in terms of differences in the HRQOL of persons with HIV without liver disease and persons with HIV and liver disease; however, clinically there is a clear difference in prognosis when persons have multiple co-morbidities, especially co-infection with HIV and liver disease. Studies are needed to better evaluate the effects of co-morbidities such as the case with HIV and liver disease on an individual's QOL (Jacobson, Murray, Zellos, & Schwarz, 2002). The aforementioned differences in persons with HIV and persons with liver disease are noted but have not been tested all at one time with a

guiding theoretical framework. As the first goal of Healthy People 2010 is to help individuals of all ages increase life expectancy and improve their HRQOL, the challenge is to be aware of what specific area of the person's HRQOL is being affected. Thus, there is a significant gap in the literature as there are many and varied influences on HRQOL with no clear direction for researchers and clinicians. This study addressed this gap by focusing on the known influential factors on HRQOL as guided by Wilson and Cleary's (1995) model and testing the model in both persons living with HIV and liver disease and in persons living with HIV without liver disease.

3.0 QUALITY OF LIFE PILOT STUDY

Cella's (1994) conceptualization of quality of life (QOL) was empirically tested in a sample (*N*=80) of persons living with HIV and liver disease (HIV+LD) (Henderson et al., 2005). The domains that comprise overall QOL according to Cella (1994) include functional, social, physical and emotional well-being. The purpose of this pilot study was to use previously collected data from a parent study to determine the relationship between the domains (functional, social, physical and emotional well-being) of QOL according to Cella's (1994) conceptualization in a subsample of persons with HIV+LD. As a study using Cella's (1994) conceptualization of QOL (hence forward referred to as Cella's model) in persons with HIV+LD was not yet available, this study assessed the totality of the components that influence a potentially curable population (liver disease) with a population lives with the chronic condition of HIV (Wilson et al., 1997). The goal of measuring QOL and its domains within the population of those co-infected with HIV+LD was to empirically identify those areas of QOL that are most affected and then tailor nursing interventions specific to the individual to assist in improving one's overall QOL.

Cella's model is comprised of four domains (functional, social, physical and emotional well-being). A possible pictorial representation of Cella's model would consist of overlapping circles within the larger circle of QOL (see Figure 3). All domains contribute to overall QOL and are subjective or self-perceived in nature. The domain of functional well-being is defined by

Cella (1994) as the subjective perspective regarding one's ability to perform daily tasks or activities of daily living. This domain could also be related to roles at work, or with family or friends. Specifically, Cella defines this domain as it pertains to "one's personal needs, ambitions, or social role(s)" (Cella, 1994, p. 188). The domain of social well-being is perceived by the individual and encompasses social support, close relations with family or friends, and intimacy. The domain of physical well-being pertains to the individuals' perceptions of their own bodily function, which includes disease symptomomatology, side effects of medication, or general physical well-being. The last domain is emotional well-being. This domain is defined by Cella (1994) as being bipolar with both positive and negative affect relations. This domain could include, but is not limited to, optimism, depression, or anxiety. Overall QOL is defined as one's self perceived overall well-being. The domains of importance that predict overall QOL in one patient population may not necessarily be the same as those of another population.

Cella's (1994) model was chosen to be pilot tested in a subgroup of persons with HIV+LD because it had been previously applied to hepatocellular carcinoma populations. Additonally, Cella's (1994) model had also been applied to other specific diseases including, but not limited to, many cancers (breast, bladder, brain, colorectal, central nervous system, cervical, esophageal, endometrial, head and neck, hepatobiliary, lung, leukemia, lymphoma, ovarian, and prostate), and symptoms (fatigue, anemia, neutropenia, incontinence, lymphedema, and cachexia) (Cella, 2004).

The scope of Cella's (1994) model could be considered large as it may be applied to all persons capable of indicating their personal perceptions. The relational statements within the theory are such that the domains of QOL are the necessary building blocks contributing to the dynamic concept of QOL, thereby allowing the researcher to quantify the relationships of the

constructs to the concept. All domains of QOL within Cella's conceptualization (functional, social, physical, and emotional) make up the person's perceived QOL status. The domains thereby have the potential to directly influence the individual's overall QOL.

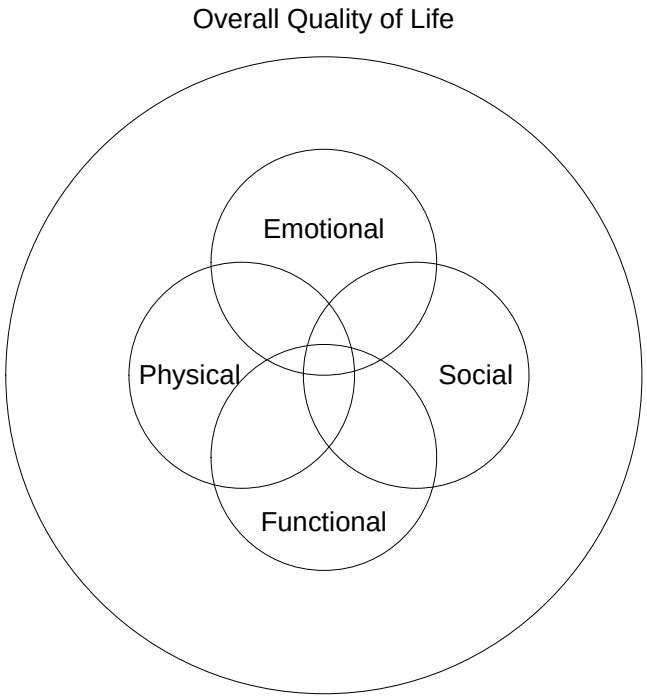


Figure 3. *Interpretation of Cella's (1994) Model*

There are multiple interpretations and conceptual frameworks for QOL (see Chapter 2), most of which consider QOL to be multidimensional phenomenon in which the components make up the whole, similar to Cella's model (1994). QOL measures have been used in many settings and disease processes as noted previously. Being able to quantify QOL outcomes is of great interest to many researchers because it is important to be able to explain whether different treatments or interventions are positively affecting the patient's overall QOL.

3.1.1 Design

This cross-sectional secondary data analysis assessed QOL of persons living with HIV and co-morbid LD who were recruited to a parent study funded by the National Institutes of Health. The parent study (R01 NR04749, PI, J. A. Erlen) was designed to improve medication adherence in persons living with HIV taking highly active antiretroviral medication. The investigator analyzed retrospective data from individuals with HIV who self-reported liver problems; however, the particular liver problem was not always known because those data were not systematically collected as part of the parent study. Exempt Institutional Review Board authorization was gained from the University of Pittsburgh prior to initiation of the study (see Appendix B). Data were extracted by an honest broker and participants' personal health information was de-identified. Data were compiled from baseline data collection before any adherence promoting interventions occurred. Chart review for clinical indicators of liver comorbidities was also performed by the honest broker.

3.1.2 Sample

The inclusion criteria for the parent study were: a diagnosis of HIV and currently being treated with highly active antiretroviral medication, males and females of all races and ethnicities, telephone access, and consent to participate in the parent study. Exclusion criteria included failure on the HIV Dementia Scale (Power, Selnes, Grim, & McArthur, 1995), currently incarcerated, living with someone else already in the study, or not presently administering one's own medications.

The sample for this secondary data analysis included 80 persons with HIV+LD who were predominately male (70%) and Caucasian (63.8%); 48.8% had chronic or permanent hepatitis. The average age was 40.95 $\pm$ 7.03 years; and the average number of years of education was 13.01 $\pm$ 2.77.

3.1.3 Measures

Cella's (1994) model guided this preliminary study. The concepts of the model were operationalized as follows: functional (Medical Outcomes Study HIV Health Survey (MOS-HIV) role function subscale [MOSRF]); social (Interpersonal Support Evaluation List [ISEL]); physical (Symptom Distress Scale [SDS]); and emotional (Beck Depression Inventory II, [BDI II]). Overall QOL was measured by the Ferrans and Powers (1992) Quality of Life Index (QLI).

3.1.4 Functional Well-Being

Functional well-being was measured with the MOS-HIV role function subscale (MOSRF). This tool was used to assess self-perceived functionally. The MOS SF-36 (Ware et al., 1993) has been adapted for use with the HIV population (MOS-HIV). The ordinal level responses to questions vary from answers such as "all the time" to "none of the time" (Wu, Revicki et al., 1997). The 100-item subscale is standardized with a range of scores from 0-100 with higher scores signifying better function. The MOSRF has a Cronbach's alpha of .50 (N=117, HIV). The MOS-HIV subscales have been validated in persons living with HIV+LD (Henderson et al., 2006; Henderson et al., 2007). A detailed description is available in Appendix A.

3.1.5 Social Well-Being

The Interpersonal Support Evaluation List (ISEL) was used to measure social support as an indicator of the social domain of QOL within Cella's model (1994). The ISEL is an ordinal instument that asks participants to subjectively rate the support they receive from others as definitely false (0) to definitely true (3). There are 40 items: 20 true and 20 false. Higher scores equate with higher perceived social support. Cohen, Mermelstein, Kamarck, and Hoberman (1985) report the reliability for the total scale of the ISEL to be a Cronbach's alpha of .88-.90 in a sample of healthy adults (*N*=64) without chronic disorders.

3.1.6 Physical Well-Being

The domain of physical well-being was evaluated in terms of physical symptom distress using the Symptom Distress Scale (SDS), a reliable instrument used to assess 13 particular symptoms in persons living with HIV (Ragsdale & Morrow, 1990). There are five choices on each of the 13 ordinal items, which are ranked 1 to 5 (no distress to severe distress); the higher the score the more distress one is experiencing. Ragsdale and Morrow (1990) report a Cronbach's alpha for the SDS as .92 (*N*=95, HIV patients).

3.1.7 Emotional Well-Being

The Beck Depression Inventory II (BDI-II) (Beck et al., 1996) was used to assess the emotional component of QOL. The BDI-II is a 21-item ordinal tool for which each question has four statements ordered according to depressive symptom severity (maximum score is 63). Higher

scores indicate more depressive symptoms. The BDI-II has a Cronbach's alpha of .92 (*N*=500, psychiatric outpatients) (Beck et al., 1996).

3.1.8 Overall Quality of Life

The Ferrans and Powers (1992) Quality of Life Index (QLI) was used to assess overall QOL. The QLI assesses both importance and satisfaction with life. The total scale of this 66-item ordinal index has been shown to have a Cronbach's alpha of .84 when assessed in the HIV population (Mellors, Riley, & Erlen, 1997).

3.1.9 Analysis

The analysis included descriptive statistics, parametric and non-parametric techniques as appropriate, correlations, and multiple regression tests. Multiple regression analysis measured QOL as the dependent variable and the four measured domains of QOL as potential predictors (see Figure 4). Confirmatory factor analysis was preformed to test the goodness of fit of the data to Cella model (1994). Statistical significance was set *a priori* at .05. SPSS version 13.0 (SPSS Inc., Chicago, Illinois) was used to manage and analyze the data. Confirmatory factor analysis was preformed with EQS software package version 6.1 (Multivariate Software, Inc., Encino, California).

3.1.10 Results

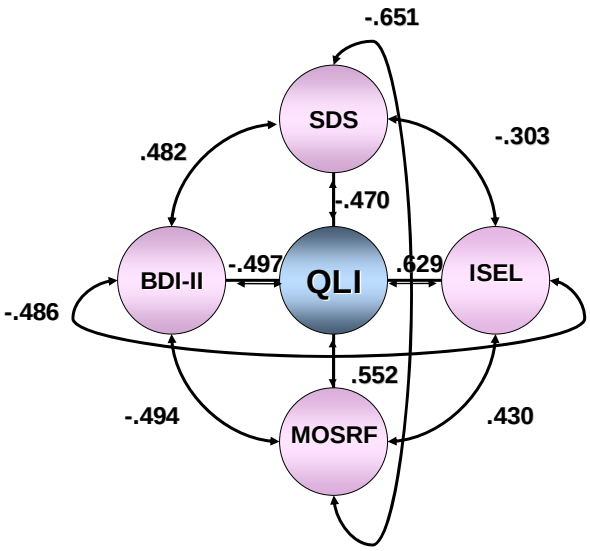
All four domains were moderately associated with correlations ranging from .303 to .651 with appropriate negative correlations with inversely related domains (see Table 4). For example, BDI-II scores were negatively correlated with ISEL scores, in that, the more self-reported depressive symptoms the lower the amount of self-perceived social support. Similarly, higher SDS scores were negatively correlated with MOSRF scores indicating that the higher the self-reported symptoms the lower the self-perceived role function ability (see Figure 4).

Table 4. *Correlational Matrix of Measures.*

Variable	QLI	MOSRF	ISEL	SDS	BDI-II
QLI[a]	1.000				
MOSRF	.552	1.000			
ISEL	.629	.430	1.000		
SDS	-.470	-.651	-.303	1.000	
BDI-II	-.497	-.494	-.486	.482	1.000

Note. QLI[a] = Constant; QLI = Quality of Life Index; MOSRF = Medical Outcomes Survey HIV Role Function Subscale; ISEL = Interpersonal Support Evaluation List; SDS = Symptom Distress Scale; and BDI-II = Beck Depression Inventory II.

Multiple regression analysis with QLI as the dependent measure and the four dimensions as predictors resulted in significant prediction by the emotional, social, and physical domains explaining approximately 50% of the variance of QLI (R^2=.532). Cella's domains were significantly associated with QOL as measured by the QLI: functional (MOSRF), r=.329, p< .01; social (ISEL), r=.636, p<.01; emotional (BDI-II), r=-.549, p<.01; and physical (SDS), r=-.480, p<.01 (See Table 5). However, the functional domain, as measured by the MOSRF subscale made no unique contribution to the regression model.



$R^2 = .53$

Figure 4. *Correlation Model of Operationalized Cella Quality of Life Model*

Relationships of overall QOL as measured by the QLI with functional well-being (MOSRF); social well-being (ISEL); physical well-being (SDS); and emotional well-being (BDI-II); QLI = Quality of Life Index; MOSRF = Medical Outcomes Survey HIV Role Function Subscale; ISEL = Interpersonal Support Evaluation List; SDS = Symptom Distress Scale; and BDI-II = Beck Depression Inventory II.

Table 5. *Regression Analysis Summary for Measures Predicting Quality of Life (N=80)*

Measure	*B*	SE *B*	*p*	partial r^2
QLI[a]	14.450	4.30	.001	-
MOSRF	.440	.63	.490	.003
ISEL	.125	.03	.001	.161
SDS	-.170	.08	.040	.028
BDI-II	-.140	.07	.040	.028

Note. R^2 = .53. QLI[a] = Constant; QLI= Quality of Life Index; MOSRF = Medical Outcomes Survey HIV Role Function Subscale; ISEL = Interpersonal Support Evaluation List; SDS = Symptom Distress Scale; and BDI-II = Beck Depression Inventory II.

The description of Cella's conceptualization of QOL (1994) suggests a second order factor called QOL which underlies the sub-domains (well-being domains). Multiple regression analyses performed in the pilot study demonstrated predictive validity in that the sub-domains predicting QOL suggested that the use of the QLI was valid in this sample. However, this analysis did not directly test Cella's hypothesis that all the domains make up the totality of QOL. Therefore, a confirmatory factor analysis was performed based on the correlation among the sub-domains (MOSRF, ISEL, SDS, and BDI-II) all loading on one factor (QOL as measured by the QLI). All 4 factor loadings were significant (see Table 6), ranging in magnitude from .522 to

.829. The overall model fit was good even though the model chi-square was significant, $\chi^2(2)=7.591$, p=.022; CFI=.939, GFI=.956, SRMR=.058. The communalities ranged from .272 for ISEL to .687 for MOSRF. The QOL domain as measured by the QLI had good reliability, Cronbach's alpha =.783.

Table 6. *Confirmatory Factor Analysis*

Measure QLI[a]	Factor loading	*z*-value	*SE*
MOSRF	.829	7.784	.107
ISEL	.522	4.525	.115
SDS	.754	6.972	.108
BDI-II	.643	5.788	.111

Note. $\chi^2(2) = 7.591$, p = .022; CFI = .939, GFI = .956, SRMR = .058. QLI[a] = Constant; QLI= Quality of Life Index; MOSRF = Medical Outcomes Survey HIV Role Function Subscale; ISEL = Interpersonal Support Evaluation List; SDS = Symptom Distress Scale; and BDI-II = Beck Depression Inventory II.

3.1.11 Discussion

The results of this preliminary study supported the Cella Model (1994); however the functional and physical domains were highly correlated in the sample of persons with HIV+LD studied. Interestingly, these findings were similar to results of a study by Wu et al. (1991). Role function weakly correlated with physical function, but did not act as a predictor of overall QOL as measured by the QLI (*N*=80, HIV and liver disorders, Henderson et al., 2004). Self-reported role function, as measured by the MOSRF, was not a predictor of overall QOL, as measured by the QLI. These findings may be due to individuals with HIV+LD viewing themselves as not having a social or working role; possibly these findings may have been moderated by participants' employment status (over 70% were unemployed or disabled). The MOSRF demonstrated a Cronbach's alpha=.50 in this sample, suggesting that this particular tool may not be appropriate for this population or the use of a subscale of the MOS-HIV is not as reliable as using the MOS-HIV summary scales. The results do not, however, refute Cella's model (1994), as he does not speculate on the level of association between the two domains; Cella claims that the domains are related. The findings of this study supported that claim.

The quality of one's life with HIV and liver disease and the perceived roles in one's life or on a daily basis may differ. Functioning on a daily basis may be very different from having a perceived role. Functional well-being is an antecedent to functional status (Fawcett, 1999). Functional status is important because better understanding of the factors that directly affect an individual's ability to function in daily life could guide implicit and explicit supportive care. While Cella's model (1994) did show a good prediction of QOL, functional status dropped out of the regression model.

It is difficult to ascertain what could be done to aid these individuals toward the life they desire if all that is known is that their QOL is decreased. The components that are most important to the individual and their health within these domains may hold the key to potential interventions in the future. Therefore, the next logical step is to use a more sophisticated model that has causal pathways and includes symptoms in order to further assess the phenomenon of QOL within the population of individuals with co-morbid HIV and liver disease. The Wilson and Cleary (1995) model of HRQOL has the potential to bridge the gap between well-being verses health-defined models. Not only is QOL theoretically defined in such a way that it includes health and well-being, but also the directional theoretical framework gives guidance and specification toward potential causation for decreased overall QOL. Ultimately, the Wilson and Cleary (1995) model of HRQOL is a feasible and empirically supported theoretical framework by which to guide research in the HIV area. As individuals living with HIV are more likely to die from their liver disease related complications than from HIV itself, testing the Wilson and Cleary (1995) model of HRQOL is warranted.

3.1.12 Limitations

There are several reasons for why Cella's conceptualization of QOL (1994) did not aid in identifying a point of intervention to improve QOL in persons with HIV+LD. The first reason is a possible measurement error and lack of a causal framework. The second relates to the way the model defines QOL, which is overall "well-being". Physical well-being is an antecedent to physical status and physical status can be highly related to particular health and physical symptoms that go along with chronic conditions. Additionally the retrospective nature of the study with QOL measures that were predetermined and a relatively small sample size limit the

generalizability of these study findings. A more reliable measure of role function is needed to better assess role function in this population. Future research is warranted with potentially different measures of the functional domain.

4.0 METHODS

4.1 RESEARCH DESIGN

4.1.1 Introduction

This secondary data analysis tested the fit of the Wilson and Cleary (1995) model of HRQOL in persons living with HIV without liver disease and persons living with HIV and liver disease. Data from persons living with HIV and liver disease from the parent study (1R01 NR04749, Principal Investigator, J. A. Erlen) were combined with data from persons living with HIV and liver disease who participated in the continuation study (2R01 NR04749, Principal Investigator, J. A. Erlen). These two studies are henceforth referred to as Study 1 and Study 2. The current analysis was a secondary data analysis of the larger parent studies and was a cost-effective and time-efficient means to examine the multiple components of HRQOL and test the relationships in the Wilson and Cleary (1995) model of HRQOL in the two patient populations.

4.1.2 Parent Study Overview

The parent study tested a nurse-delivered, telephone-based, cognitive-behavioral medication adherence intervention designed to improve adherence to antiretroviral therapy in persons living

with HIV (R01 NR04749, Principal Investigator, J. A. Erlen). The primary aim of the parent study was to determine the effect over time of a nurse-delivered telephone adherence intervention compared to usual care on adherence to antiretroviral therapy in persons living with HIV. The secondary aims included testing the relationship between adherence and quality of life and between adherence and clinical response over time. The sample included persons living with HIV who were taking antiretroviral therapy; evidenced no cognitive dysfunction as assessed by the HIV Dementia Scale (Power, Selnes, Grim, & McArthur, 1995) at baseline; were over 18 years of age; spoke English; and lived in the community with telephone access. No one was excluded based on race, gender, or ethnicity. Exclusion criteria included living with someone who was currently in the study, or not presently self-administering medications. The parent study used Teleform™, a Windows-based software program, for automated data entry, processing, and verification of the data. The parent study (*N*=215) began in 1998 and was renewed for an additional five years in 2003, at which time a third arm (individualized adherence intervention) was added. The continuation study enrolled 352 participants.

4.2 SETTING AND SAMPLE

4.2.1 Setting

Parent study participants were recruited from western Pennsylvania and eastern Ohio community hospitals, university-based clinics, and comprehensive HIV care centers, as well as self-referral. The study was conducted by investigators at the University of Pittsburgh. If participants were randomized to an intervention arm, they received telephone-based behavioral interventions

aimed at improving their adherence to antiretroviral therapy plus their usual care. Participants not randomized to interventions received their usual care only. A private conference room at the clinic or university was used for enrollment and baseline and subsequent data collections.

4.2.2 Sample

Inclusion criteria for this secondary data analysis included all persons living with HIV who were eligible based on the aforementioned criteria and consented to participate in the parent study. The total sample of persons living with HIV was divided into those with and without liver disease. Liver disease was confirmed via medical record review or self-report and included but was not limited to hepatitis (A, B, C, other), cirrhosis, steatosis, and hepatocellular carcinoma. The subsample of persons living with HIV and liver disease from the preliminary analysis of the initial parent study sample (N=215) found 45% of the persons living with HIV had liver disease (N=96) of whom 31% were female and 60% were Caucasian (Henderson et al., 2006).

4.3 MEASURES

The assessment of HRQOL and its components were limited to the measures that were used in the parent study. These measures included standardized and disease-specific questionnaires that were deemed to assess components of HRQOL. A minimum of two measures per component were selected. This study operationalized the five main components of the Wilson and Cleary (1995) model of HRQOL as follows: biological/physiological factors (CD4 count, HIV viral load), symptom status (BDI-II, MOS-HIV mental summary scale), functional status (missed

appointments, MOS-HIV physical summary scale), general health perceptions (Perception of Illness, MOS-HIV health transition score), and overall QOL (MOS-HIV Overall QoL, Satisfaction with Life Scale). All measures are included in Appendix C.

4.3.1 Biological/Physiologic Factors

Biological and physiological factors were examined using HIV viral load and CD4 counts. HIV viral load and CD4 counts were collected by self-report and medical record review obtained at baseline. HIV viral load was reported categorically as detectable or undetectable (below laboratory norms for analysis) as suggested by Sousa and Chen (2002). CD4 counts were the number of CD4 cells counted as a continuous measure per milliliter of human blood. The range for CD4 counts was from zero to approximately 1,600. Continuous measures of CD4 cell counts have been shown to predict HRQOL in persons living with HIV by researchers using the Wilson and Cleary model (Holzemer, Corless et al., 1999).

4.3.2 Symptom Status

Symptom status was assessed using the Beck Depression Inventory II (BDI-II) score and the MOS-HIV mental function summary score obtained at baseline. Although some models include anxiety in symptom status, anxiety was not initially assessed in the parent study and therefore was not included. The BDI-II (Beck et al., 1996) was used to reflect the emotional component specific to depressive symptoms that contributed to HRQOL. The BDI-II is a 21-item ordinal tool for which each question has four statements indicative of depressive symptom severity (maximum score is 63). Scores of 14-19 indicate mild depressive symptoms; 20-28 indicate

moderate depression; and 29-63 indicate severe self-reported depressive symptoms. The higher the score, the greater the degree of depressive symptoms (Beck et al., 1996). Previous research has revealed that the BDI-II has a coefficient alpha of .92 (*n*=500, psychiatric outpatients) and .91 (*n*=215, HIV outpatients, 1R01 NR04749, parent study).

The MOS-HIV (Wu, 1996) mental function summary score (Revicki et al., 1998) was used to assess mental well-being. Because the MOS-HIV had not been validated in a persons with HIV and liver disease, an exploratory factor analysis of ten of the eleven total subscales of the MOS-HIV was performed (Henderson et al., 2006). The transititonal item that queries change in mental and physical status is not included in the factor analysis. A two-factor model (mental, physical) was found and corresponded with a national normative HIV study (Revicki et al., 1998). The two-factor solution is presented in Appendix A and describes the factor loading for the two factors. Cronbach's alphas for each of the components that comprised the two summary scores (physical and mental) of the MOS-HIV have generally been reported above .70 (Wu, 1996) and have been shown to predict outcomes and discriminate between HIV groups.

4.3.3 Functional Status

Functional Status was measured with the MOS-HIV (Wu, 1996) physical function summary score and missed clinic appointments. The baseline MOS-HIV (Wu, 1996) physical function summary score was used to report perceived function. The factor loadings for the physical summary score are presented in Appendix A. Missed clinic appointments were quantified using chart review data from the medical record review and were categorized as missed or not missed. This method was previously used as a measure of functional ability to achieve tasks in a sample of persons living with HIV (Holzemer et al., 1999).

4.3.4 General Health Perceptions

General health perceptions was measured by the Perception of Illness Visual Analog Scale (VAS) developed for the parent study by Erlen (J. A. Erlen, personal communication, February 1, 2006) and the MOS-HIV (Wu, 1996) health transition score obtained at baseline. The Perception of Illness VAS is a series of five questions asking participants to place a vertical line through a 100 mm horizontal scale at a point that indicated the extent to which HIV was burdening his or her life. An example of the anchoring points on the horizontal scales is "no effect" to "major effect". After standardizing the coding of the items, higher scores indicated higher perceived burden of HIV disease (J. A. Erlen, personal communication, February 1, 2006). The mean score was used. The MOS-HIV health transition scale is a single-item that asks how much on a scale from one to five HIV has affected one's life; a higher score indicates a poorer view of health (Wu, 1996).

4.3.5 Overall Quality of Life

Overall QOL was measured with the Satisfaction with Life Scale (Diener et al., 1985) and the single MOS-HIV item that measures overall QOL (Wu, 1996) obtained at baseline. The Satisfaction with Life Scale is a series of five questions using a Likert scale ranging from one to seven that asks participants to indicate their level of agreement with positively-referenced life questions. Scores may range from 5-35, with higher scores indicating increased life satisfaction. Internal consistency reliability for this scale in community-dwelling adults has been reported as Cronbach's alpha=.87 and two-month test-retest reliability r=.82 (N=176) (Diener et al., 1985). The overall QOL item from the MOS-HIV tool asks how the participant would rate his or her

overall QOL during the past four weeks. This is a five-point Likert scale question, with responses that range from very good to very bad, and include a neutral midpoint (Wu, 1996). Responses were reverse-coded so that a higher score indicated better perceived QOL.

4.3.6 Characteristics of the Individual

Baseline measures used to assess the characteristics of the individual included age (measured in years), sex (categorized as male or female), ethnicity/race (categorized as white and non-white and further categorized based on self-report), and number of years of education. These data were obtained from the data collected at baseline using the Socio-demographic Questionnaire developed by the CRCD, University of Pittsburgh School of Nursing (1999).

4.3.7 Characteristics of the Environment

The characteristics of the environment were measured by the total score of the Inventory Support Evaluation List (ISEL) (S. Cohen et al., 1985) and annual gross household income, both ascertained at baseline in the parent study. The ISEL is an ordinal instument that asks participants to subjectively rate the support they receive from others as definitely false (0) to definitely true (3). There are 40 items, 20 true and 20 false. Higher scores indicate higher percieved social support. Cohen and colleagues (1985) report an alpha coefficient of .88-.90 for the ISEL. The annual gross household income was collected as self-report data at baseline using the Socio-demographic Questionnaire developed by the CRCD, University of Pittsburgh School of Nursing (1999). Annual gross household income was collected categorically ranging from under $10,000 to greater than $50,000. These instruments are included in Appendix C.

4.4 DATA COLLECTION PROCEDURES

4.4.1 Overview of Data Collection Procedures

The first step in the conduct of this dissertation was to seek approval as an "exempt" study from the Institutional Review Board at the University of Pittsburgh (see Appendix B). Data from the parent study were then extracted and de-identified by the data manager before being used by this researcher for this secondary data analysis. Data were compiled from the baseline data collection and medical record review across the two study cohorts. Then all variable values were extracted and organized in SPSS version 15.0 (SPSS Inc., Chicago, Illinois). Next, this researcher cleaned the data and performed data screening procedures as described in the next section. After organizing and cleaning the data, preliminary analysis was conducted.

In order to identify persons living with HIV and liver disease and persons living with HIV without liver disease, a screening of participants' self-reports of liver disease was extracted from their baseline data from the parent study. For the purposes of this study, liver disease was defined broadly as any liver problem or pathology known to and self-reported by the person living with HIV with the Co-morbidity Questionnaire (CRCD, University of Pittsburgh School of Nursing, 1999) or recorded in their Medical Record Review (CRCD, 2003) or Co-morbidity Conditions Problem list (CRCD, 2000). All persons living with HIV who self-reported a "liver problem" were included in the HIV and liver disease group regardless of available objective medical record data. All persons living with HIV who had a liver disease noted in their baseline medical record were also included in the liver disease group. All others were considered persons living with HIV without liver disease. A trained research assistant confirmed group placement. This researcher, the researcher's mentor, and the parent study's project manager met bi-weekly

to monitor the progress of the study. A statistician with expertise in structural equation modeling was consulted to aid in the formulation of the covariance matrix and to ensure proper model construction. The study's hypotheses were tested as indicated below.

4.5 DATA SCREENING PROCEDURES

The data were screened for missing data, outliers, and normality. The data screening procedures are described below.

4.5.1 Missing Data

The data for this secondary data analysis were screened for missing data. The degree to which the missing data were problematic was assessed by examining the pattern of the missing data within and across variables. There are multiple techniques to deal with missing data depending on the pattern of missingness including listwise deletion, pairwise deletion, mean imputation, and regression imputation. However, in structural equation modeling a deletion or imputation technique is not necessary. A separate procedure estimated the model parameters without imputing data. The full information maximum likelihood (Jamshidian & Bentler, 1999; Yuan & Bentler, 2000) computation based on the log-likelihood function was used; this approach assumes multivariate normality, and produces a model chi-square. If non-parametric methods are warranted due to not meeting the assumptions of multivariate normality then bootstrapping via naïve bootstrap or model-based bootstrapping was used as a re-sampling technique using the sample in place of a population parameter (Bentler & Yuan, 1999).

4.5.2 Univariate and Multivariate Outliers

Preliminary data analysis included computation of means, modes, medians, frequencies, ranges of scores, standard deviations, and tests for normality, as well as the generation of scatter plots to examine influential data points.

4.5.3 Data Screening for Normality, Linearity, and Multi-collinearity

Attempts were made to normalize data with transformation, if indicated. If certain data could not be normalized, then these variables were dichotomized or divided by a constant. For example, CD4 is positively skewed with a standard deviation of approximately 300 in both the HIV without liver disease and HIV with liver disease groups (see Results in Chapter 5). Standard transformations were unable to normalize the data. Therefore, continuous CD4 counts were divided by a constant of 100 and robust SEM measures were used. Exploratory factor analysis scree plots were used to test for factor loadings and factor structures within each measure, as necessary. Correlation matrices were constructed to assess for collinearity diagnostics.

4.6 DATA MANAGEMENT/ANALYSIS

A statistical consultant assisted with developing the plan for the statistical analysis. The parent study used Teleform™ reader to enter data from the instruments (Appendix C). These scanned data were double checked by a trained research assistant. The data were entered into an Oracle™ database. The data manager saved and stored the data. The data files were compiled and stored

until further cleaning and transformation of the data were performed. The data manager reassigned the de-identified data so that the participants could not be identified in this study. The data manager transferred de-identified data to a secure, separate Unix™-based University of Pittsburgh private internet server that was accessible only by the research staff working on the study. SPSS version 15.0 (SPSS Inc., Chicago, Illinois) was used to further manage and analyze the data.

4.7 DESCRIPTIVE STATISTICS

Each variable was examined for its distribution, range, mean, median, mode, and standard deviation. Assessment was done to test for normality specific to the type of variable. For dichotomous variables, frequencies were explored to identify whether cell sizes were relatively equal. Chi-square and the independent-samples *t*-test were used to examine differences between the initial and continuation studies and the two groups: persons living with HIV and liver disease and persons living with HIV without liver disease. Correlations between the variables were analyzed for systematic entry into the SEM. The SEM Wilson and Cleary model (1995) was tested (Figure 5) as well as the step-wise Wilson and Cleary model (Figure 6).

4.8 STRUCTURAL EQUATION MODELING

The primary aim was to test the null hypothesis, wherein the hypothesized model held true with the components (biological/physiological factors, symptom status, functional status, general

health perceptions, and overall QOL) in two groups; persons living with HIV and liver disease and in persons living with HIV without liver disease (i.e., correctly explain the relationship among the variables). A multi-group structural equation modeling (SEM) was used to test the fit of the Wilson and Cleary (1995) model of HRQOL in the two groups. A maximum likelihood estimation method used EQS software package version 6.1 (Multivariate Software, Inc., Encino, California) to perform the statistical analyses (Bentler & Wu, 2002).

SEM analysis is a sophisticated statistical method designed to determine whether specific hypotheses about the nature and interrelationships among underlying factors (or dimensions, often called latent constructs) proposed in the theoretical model are consistent with the observed data collected from the sample (Bentler & Bonett, 1980). Thus, SEM can be used to assess the complex relationships among the components in the Wilson and Cleary (1995) model of HRQOL in a sample of persons living with HIV and liver disease and in persons living with HIV without liver disease. Direct and indirect effects on nonadjacent components in the model were tested with SEM simultaneously (Vidrine et al., 2005). The final analysis of the SEM showed an associated regression coefficient called a model parameter. A path diagram and path analysis was used to represent a model based on a theory and test the secondary aims of the study, which included latent variables or factors (see Figure 6).

The exploratory aim was to identify whether there were different relationships with regard to the characteristics of the individual (age, sex, ethnicity/race, and number of years of education) and the environment (social support and household income) between and among persons living with HIV without liver disease and persons living with HIV and liver disease. This model was more powerful (i.e., the effects of the Wilson and Cleary components were stronger in magnitude) than without covariates. The relevant covariates were determined by

model comparisons and/or LaGranage Multiplier tests. Only relevant covariates were kept in the model for reasons of parsimony. In other words, only covariates that significantly improved the model logically and statistically were included.

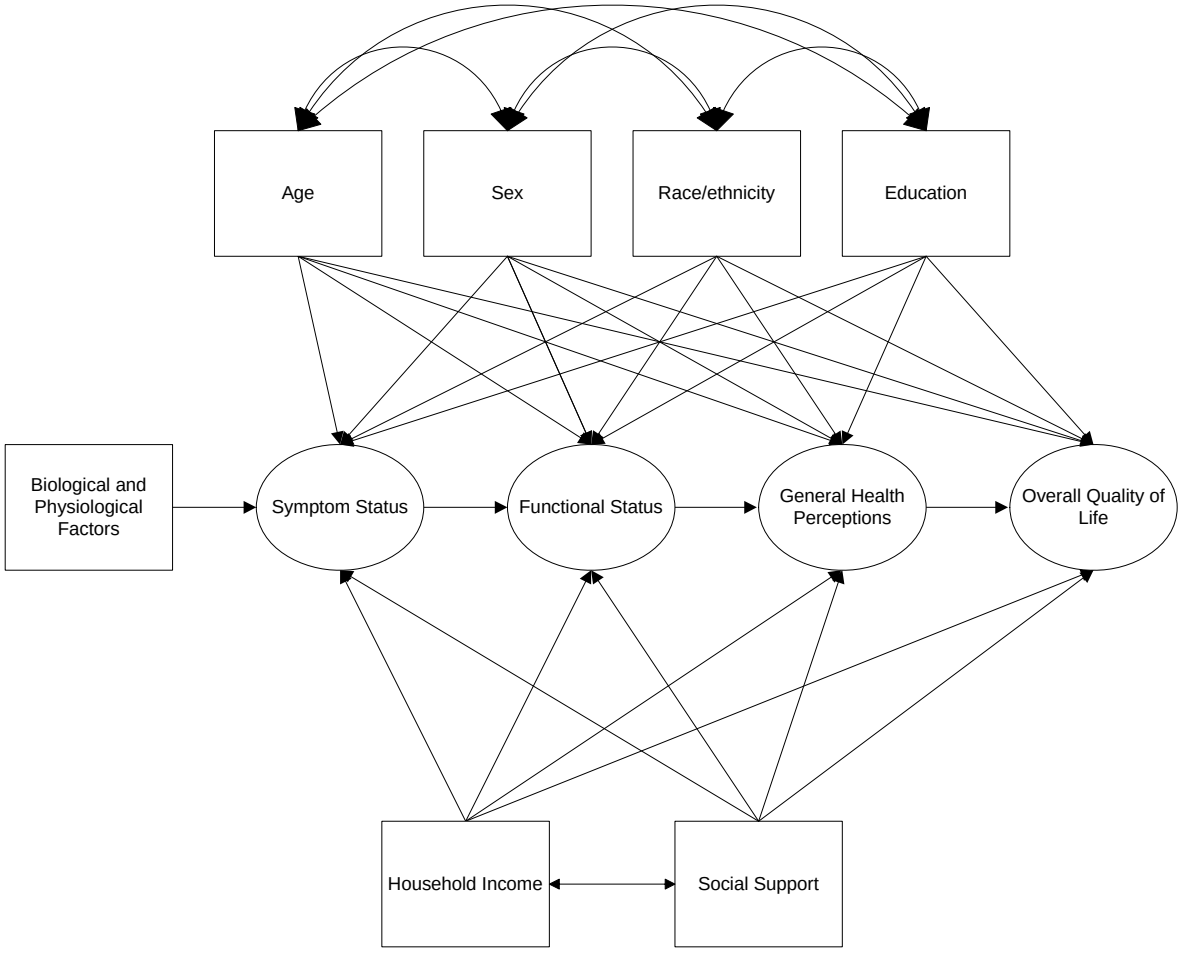


Figure 5. *SEM Operationalized Wilson and Cleary Model*

4.9 PATH MODEL

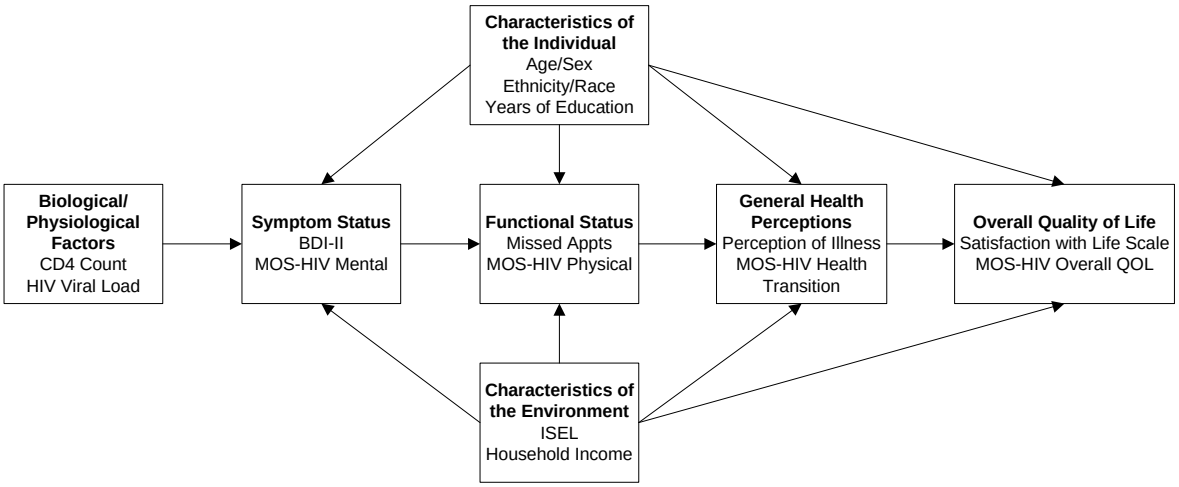


Figure 6. *Operationalized Step-wise Wilson and Cleary (1995) Model of HRQOL*

4.10 MODEL SPECIFICATIONS

For this study the Wilson and Cleary (1995) model of HRQOL was tested *a priori,* as it was theorized by its authors. The model was evaluated using the model chi-square and fit indices. The model chi-square is known to be sensitive to the sample size; it is not recommended for a model evaluation. Instead, fit indices were used, which are like "effect" sizes. There are different classes of fit indices (incremental and absolute). The current recommendation is to use at least 2 different fit indices from two different classes (Hu & Bentler, 1998, 1999). The comparative fit index (CFI) (Bentler, 1990) is an incremental fit index. A model is considered "good" if the value is greater than or equal to .95. The root-mean-square-error-of-approximation (RMSEA) is an absolute fit index (Steiger & Lind, 1980), which measures the amount of error (differences between an observed and a model covariance matrix). A model is considered "good" if the value of RMSEA is less than or equal to .06. Once a "good" model is identified with path coefficients (i.e., the size or strength of the relationship between underlying latent variables) and factor loadings (i.e., the size or strength between scale items and construct to be measured by the items) the overall model is assessed. The model parameters (i.e., factor loadings and path coefficients) are then tested using the *z*-test at alpha equal to .05 (two-tailed). The model specification and results of model testing are described in Chapter 5.

4.11 POWER ANALYSIS

4.11.1 Sample Size Justification:

Study 1 was powered to require a total sample size of approximately 200. For the parent study, the sample size was calculated for those with poor adherence and was estimated to have adequate statistical power (.80) to test for differences in mean adherence between the two treatment groups over time at a significance level of .05. The initial parent study (Study 1) enrolled a total of 215 persons with HIV. Study 1 added a third arm (individualized adherence intervention) and was renewed for an additional 5 years. The continuation study (Study 2) was powered to require a total sample size of 300 participants and enrolled a sample of 352 persons with HIV, with baseline data for the measures included in this dissertation. After removing data from Study 1 on 35 individuals who were also enrolled in Study 2, the overall sample size for this secondary data analysis was 532.

4.11.2 Sample Size

The total number of persons living with HIV and liver disease after combining Study 1 (revised *N*=180) and Study 2 (*N*= 352) was 227 (42.6%) of the overall sample (N=532) with baseline parent study data; demographic findings are reported in Chapter 5. The parent study invited control participants from Study 1 to enroll in Study 2 and be randomized. Thirty-five individuals in Study 1 who did not receive the adherence intervention were enrolled in Study 2. Study 2 baseline data from these individuals was used rather than their Study 1 data. These criteria were

established *a priori* to allow for more recent data regarding liver disease status. The results of the merger of the initial study and the continuation study are described in Chapter 5.

4.11.3 Feasible Sample Size

Given Study 2 recruitment goals and the goals of this dissertation, the estimated sample size for this secondary data analysis was approximately 300, with 150 participants in each of the two groups (persons living with HIV with and without liver disease). The total number of individuals who were available for this study (N=532) exceeded the required number for the planned analysis.

4.11.4 SEM Power Analysis

To estimate necessary sample size in SEM four fit indices were used to compute a noncentrality paramenter. These included the root mean square error of approximation (*RMSEA*), Comparative fit index (*CFI*), Steiger's gamma, and McDonald's Fit Index (K. H. Kim, 2005). A maximum of 66 parameters were estimated to allow all variables to correlate with a total of 12 variables. However, when applying SEM to Wilson and Cleary's (1995) model (see Figure 6), 20 parameters were estimated. (Note that all variables were allowed to correlate and all possible combinations of relationships are not shown in Figure 6) Given the degrees of freedom approximated at 620, power of .80 and alpha equal to .05, the critical noncentrality parameter was 26.13. Given these calculations, a minimum total sample size was 264 participants. Because there were baseline parent study data from over 150 participants in each group, yielding a total sample size of over 300, there was more than adequate power for the analysis.

4.12 AIMS OF THE STUDY

4.12.1 Primary Aim

The primary aim was to test the null hypothesis, wherein, the hypothesized model held true with the components (biological/physiological factors, symptom status, functional status, general health perceptions, and overall quality of life) in persons living with HIV without liver disease and in persons living with HIV with liver disease.

4.12.2 Secondary Aim

The secondary aim was to test the relationships proposed within Wilson and Cleary's directional model of HRQOL between biological/physiological factors, symptom status, functional status, general health perceptions, and overall quality of life among persons living with HIV without liver disease and persons living with HIV and liver disease. The hypotheses for the secondary aim were as follows:

4.12.2.1 Secondary Hypothesis 2.1

Biological/physiological factors have a direct effect on symptom status in persons living with HIV without liver disease and in persons living with HIV and liver disease.

4.12.2.2 Secondary Hypothesis 2.2

Symptom status has a direct effect on functional status in persons living with HIV without liver disease and in persons living with HIV and liver disease.

4.12.2.3 Secondary Hypothesis 2.3

Functional status has a direct effect on general health perceptions in persons living with HIV without liver disease and in persons living with HIV and liver disease.

4.12.2.4 Secondary Hypothesis 2.4

General health perceptions has a direct effect on overall quality of life in persons living with HIV without liver disease and in persons living with HIV and liver disease.

4.12.3 Exploratory Aim

The exploratory aim was to identify whether there were different relationships with regard to the characteristics of the individual (age, gender, ethnicity/race, and number of years of education) and the environment (social support and household income) between and among persons living with HIV without liver disease and persons living with HIV and liver disease.

4.13 PROTECTION OF HUMAN RIGHTS

4.13.1 Human Subjects

This descriptive study met criteria for an exempt study by the Institutional Review Board because it was a secondary data analysis that used data collected at baseline and through medical record review for the parent study. No identifying information was used. For the study no one was excluded on the basis of gender, race, or ethnic background. This study involved the use of existing data/documents/records. Data were provided to the investigator in such a manner that subjects could not be identified directly or through identifiers linked directly to the subjects.

4.13.2 Potential Risks

The potential risk to the parent study participants was minimal. Information about HIV and liver disease status was used; however, to ensure complete anonymity prior to its use by this researcher, the parent study data manager de-identified the data. The data were compliant with the most current guidelines of the Complete Health Insurance Portability and Accountability Act (HIPAA) of 1996; there was no way in which to link health status to any particular participant. No potential physical, psychological, social, legal, or other risks occurred. Prior to the start of the study, approval was obtained from the Institutional Review Board of the University of Pittsburgh.

4.13.3 Protection Against Risk

Fully de-identified, HIPAA-compliant data were accessible only on password-protected computers on a private University of Pittsburgh internet server maintained by trained personnel at the University of Pittsburgh. This researcher completed the University of Pittsburgh education and certification program in research and practice fundamentals and monitored access to the data by ensuring only authorized access to the secure server. Access to the server was password-protected. Any additional records kept by this researcher were double-locked in a file cabinet in the researcher's office.

4.13.4 Inclusion of Women, Minorities, and Children over the Age of 18

The parent study included women, minorities, and children over 18 years of age. The numbers for each subgroup included in this secondary data analysis are reported in Chapter 5.

4.14 LIMITATIONS

There were limitations to this study because it was a secondary analysis of data collected for a larger study. The parent study was not designed to make predictions about a subgroup of persons living with HIV and liver disease. The level of logical rigor in a study is highly dependent upon the level of credibility/validity and dependability/reliability of the measures used within the context of the specified population of persons living with HIV with and without liver

disease. HRQOL measures have been adapted for use in many settings and disease processes; however, several of the selected measures did not have demonstrated reliability and validity in a sample of persons living with HIV and liver disease (e.g., Perception of Illness (J. A. Erlen, personal communication, February 1, 2006) and the Satisfaction with Life Scale (Diener et al., 1985)). Predicting influencing factors on HRQOL is of great interest to researchers and clinicians, but measuring HRQOL at one time point may not be sufficient. There are multiple interpretations and conceptual frameworks for HRQOL (see Chapter 2), most of which consider HRQOL to be a multidimensional phenomenon wherein the components make up the whole.

The significant difference in these conceptualizations is that Wilson and Cleary's (1995) model of HRQOL is a causal directional model that allowed for identification of potential causal factors in the overall HRQOL paradigm. Furthermore, the model links biomedical and social science paradigms and thereby has the potential to bridge the gap between physiological indicators and patient perceptions of overall quality of life in patients living with HIV and liver disease. Testing this model using SEM is only one approach to understanding HRQOL. HRQOL may be a phenomenon in which its predictors are too highly interrelated and thereby over saturate any model. The components of importance that predict overall HRQOL in persons with HIV without liver disease may not necessarily correlate with the perceptions of persons with HIV and liver disease.

5.0 RESULTS

After an initial review of the data sampling procedures, this chapter provides the results of the sample demographic characteristics, reliability of the measures, and results of the primary aim, the four secondary aims, and the exploratory aim. Because this is a secondary data analysis, the number of persons with HIV and HIV and liver disease (HIV+LD) in Study 1 and Study 2 that met criteria for this analysis were not known *a priori.* Therefore, the procedure and results of the inclusion criteria are outlined below.

5.1 PROCEDURES

5.1.1 Determining the Sample

The procedure for determining the overall sample involved multiple steps to merge data from Study 1 and Study 2. The following criteria had to be met prior to combining the two studies. The first criterion involved uniqueness of the participants in both studies. Given the history of the parent study having an initial phase (Study 1) and a continuation phase (Study 2), it was necessary to ensure that each study participant was unique, in that the person was only included in the overall data set one time. Persons living with HIV that participated in Study 1 and were randomized to the control group (i.e., did not receive any intervention in Study 1) were invited to

enroll in Study 2 and be randomized to one of three arms of the study. Baseline data from Study 1 were collected between April of 1999 and October of 2002. Baseline data from Study 2 were collected between March of 2004 and March of 2007. As previously indicated, the *a priori* condition was set in that if persons living with HIV from Study 1 also participated in Study 2 (i.e., they were controls in Study 1), the data from Study 2 would be used rather than the data from Study 1 (see Figure 7). There were 35 individuals who were randomized to the control group in Study 1 and were subsequently enrolled in Study 2. The use of data from these Study 2 participants (*n*=35) reflected more recent liver disease and QOL status. The final overall sample size was 532 persons living with HIV after combining Study 1 (*n*=180) and Study 2 (*n*=352).

In order to differentiate individuals with HIV without liver disease from those individuals with HIV+LD it was necessary to merge identifying liver disease data from four instruments (see Appendix C). In Study 1, determination of liver disease was based first on the Co-Morbidity Conditions Problem List and then on the self-reported Co-morbitidity Questionnaire. In Study 2 the same procedure for identifying persons living with HIV+LD was completed along with two other measures. The first was a liver disease-specific Medical Record Review Addendum A that collected HCV diagnosis, HCV viral load, and HCV genotype. The second was an additional self-reported questionnaire that included history of hepatitis A, B, C or other hepatitis. Positive documented history of liver disease from the medical record review data took priority over self-reported data. If positive history of liver disease from medical record review data was missing, then self-report data were merged into the missing liver disease data field. In other words, any positive history of liver disease, first from objective data (medical record review) and then from subjective data (self-report), was classified as HIV+LD. The classifications of merged co-morbid types of liver diseases are noted in Table 7. All others were classified as HIV. The data merge

was conducted twice: once by hand and then with confirmation by a computer-based merger of data.

Table 7. *Classification of Co-morbid Types of Liver Disease (n=227)*

HIV & Type of Liver Disease	*N*	Cumulative total	Percentage (%)
HIV+ Hepatitis A only	15	15	6.6
HIV + Hepatitis B only	32	47	14.1
HIV + Hepatitis C only	88	135	38.8
HIV + Hepatitis A & B	7	142	3.1
HIV + Hepatitis A & C	1	143	0.4
HIV + Hepatitis B & C	13	156	5.7
HIV + Hepatitis A, B & C	5	161	2.2
HIV + Unknown Hepatitis	52	213	22.9
HIV + Other liver disease	12	225	5.3
HIV + Other liver disease + Hepatitis C	1	226	0.4
HIV + Other liver disease + Hepatitis A, B, & C	1	227	0.4

A new variable was created for liver disease and data were indicator/dummy coded as "0" for no positive liver disease data and "1" for positive liver disease data. After following the aforementioned criteria for discriminating persons with HIV from persons with HIV+LD in the overall sample (*N*=532), the data revealed 305 persons with HIV and no evidence of liver disease (57.3%) and 227 persons with HIV+LD (42.7%) (see Figure 7).

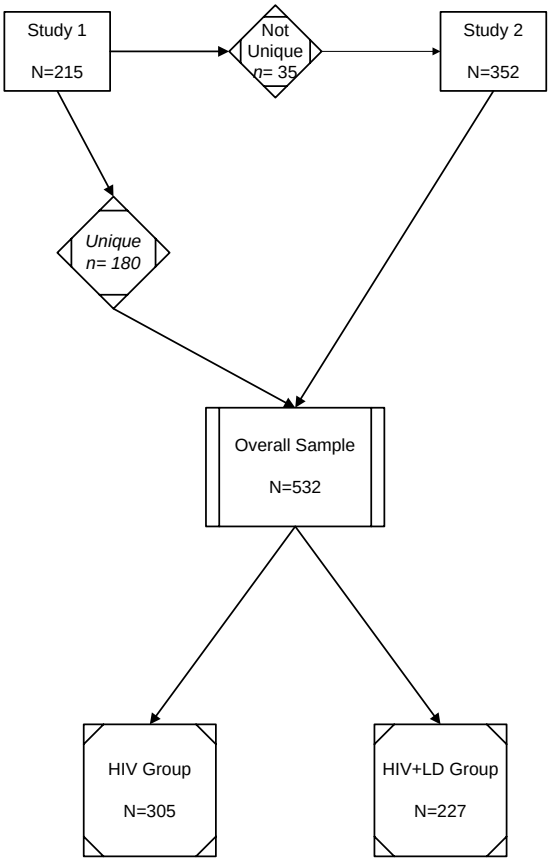


Figure 7. *Overall Study Grouping Algorithm*

Note. LD= liver disease

5.2 DATA EXPLORATION STATISTICS

Exploratory statistical analyses were conducted to screen for missingness, outliers, normality, collinearity and homeoscedasticity. The exploratory statistics for the physiological/biological factors (CD4 count, HIV viral load), symptom status (BDI-II, MOS-HIV mental summary scale), functional status (missed appointments, MOS-HIV physical summary scale), general health perceptions (Perception of Illness, MOS-HIV health transition score), and overall QOL (Satisfaction with Life scale) are reported in Table 8. Significant outliers were found for CD4 count (n=3) and BDI-II total score (n=3). The three CD4 counts that were statistical outliers were also above normal laboratory values (maximum 1612). The three highest BDI-II total scores were 53, 54, and 60. In addition, CD4 count and BDI-II total score were both positively skewed, and Perception of Illness was negatively skewed. Because of the large sample size and the distribution of the data, robust SEM adjusts for these violations of non-normality. Therefore, a maximum likelihood robust regression was performed.

Approximately 13% of the CD4 count and 10% of HIV viral load data were missing. Of the 90% with data coded for CD4 count and HIV viral load more than 70% came from objective medical review data. The remaining CD4 count and HIV viral load data were self-reported. There were detectable HIV viral load levels in approximately 41% of the overall sample. With the exception of biological/physiological data (as noted above), there was less than three percent missing data for the other four primary model variables. Means and standard deviations conformed to expected values for a sample of persons living with HIV (see Table 8). Missed appointments were categorized as missed or not missed, with 33% of the overall sample having

missed clinic appointments. The Perception of Illness was assessed with a visual analogue (0-1) and scores ranged from .06-1.0. The MOS-HIV health transition score and Satisfaction with Life Scale were both measured with Likert scales with average scores of 3.33 and 3.57, respectively.

Table 8. *Data Screening Descriptive Statistics for Measures*

Variable	*N*	Number	Percentage	(%)/*M* (*SD*)	Range	Outliers
Measure		Missing	Missing			
Biological/Physiological Factors						
CD4 count	459	71	13.4	455.94 (303.97)	44-1540	3
HIV Viral Load Detectable	484	49	9.2	(41.1)	n/a	0
Symptom Status						
Beck Depression Inventory-II	524	6	1.1	14.92 (11.54)	.0-52.0	3
MOS-HIV Mental Summary Score	519	11	2.1	45.45 (12.08)	10.38-67.78	0
Functional Status						
Missed Appointments-yes	522	11	2.1	(33.0)	n/a	0
MOS-HIV Physical Summary Score	519	11	2.1	41.83 (11.60)	14.65-63.37	0
General Health Perceptions						
Perception of Illness	523	7	1.3	0.74 (.18)	0.06-1.00	0
MOS-HIV Health Transition Score	523	7	1.3	3.33 (1.02)	1-5	0
Overall Quality of Life						
Satisfaction with Life Scale	516	14	2.6	3.57 (1.49)	1-7	0

Note. n/a= not applicable

5.3 RELIABILITY STATISTICS OF THE MEASURES

Internal consistency of each of the measures assessing the model's components (e.g., BDI-II, MOS-HIV, etc.) is shown in Table 9. Acceptable to excellent reliability was noted for all applicable measures in the overall sample (*N*=532) and in both subgroups (HIV *n*=305 vs. HIV+LD *n*=227). In the overall sample, Cronbach's alpha statistics for those measures with more than two questions ranged from 0.628 to 0.953 showing acceptable to excellent reliability across the instruments. When the sample was split into the subgroups (HIV and HIV+LD groups) Cronbach's alpha statistics ranged from 0.617 to 0.954, again showing acceptable to excellent reliability.

The MOS-HIV mental and physical summary scores were generated by computing weighted HIV population-based scores for the individual subscales (e.g., pain, role function; see Appendix A). Therefore, individual MOS-HIV mental and physical summary score Cronbach's alphas were the same. Cronbach's alpha reliability statistics were performed on instruments with more than two questions that comprised the measure.

It should be noted that the final primary model component, overall QOL, has only one measure. Overall QOL was initially operationalized to include assessment using the MOS-HIV overall QOL score and the Satisfaction with Life Scale. After an exploratory factor analysis of the total MOS-HIV tool (see manuscript in Appendix A), the MOS-HIV overall QOL subscale score was found to be included in both the physical and mental summary scores of the MOS-HIV. Therefore, the MOS-HIV overall QOL subscale score perfectly correlated to one of the

measures of symptom status (MOS-HIV mental summary score) and one of the measures of functional status (MOS-HIV physical summary score). This would have unjustly biased the analysis in favor of finding a good fitting model. Therefore, the MOS-HIV overall HRQOL was excluded and the Satisfaction with Life Scale was used as the only measure for the primary model variable overall QOL.

Table 9. *Reliability Estimates for the Measures Assessing the Model Components*

Variable Measure	Description	Number of Items	Cronbach's Alpha		
			Overall	HIV group (*N*=305)	HIV +LD Group (*N*=227)
Biological /Physiological Factors					
CD4 Count		1	n/a	n/a	n/a
HIV Viral Load		1	n/a	n/a	n/a
Symptom Status					
Beck Depression Inventory-II	Total Score	21	.934 *N*=515	.940 *N*=294	.924 *N*=221
MOS-HIV Mental Summary Score		11	.849 *N*=522	.844 *N*=301	.850 *N*=221
Functional Status					
Missed Appointments		1	n/a	n/a	n/a
MOS-HIV Physical Summary Score		11	.849 *N*=522	.844 *N*=301	.850 *N*=221
General Health Perceptions					
Perception of Illness		4	.628 *N*=525	.639 *N*=301	.617 *N*=224
MOS-HIV Health Transition Score		1	n/a	n/a	n/a
Overall Quality of Life					
Satisfaction with Life Scale		5	.859 *N*=527	.847 *N*=303	.868 *N*=224
Characteristic of the Environment					
Interpersonal Support Evaluation List	Total Score	40	.953 *N*=502	.952 *N*=287	.954 *N*=215

5.4 CORRELATIONS AMONG MEASURES

Before merging data from Study 1 and Study 2 there was a need to ensure that there were no gross differences in the overall relationships among the measures. Specifically, the relationships between the measures across disease groups (HIV vs. HIV+LD) as a function of Study 1 or Study 2 were examined. Fisher's *r*-to-*z* transformation of correlation coefficients was performed to test for significant differences in the bivariate relationships across disease groups between Study 1 and Study 2. The raw correlation coefficients with two group comparisons are presented in Table 10 for the HIV group and in Table 11 for the HIV+LD group with significance levels of Fisher's *r-to-z* transformation noted with asterisks. Most of the group comparisons showed no significant differences when comparing the two studies. Five of the 36 sets of correlations were different when comparing variable correlations in persons with HIV from Study 1 (n= 93) to Study 2 (n=151). Seven of the 36 sets of correlations were different when comparing variable correlations in persons with HIV+LD from Study 1 (n= 66) to Study 2 (n=130). However, the few correlations that were statistically different reflected appropriately in the strength of the association. For example, the correlation between Beck Depression Inventory-II (BDI-II) scores and Satisfaction with Life scores in the HIV groups were -.213 and -.503 in Study 1 and Study 2, respectively, indicating a statistically significant difference in the strength of the relationship when applying the Fisher's *r*-to-*z* transformation (z=2.52; p<.05). However, this finding was reflected in the negative correlations found in both studies in which the more self-reported

depressive symptoms, as measured by the BDI-II, the lower the Satisfaction with Life scores (see Table 10).

Similarly, the correlation between HIV Medical Outcomes Survey (MOS-HIV) Mental Summary Score and MOS-HIV Physical Summary score in HIV+LD was .525 and .716 in Study 1 and Study 2, respectively, indicating a statistically significant difference in the strength of the relationship when applying the Fisher's *r*-to-*z* transformation (z=-2.05; p=.04). The correlations indicate that the MOS-HIV Mental and Physical Summary scores were positively correlated in both studies; however the strength of the relationship was different (see Table 11). After an evaluation of the correlational matrices in Study 1 and Study 2 across persons with HIV without LD and persons with HIV+LD the data and correlational matrices supported merging Study 1 and Study 2 data.

Table 10. *Correlations Among Measures of Variables of the Model for HIV Group Study 1 (n=93) and Study 2 (n=151)*

Variables Measure	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Biological/ Physiological Factors	-								
1. CD4 Count	.334 (.228)	-							
2. HIV Viral Load									
Symptom Status	-.065 (-.067)	-.220 (-.011)	-						
3. Beck Depression Inventory-II	.173 (.155)	.331* (.031)*	-.743 (-.782)	-					
4. MOS-HIV Mental Summary Score									
Functional Status	.158 (.115)	.157 (.107)	-.025 (-.159)	-.023 (.178)	-				
5. Missed Appointments	.118 (.204)	.173 (.062)	-.501 (-.505)	.677 (.623)	-.101 (.026)	-			
6. MOS-HIV Physical Summary Score									
General Health Perceptions	.318 (.264)	.299* (.006)*	-.467 (-.419)	.522 (.526)	-.039 (.108)	.423 (.310)	-		
7. Perception of Illness	.074 (.070)	.003 (.018)	-.461 (-.458)	.569 (.428)	-.098 (.023)	.425 (.384)	.514* (.292)*	-	
8. MOS-HIV Health Transition Score									
Overall Quality of Life	-.106 (.150)	-.041 (.029)	-.213* (-.503)*	.186** (.521)**	-.002 (.064)	.099 (.297)	.050 (.295)	.066 (.152)	-
9. Satisfaction with Life Scale									

Note. Fisher's *r* to *z* values $^{*}p< .05$; $^{**}p<.01$; $^{***}p<.001$. Study 2 correlations are in parenthesis.

Table 11. *Correlations Among Measures of Variables of the Model for HIV+LD Group Study 1 (n=66) and Study 2 (n=130)*

Variables Measure	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Biological/ Physiological Factors	-								
1. CD4 Count	.352 (.286)	-							
Symptom Status	-.176 (.127)	.002 (-.129)	-						
3. Beck Depression Inventory-II	.282 (.009)	-.011 (.205)	-.765 (-.803)	-					
Functional Status	.046 (.058)	-.094 (.002)	.046 (-.086)	.006 (.067)	-				
5. Missed Appointments	.434** (.017)**	-.037 (.203)	-.454 (-.573)	.525* (.716*)	-.073 (.081)	-			
General Health Perceptions	.114 (-.073)	.041 (.140)	-.548 (-.389)	.647* (.404*)	-.239 (.037)	.419 (.360)	-		
7. Perception of Illness	.189 (-.075)	.048 (.142)	-.217 (-.463)	.398 (.427)	.187 (.125)	.094 (.278)	.219 (.169)	-	
Overall Quality of Life	-.104 (-.018)	.076 (.219)	.069*** (-.499)***	-.068*** (.483)***	-.105 (.098)	.017* (.313)*	.066 (.340)	-.083* (.251)*	-
9. Satisfaction with Life Scale									

Note. Fisher's *r* to *z* values $^{*}p< .05$; $^{**}p<.01$; $^{***}p<.001$. Study 2 correlations are in parenthesis.

5.5 DEMOGRAPHIC CHARACTERISTICS STUDY 1 VS. STUDY 2

As a preliminary data screening to the secondary data analysis, the selected demographic characteristics between Study 1 and Study 2 were determined (see Table 12). There were a greater number of males than females in both Study 1 (70% male; 30% female) and in Study 2 (69.6% male; 30.4%). There was no significant difference between the two studies with regard to percentage of male and female participants $\chi^2(1) = .009$, $p = .925$. There were differences in the percentage of individuals that self-reported being "white" in the two studies. There were significantly more participants who self-reported their race as "white" in Study 1 (65.5%) than in Study 2 (40.6%) $\chi^2(1) = 29.62$, $p = .001$. Participants who self-reported their race as anything other than "white" were considered "non-white." Those in the "non-white" category were primarily African-American due to recruitment in Study 2 in urban areas in Western Pennsylvania and Northeastern Ohio. The self-reported total gross household incomes between Study 1 and Study 2 ($\chi^2(5) = 22.16$, $p < .001$) were significantly different. The average age across the two studies was 42.4 ±7.86 years. Study 1 participants were significantly younger ($t(530) = -4.71$, $p < .001$) than those in Study 2 (40.26 ± 7.64 vs. 43.66 ±7.73 years of age respectively). Participants in Study 1 self-reported an average of 13.36 ±2.64 years of formal education, whereas 12.96 ±2.85 years were reported in Study 2. There was no significant difference between the two studies with regard to number of years of education ($t(529) = 1.59$, $p = .112$). Overall, participants in Study 2 were older and more likely to be non-white; a greater proportion in Study 2 reported incomes below $10,000 (see Table 12).

Table 12. *Selected Sample Characteristics for Study 1 and Study 2*

Variable		Group					
		Overall (*N*=532)	**Study 1** (*N*=180)	**Study 2** (*N*=352)	**Statistic**		
		n (%)/*M* (*SD*)	*n* (%)/*M* (*SD*)	*n* (%)/*M* (*SD*)	Chi-Sq/ *t*-test		*p* value
					df	value	
Sex					1	.009	.925
	Male	371 (69.7)	126 (70.0)	245 (69.6)			
	Female	161 (30.3)	54 (30.0)	107 (30.4)			
Race					1	29.62	.001
	White	261 (49.1)	118 (65.6)	143 (40.6)			
	Non-white	271 (50.9)	62 (34.4)	209 (59.4)			
Total gross household income					5	22.16	<.001
	Under 10,000	262 (49.2)	68 (37.8)	194 (55.1)			
	10,000 to 13,000	90 (16.9)	37 (20.6)	53 (15.1)			
	13,000 to 20,000	60 (11.3)	21 (11.7)	39 (11.1)			
	20,000 to 30,000	39 (7.3)	13 (7.2)	26 (7.4)			
	30,000 to 50,000	34 (6.4)	18 (10.0)	16 (4.5)			
	Over 50,0000	32 (6.0)	18 (10.0)	14 (4.0)			
	Missing	15 (2.8)	5 (2.8)	10 (2.8)			
Age		42.40 (7.86)	40.26 (7.64)	43.66 (7.73)	530	-4.71	<.001
Number of years of formal education		13.21 (2.76)	13.36 (2.64)	12.96 (2.85)	529	1.59	.112

5.6 STUDY 1 VS. STUDY 2 MEASURE COMPARISONS

A comparison was made among the measures selected to assess the five model components between Study 1 and Study 2. The Wilson and Cleary (1995) model components include: biological/physiological factors (CD4 count, HIV viral load), symptom status (Beck Depression Inventory II [BDI-II], Medical Outcomes Study HIV Health Survey [MOS-HIV] mental summary score), functional status (missed appointments, MOS-HIV physical summary score), general health perceptions (Perception of Illness visual analogue scale, MOS-HIV health transition score), and overall HRQOL (Satisfaction with Life Scale).

The frequencies, means, standard deviations, and effect parameters are noted in Table 13. Cohen's *d* was determined for parametric effect size and Φ for non-parametric effect size for standardized differences between Study 1 and Study 2. These analytic techniques were used in place of independent sample t-tests and chi-square tests given the difference in sample sizes between Study 1 (*n*=180) and Study 2 (*n*=352). A small Φ or Cohen's *d* effect size is equivalent to approximately .200, whereas .500 is a medium effect, and .800 is a large effect (J. Cohen, 1988).

When assessing the biological/physiological factors, there was no significant difference in the CD4 count (Cohen's *d*=.165) between Study 1 (487.41 ± 325.19 cells/ml) and Study 2 (437.44 ± 289.75 cells/ml). Additionally, there was no significant difference in percentage of detectable HIV viral load. In Study 1 there were 45.9% of the participants with detectable HIV viral load reported compared to 38.5% in Study 2 (Φ = .073).

There was no significant difference in symptom status (MOS-HIV mental summary score, [Cohen's *d*=.208]), functional status (missed appointments [Φ = .000, no effect], MOS-HIV physical summary score [Cohen's *d*=.345]), general health perceptions (Perception of Illness visual analogue scale [Cohen's *d*=.081], MOS-HIV health transition score [Cohen's *d*=.182]), and overall HRQOL (Satisfaction with Life Scale, [Cohen's *d*=.061]).

Other than the total BDI-II scores, there were no significant differences between the measures from the two studies. Persons in Study 2 had higher total self-reported depressive symptoms (*M*=16.05) than persons in Study 1 (*M*=12.80). The clinical significance of this difference may not be noteworthy as both mean scores are below the moderate depressive symptom cutoff score of 20 (Beck et al., 1996). For example, the BDI-II scores from the two studies had approximately 85% distribution overlap with a small Cohen's *d* effect of .284. Therefore, after considering the correlational matrices and the distribution of the data from Study 1 and Study 2, the data were appropriately combined and used in the structural equation model (SEM).

Table 13. *Differences of Study Measures for Study 1 and Study 2*

Variable / Measure		Group: Overall	Study 1 (*n*=180)	Study 2 (*n*=352)	Statistic
		n (%)/*M* (*SD*)	*n* (%)/*M* (*SD*)	*n* (%)/*M* (*SD*)	Cohen's d/ *phi*
Biological/Physiological Factors					
CD4 Count		455.94 (303.97)	487.41 (325.19)	437.44 (289.75)	.165
HIV Viral load	Detectable	199 (41.1)	79 (45.9)	120 (38.5)	.073
	Undetectable	285 (58.9)	93 (54.1)	192 (61.5)	
Symptom Status					
Beck Depression Inventory-II		14.94 (11.54)	12.80 (9.29)	16.05 (12.42)	.284
MOS-HIV Mental Summary Score		45.44 (12.06)	47.10 (11.87)	44.59 (12.08)	.208
Functional Status					
Missed Appointments	Yes	172 (33.0)	57 (32.9)	115 (33.0)	.000
	No	350 (67.0)	116 (67.1)	234 (67.0)	
MOS-HIV Physical Summary Score		41.80 (11.62)	39.18 (10.36)	43.14 (12.02)	.345
General Health Perceptions					
Perception of Illness		0.74 (.19)	0.75 (.18)	0.73 (.19)	.081
MOS-HIV Health Transition Score		3.34 (1.02)	3.46 (.98)	3.27 (1.03)	.182
Overall Quality of Life					
Satisfaction with Life Scale		3.57 (1.49)	3.63 (1.53)	3.54 (1.47)	.061

5.7 DEMOGRAPHIC CHARACTERISTICS HIV VS. HIV+LD

The participants in both groups (HIV and HIV+LD) were relatively homogeneous with regard to the selected demographic characteristics. There was a larger proportion of men in the overall sample (69.7%), as well as the subgroup of HIV (67.5%) and the subgroup of HIV+LD (72.7%). There were no significant difference between these percentages ($\chi^2(1) = 1.63$, $p = .201$). The overall sample and the subgroups were split almost equally (range 47.6-53.4%) between white and non-white race ($\chi^2 = 1.79$ (1), $p = .181$). The majority of persons across both groups had a total gross annual household income under $10,000 (45.9-52.9%; $\chi^2(5) = 8.08$, $p = .152$). Overall, only 12% had annual household income over $30,000. Persons in the HIV group ($M = 41.51$, $SD \pm 8.29$) were significantly younger than persons in the HIV+LD group ($M = 43.87$, $SD \pm 7.14$; $t = -3.44$ (530), $p = .001$). There was also a significant difference in years of education between the HIV group ($M = 13.35$, $SD \pm 2.83$) and the HIV+LD group ($M = 12.77$, $SD \pm 2.66$; $t(529) = 2.37$, $p = .018$). In summary, there were no significant differences between persons with HIV with and with out LD as a function of sex, ethnicity/race, or income. Persons with HIV+LD were older and less educated than persons with HIV without LD (see Table 14).

Table 14. *Sample Characteristics for HIV and HIV and Liver Disease Groups*

Variable		Group			Statistic		
		Overall (*N*=532)	**HIV** (*N*=305)	**HIV+LD** (*N*=227)			
		n (%)/*M* (*SD*)	*n* (%)/*M* (*SD*)	*n* (%)/*M* (*SD*)	Chi-Sq/ *t*-test		*p* value
					df	Value	
Sex					1	1.63	.201
	Male	371 (69.7)	206 (67.5)	165 (72.7)			
	Female	161 (30.3)	99 (32.5)	62 (27.3)			
Race					1	1.79	.181
	White	261 (49.1)	142 (46.6)	119 (52.4)			
	Non-white	271 (50.9)	163 (53.4)	108 (47.6)			
Total Gross Annual Household Income					5	8.08	.152
	Under 10,000	262 (49.2)	140 (45.9)	122 (52.9)			
	10,000 to 13,000	90 (16.9)	53 (17.4)	37 (16.3)			
	13,000 to 20,000	60 (11.3)	35 (11.5)	25 (11.0)			
	20,000 to 30,000	39 (7.3)	29 (9.5)	10 (4.4)			
	30,000 to 50,000	34 (6.4)	23 (7.5)	11 (4.8)			
	Over 50,0000	32 (6.0)	17 (5.6)	15 (6.6)			
	Missing	15 (2.8)	8 (2.6)	7 (3.1)			
Age		42.40 (7.86)	41.51 (8.29)	43.87 (7.14)	530	-3.44	.001
Number of Years of Education		13.21 (2.76)	13.35 (2.83)	12.77 (2.66)	529	2.37	.018

5.8 CORRELATIONAL MATRIX

Because the primary aim of this secondary analysis was to test the Wilson and Cleary (1995) model of HRQOL in persons with HIV without LD and in persons with HIV and LD, a correlational matrix was run separately for the two groups and the combined overall sample (*N*=532). Moderate to high correlations were noted (Spearman's *rho*= .30 to greater than .60) for all of the measures with the exception of missed appointments. Missed appointments had very low correlations with the other measures, Spearman's *rho* ranged from .002 to .140 in the overall sample and in the two subgroups. The correlational matrices are presented in Tables 15, 16 and 17.

Table 15. *Correlations Among Measures by Model Variable for Overall HIV Group (n=305)*

Variables Measure	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Biological/ Physiological Factors									
1. CD4 Count	-								
2. HIV Viral Load	.257	-							
Symptom Status									
3. Beck Depression Inventory-II	-.084	-.073	-						
4. MOS-HIV Mental Summary Score	.178	.150	-.767	-					
Functional Status									
5. Missed Appointments	.140	.114	-.123	.104	-				
6. MOS-HIV Physical Summary Score	.141	.120	-.464	.617	-.035	-			
General Health Perceptions									
7. Perception of Illness	.286	.113	-.445	.526	.056	.335	-		
8. MOS-HIV Health Transition Score	.074	.004	-.463	.489	-.016	.372	.377	-	
Overall Quality of Life									
9. Satisfaction with Life Scale	.040	.004	-.377	.370	.039	.225	.191	.115	-

Note. Spearman's rho values

Table 16. *Correlations Among Measures by Model Variable for Overall HIV+LD Group (n=227)*

Variables Measure	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Biological/ Physiological Factors									
1. CD4 Count	-								
2. HIV Viral Load	.312	-							
Symptom Status									
3. Beck Depression Inventory-II	.035	-.084	-						
4. MOS-HIV Mental Summary Score	.102	.125	-.793	-					
Functional Status									
5. Missed Appointments	.049	-.026	-.034	.032	-				
6. MOS-HIV Physical Summary Score	.157	.139	-.529	.644	.052	-			
General Health Perceptions									
7. Perception of Illness	.005	.115	-.428	.484	-.057	.379	-		
8. MOS-HIV Health Transition Score	.019	.106	-.390	.417	.125	.211	.186	-	
Overall Quality of Life									
9. Satisfaction with Life Scale	-.051	.164	-.335	.300	.002	.204	.241	.168	-

Note. Spearman's rho values

Table 17. *Correlations Among Measures by Model Variable for Overall Sample (n=532)*

Variables Measure	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Biological/ Physiological Factors									
1. CD4 Count	-								
2. HIV Viral Load	.282	-							
Symptom Status									
3. Beck Depression Inventory-II	-.064	-.103	-						
4. MOS-HIV Mental Summary Score	.172	.170	-.780	-					
Functional Status									
5. Missed Appointments	.084	.062	-.114	.093	-				
6. MOS-HIV Physical Summary Score	.165	.164	-.520	.636	.018	-			
General Health Perceptions									
7. Perception of Illness	.159	.100	-.407	.483	.005	.332	-		
8. MOS-HIV Health Transition Score	.067	.052	-.395	.442	.043	.299	.228	-	
Overall Quality of Life									
9. Satisfaction with Life Scale	.011	.101	-.388	.379	.069	.236	.224	.150	-

Note. Spearman's rho values

5.9 HIV AND HIV+LD GROUP MEASURE COMPARISONS

Descriptive statistics and measure comparisons between the HIV group and HIV+LD group are presented in Table 18. Frequencies were used to calculate percentages of categorical measures (e.g., HIV viral load and missed appointments). Means and standard deviations were used to describe continuous measures. Pearson chi-square was used to test for statistical differences between the two groups on categorical data; independent sample t-tests were used to test for statistical differences between the two groups on continuous measures. A non-parametric *t*-test (Mann-Whitney) was used to assess for statistical differences in CD4 counts, a continuous measure, due to the positively skewed nature of the data.

There was a statistically significant difference between the HIV group and the HIV+ LD group on CD4 counts. When compared to the HIV group (*M*=492.25, *SD*±341.98), the HIV+LD group had statistically significant lower CD4 counts (*M*=435.43, *SD*±316.30; *t*= -2.01, *p*=.044). CD4 counts were inversely related to HIV viral load so that when the HIV viral load goes up CD4 counts go down. There was a higher percentage of persons with HIV+LD (45.8%) who had detectable HIV viral load than persons with HIV without liver disease (37.5%). However, this difference was not statistically significant ($\chi^2(1) = 3.35$, *p*=.067).

Persons in the HIV group self-reported significantly fewer depressive symptoms (*t*(525) =-2.42, *p*=.016), as measured by the BDI-II (mean total score 13.89 ± 11.68) compared to HIV+LD group (*M*=16.34, *SD* ±11.22). Additionally, persons in the HIV group had higher self-reported mental function (*t*(520) =2.96, *p*=.003), as measured by the MOS-HIV mental summary score (*M*=46.77, *SD* ±12.24) compared to the HIV+LD group (*M*=43.63, *SD* ± 11.59). There was

a significant difference in functional status between the two groups as measured by the MOS-HIV physical summary score ($t(520) = 3.90$, $p < .001$), although both groups had relatively poor self-reported physical function. The HIV group mean scores for the MOS-HIV physical summary score were 43.47 with a standard deviation of 11.28 compared to the HIV+LD group with a mean score of 39.51 with a standard deviation of 11.72. Although the categorical measure of missed appointments for the variable of functional status was not included in the SEM model due to very weak correlations among the variables, no differences were found between the groups. The HIV group data indicated that 31.3% had missed clinic appointments annually and 35.1% missed appointments in the HIV+LD group (Pearson $\chi^2(1) = .835$, $p = .361$).

There were no significant differences between the HIV and HIV+LD groups with regard to the measures of the variables for general health perceptions. Even though there were significant differences among most of the other measures between the groups, both groups have similar general health perceptions, as measured by the Perception of Illness visual analog scale ($t = .72$ (524), $p = .470$). Similarly, both groups self-reported on the MOS-HIV health transition scale that their perception of their physical and emotional health was about the same to a little worse compared to 4 weeks prior ($t(524) = 1.34$, $p = .182$).

Both groups also reported being somewhat dissatisfied with their overall QOL, as measured by the Satisfaction with Life Scale. There was no significant difference between the groups ($t(517) = 1.08$, $p < .280$). The HIV group had a mean score of 3.63 with a standard deviation of 1.44 and the HIV+LD group had a mean score of 3.49 with a standard deviation of 1.56. The mean scores in both groups for the Satisfaction with Life Scale were slightly below the mid-point.

Overall the data from persons with HIV+LD showed statistically significant lower CD4 counts, more self-reported depressive symptoms, and significantly lower self-reported mental and physical function compared to persons with HIV without LD. There were no other statistically significant differences noted between the HIV and HIV+LD groups.

Table 18. *Measure Comparisons by Model Variable for HIV and HIV+LD Groups*

Variable Measure		**Group**					
		Overall (*n*=532)	**HIV (*n*=305)**	**HIV+LD (*n*=227)**	**Statistic**		
		n (%)/*M* (*SD*)	*n* (%)/*M* (*SD*)	*n* (%)/*M* (*SD*)	Chi-Sq/ *t*-test		
					df	value	*p* value
Biological/Physiological Factors							
CD4 Count		455.94 (303.97)	492.25 (341.98)	435.43 (316.30)	Mann-Whitney	-2.01	.044
HIV Viral load	Detectable	199 (41.1)	102 (37.5)	97 (45.8)	Pearson (1)	3.35	.067
	Undetectable	285 (58.9)	170 (62.5)	115 (54.2)			
Symptom Status							
Beck Depression Inventory-II		14.94 (11.54)	13.89 (11.68)	16.34 (11.22)	525	-2.42	.016
MOS-HIV Mental Summary Score		45.44 (12.06)	46.77 (12.24)	43.63 (11.59)	520	2.96	.003
Functional Status							
Missed Appointments	Yes	172 (33.0)	94 (31.3)	78 (35.1)	Pearson (1)	.835	.361
	No	350 (67.0)	206 (68.7)	144 (64.9)			
MOS-HIV Physical Summary Score		41.80 (11.62)	43.47 (11.28)	39.51 (11.72)	520	3.90	<.001
General Health Perceptions							
Perception of Illness		0.74 (0.19)	.74 (.18)	.731 (.19)	524	.72	.470
MOS-HIV Health Transition Score		3.34 (1.02)	3.39 (1.01)	3.27 (1.02)	524	1.34	.182
Overall Quality of Life							
Satisfaction with Life Scale		3.57 (1.49)	3.63 (1.44)	3.49 (1.56)	517	1.08	.280

5.10 PRIMARY AIM

The primary aim was to test the null hypothesis, wherein, the hypothesized model will hold true with the components (biological/physiological factors, symptom status, functional status, general health perceptions, and overall quality of life) in persons living with HIV without liver disease and in persons living with HIV with liver disease.

5.10.1 Primary Aim Research Questions

(1.) Does the Wilson and Cleary (1995) model of HRQOL hold true in persons living with HIV without liver disease?

(2.) Does the Wilson and Cleary (1995) model of HRQOL hold true in persons living with HIV and liver disease (HIV+LD)?

(3.) Is there a difference in the models between persons living with HIV without liver disease and in persons living with HIV+LD?

The baseline hypothesized Wilson and Cleary model was assessed with SEM and found to hold true in both groups, persons living with HIV without liver disease and in persons living with HIV+LD, when a Lagrange multiplier modification was applied.

The baseline model parameters and subsequent model modifications are noted in Table 19. Model 1 parameters were found after releasing model constraints and allowing additional pathways from symptom status to general health perceptions and overall quality of life, and from

biological/physiological factors to general health perceptions. The second constrained model (Model 2) allowed for correlations between the biological/physiological factors (CD4 count, HIV viral load) and the error terms. There were no significant differences in the HIV group model and the HIV+LD model. A multi-sample robust SEM was performed. Because there were no significant differences between the structural models in the two groups the data were constrained to fit the same model. The constrained model estimates one set of parameters for both groups. SEM was run on both the constrained and unconstrained models and found that the constrained model had a better fit. The model parameters were not significantly different (See Table 19) when comparing the Satorra-Bentler model chi-squares.

Table 19. *Goodness of Fit Summary for Model Selection*

	SB χ^2	*df*	*CFI*	*RMSEA*	*Δ SB* χ^2	*df*	*p* value
Baseline	22.68	20	.997	.028	-	-	-
Model 1 Regression Coefficent Constrained	39.31	36	.997	.020	16.61	16	.411
Model 2 Regression Coefficent Constraints with Parsimony	40.31	38	.998	.017	17.57	18	.484

Note. *SB* χ^2= Satorra-Bentler scaled Chi-square; *df*= degrees of freedom; *CFI*= Comparative Fit Index; *RMSEA*= Root mean-square error of approximation; Δ= difference.

The standardized full information maximum likelihood solution with robust methods is presented for the HIV group (*n*=305) in Figure 8 and for the HIV+LD group (*n*=227) in Figure 9. The feasibility of the parameter estimates was accomplished by assessing each model parameter and ensuring that the parameter exhibited the correct size and sign (positive or negative relation) consistent with the underlying measure of the variable component. For example, the BDI-II to MOS-HIV health transition score parameter was -.210 which is logically feasible in that higher self-reported depressive symptoms have a negative relationship with self-reported health status. The standardized solution reflected the slight difference in sample size between the two groups otherwise the unstandardized model parameters were identical.

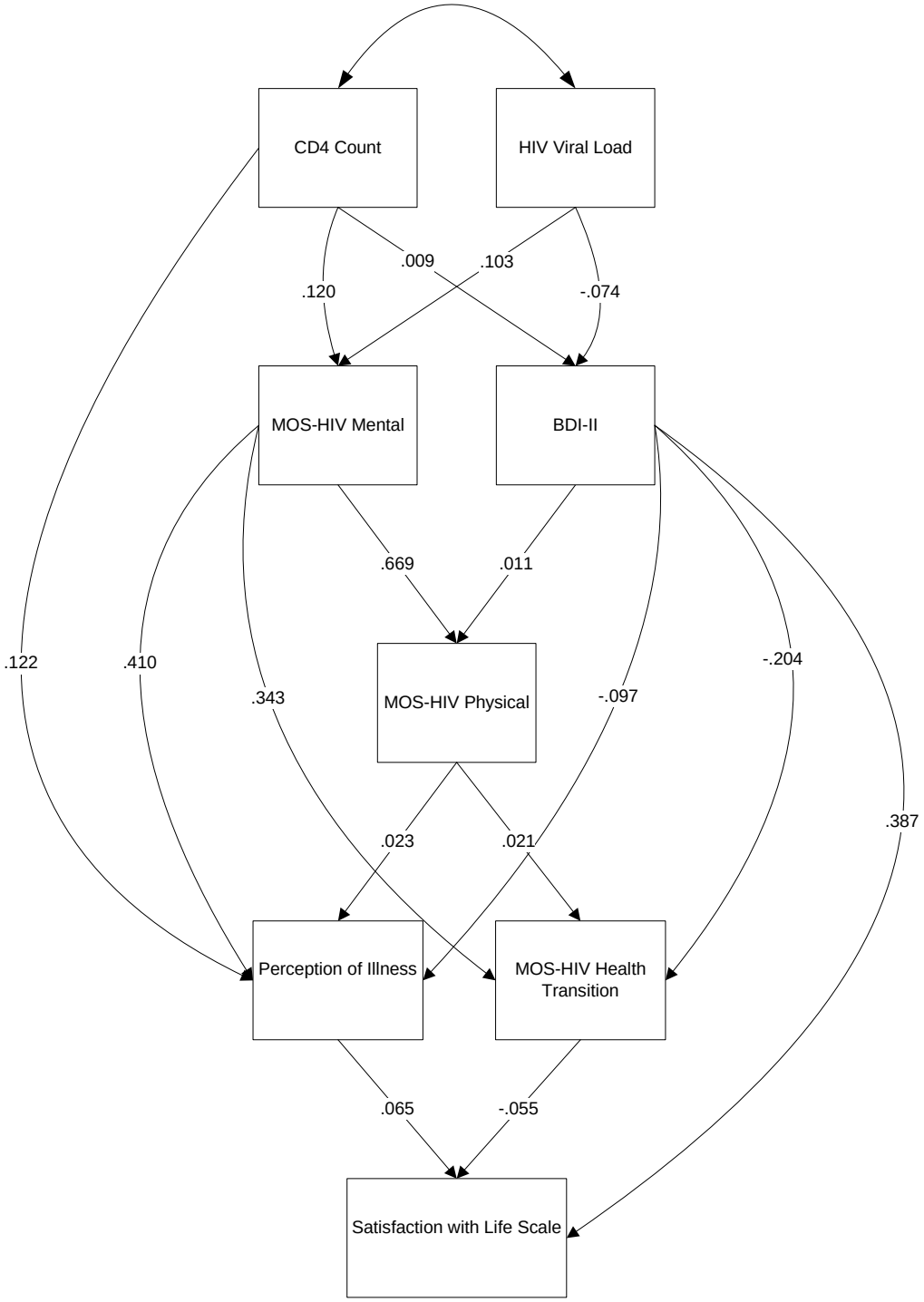


Figure 8. *Standardized Full Information Maximum Likelihood Solution in HIV Group (n=305)*

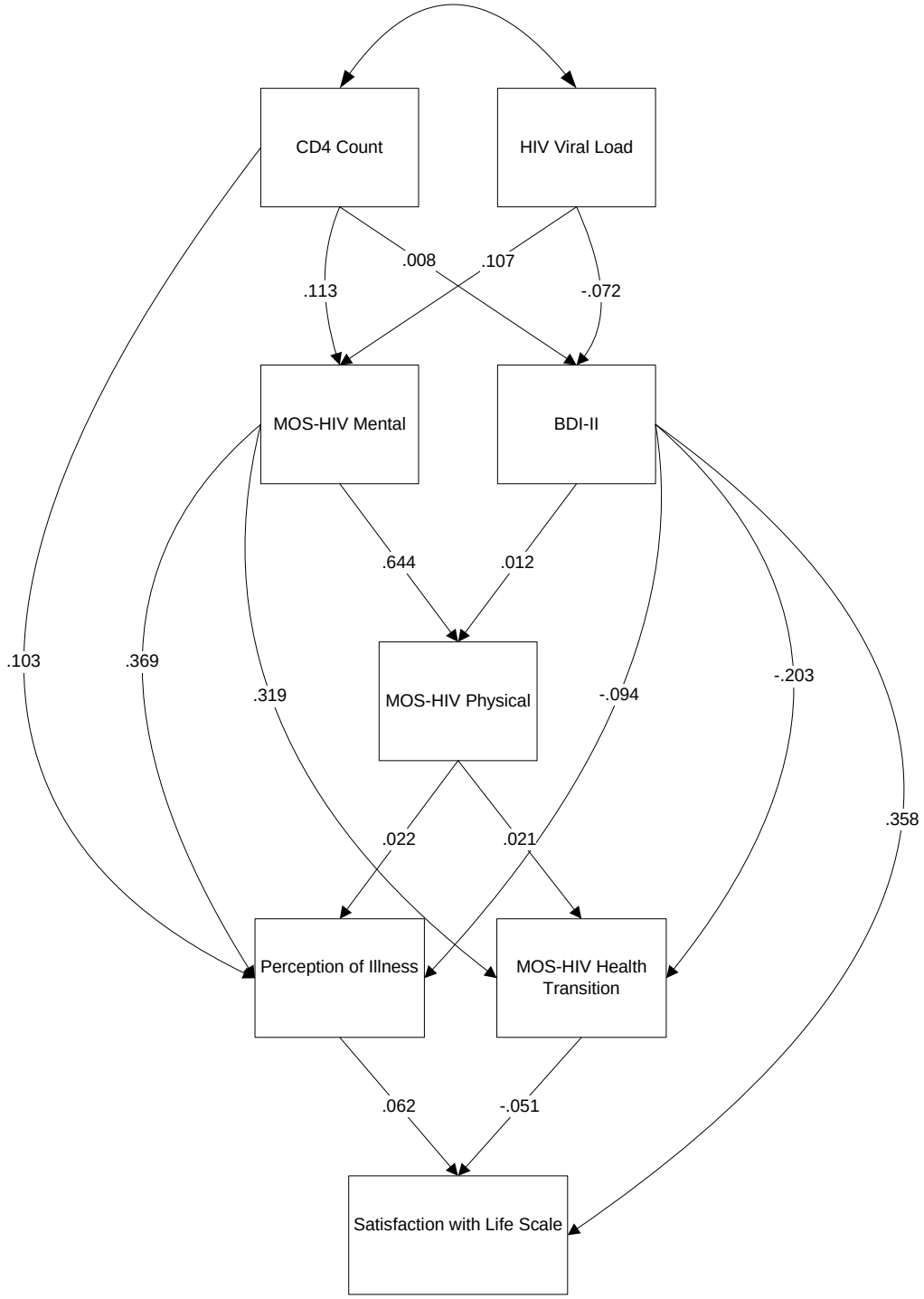


Figure 9. *Standardized Full Information Maximum Likelihood Solution in HIV+LD Group (n=227)*

The multi-group maximum likelihood robust SEM solution is detailed in Table 20 with each of the 16 model parameter estimates identified with the level of significance noted with an asterisk. The unstandardized model parameters were the same for both the HIV group and the HIV+LD group as both groups were constrained to the same model parameters. The standardized full information maximum likelihood solutions of HRQOL were slightly different (not statistically different) due to the small differences in the sample sizes of the groups (HIV group, *n*=305; HIV+LD group, *n*=227). The significantly modeled pathways are noted below in the secondary aims section 5.11 and depicted in Figure 10. Because the modified model fit both the HIV group and the HIV group there were no significant differences between any of the model parameters.

Table 20. *Multi-group Maximum Likelihood Robust SEM Solution*

	HIV Group *n*=305			HIV+LD Group *n*=227		
Path	Unstandardized.	Standardized	*z* score	Unstandardized	Standardized	*z* score
1. CD4 → BDI	.029	.009	-.18	.029	.008	-.18
2. CD4 → MHS	.423	.120	2.44*	.423	.113	2.44*
3. CD4 → POI	.006	.122	2.97**	.006	.103	2.97**
4. VLD → BDI	-1.640	-.074	-1.51	-1.640	-.072	-1.51
5. VLD → MHS	2.561	.103	2.10*	2.561	.107	2.10*
6. BDI → PHS	.012	.011	.20	.012	.012	.20
7. BDI → POI	.002	-.097	-1.25	.002	-.094	-1.25
8. BDI → HTS	-.019	-.204	-2.94**	-.019	-.203	-2.94**
9. BDI → SLS	.051	.387	-6.84***	.051	.358	-6.84***
10. MHS → PHS	.631	.669	11.52***	.631	.644	11.52***
11. MHS → POI	.006	.410	4.63***	.006	.369	4.63***
12. MHS → HTS	.028	.343	4.12***	.028	.319	4.12***
13. PHS → POI	.000	.023	.38	.000	.022	.38
14. PHS → HTS	.002	.021	.41	.002	.021	.41
15. POI → SLS	.528	.065	1.28	.528	.062	1.28
16. HTS → SLS	-.078	-.055	-1.07	-.078	-.051	-1.07

Note. *p< .05; **p<.01; ***p<.001. CD4 = CD4 Count; VLD = HIV Viral Load; BDI = Beck Depression Inventory-II; MHS = MOS-HIV Mental Summary Score; PHS = MOS-HIV Physical Summary Score; POI = Perception of Illness; HTS = MOS-HIV Health Transition Score; SLS = Satisfaction with Life Scale.

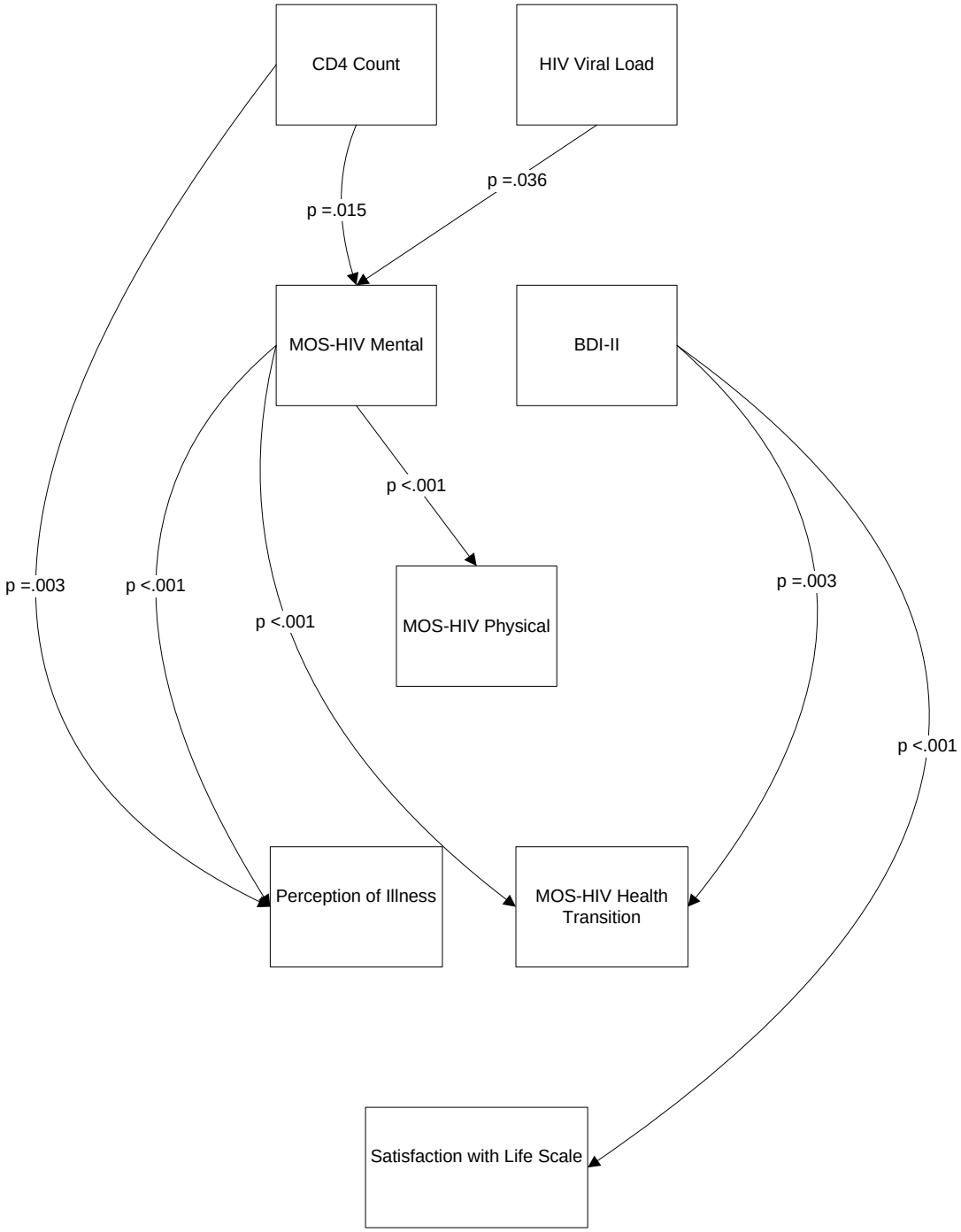


Figure 10. *SEM with Significant Measured Modeled Pathways Retained (n=532)*

5.11 SECONDARY AIM

The secondary aim was to test the relationships proposed within Wilson and Cleary's (1995) directional model of HRQOL between biological/physiological factors, symptom status, functional status, general health perceptions, and overall QOL among persons living with HIV without liver disease and persons living with HIV+LD. Four hypotheses were tested.

5.11.1 Secondary Hypothesis 2.1

Hypothesis: Biological/physiological factors have a direct effect on symptom status in persons living with HIV without liver disease and in persons living with HIV+LD.

There was a significant direct effect of biological/physiological factors on symptom status in both persons with HIV and persons with HIV and liver disease. CD4 count, as a measure of biological/physiological factors, significantly predicted symptom status, as measured with the MOS-HIV mental summary score in both the HIV (B=.120, z=2.44, p=.015).and HIV+LD groups (B=.113, z=2.44, p=.015). HIV viral load, as a measure of biological/physiological factors, significantly predicted symptom status, as measured with the MOS-HIV mental summary score in both the HIV (B=.103, z=2.10, p=.036) and HIV+LD groups (B=.107, z=2.10, p=.036). An additional significant path was identified using the LaGrange Multiplier from biological/physiological factors to general health perception (CD4 count to Perception of Illness) in both the HIV group (B=.122, z=2.97, p=.003) and the HIV+LD

group (*B*=.103, *z*=2.97, *p*=.003). CD4 count and HIV viral load, as measures of biological/physiological factors, did not predict symptom status, as measured by the BDI-II.

5.11.2 Secondary Hypothesis 2.2

Hypothesis: Symptom status has a direct effect on functional status in persons living with HIV without liver disease and in persons living with HIV+LD.

There was a significant direct effect of symptom status on functional status in both groups. However, categorized missed appointments ("yes" or "no") was not related to the study measures and was therefore not included in the SEM / path analysis. The MOS-HIV mental summary score, as a measure of symptom status, significantly predicted functional status, as measured with the MOS-HIV physical summary score, in both the HIV (*B*=.669, *z*=11.52, *p*<.001) and HIV+LD groups (*B*=.644, *z*=11.52, *p*<.001). BDI-II, as a measure of symptom status, did not predict functional status, as measured by the MOS-HIV physical summary score.

There were four significant additional paths identified by using the Lagrange Multiplier linking symptom status, as measured by the BDI-II and the MOS-HIV mental summary score, to distal components of the Wilson and Cleary (1995) model of HRQOL. Three of the identified paths linked symptom status directly to general health perceptions and one linked symptom status directly to overall quality of life (see Figure 10). The MOS-HIV mental summary score, as a measure of symptom status, significantly predicted general health perceptions, as measured with the Perception of Illness visual analogue scale in both the HIV (*B*=.410, *z*=4.63, *p*<.001) and HIV+LD groups (*B*=.369, *z*=4.63, *p*<.001). The MOS-HIV mental summary score, as a measure of symptom status, significantly predicted general health perceptions, as measured with the MOS-HIV health transition score, in both the HIV (*B*=.343, *z*=4.12, *p*<.001) and HIV+LD

groups (*B*=.319, *z*=4.12, *p*<.001). The BDI-II, as a measure of symptom status, significantly predicted general health perceptions, as measured with the MOS-HIV health transition score in both the HIV (*B*=.-.204, *z*=-2.94, *p*=.003) and HIV+LD groups (*B*=.-.203, *z*=-2.94, *p*=.003). The final added path included the BDI-II, as a measure of symptom status, which significantly predicted overall QOL, as measured with the Satisfaction with Life Scale, in both the HIV (*B*=.387, *z*=-6.84, *p*<.001) and HIV+LD groups (*B*=.358, *z*=-6.84, *p*<.001).

5.11.3 Secondary Hypothesis 2.3

Hypothesis: Functional status has a direct effect on general health perceptions in persons living with HIV without liver disease and in persons living with HIV+LD.

There was no significant direct effect of functional status, as measured with the MOS-HIV physical summary score, on general health perceptions, as measured with either the Perception of Illness visual analogue score or the MOS-HIV health transition score, in persons with HIV without liver disease or in persons living with HIV+LD.

5.11.4 Secondary Hypothesis 2.4

Hypothesis: General health perceptions have a direct effect on overall QOL in persons living with HIV without liver disease and in persons living with HIV+LD.

There was no significant direct effect of general health perceptions, as measured by either the Perception of Illness visual analogue score or the MOS-HIV health transition score, on overall QOL, as measured by the Satisfaction with Life Scale, in either group.

5.12 EXPLORATORY AIM

The exploratory aim was to identify whether there were different relationships with regard to the characteristics of the individual (age, gender, ethnicity/race, and number of years of education) and the environment (social support and household income) between and among persons living with HIV without liver disease and persons living with HIV+LD.

The SEM was tested to explore the covariates including characteristics of the individual (age, gender, ethnicity/race, and number of years of education) and characteristics of the environment (social support [measured with the mean score on the Inventory Support Evaluation List (ISEL)], and household income (measured as total gross annual household income). This was an exploratory aim as this research study was not statistically powered to test these relationships. Because there was no difference between the HIV model and the HIV and liver disease model, the final constrained multi-sample SEM was applied with the covariates included. The exogenous variable biological/physiological factors was not hypothesized by Wilson and Cleary (1995) to be predicted by the characteristics of the individual or characteristics of the environment and therefore was not included in the covariance matrix tested. In order to test for the covariates, multiple pathways were added. Model paths included the following: paths from each of the four selected demographic characteristics to the four endogenous variables (symptom status, functional status, general health perceptions and overall QOL) (16 paths); correlations among the four selected demographic characteristics (6 paths) and paths from each of the four endogenous variables to the two characteristics of the environment (household income and social support), along with the correlation between those two characteristics (9 paths). These paths are depicted graphically in Figure 11.

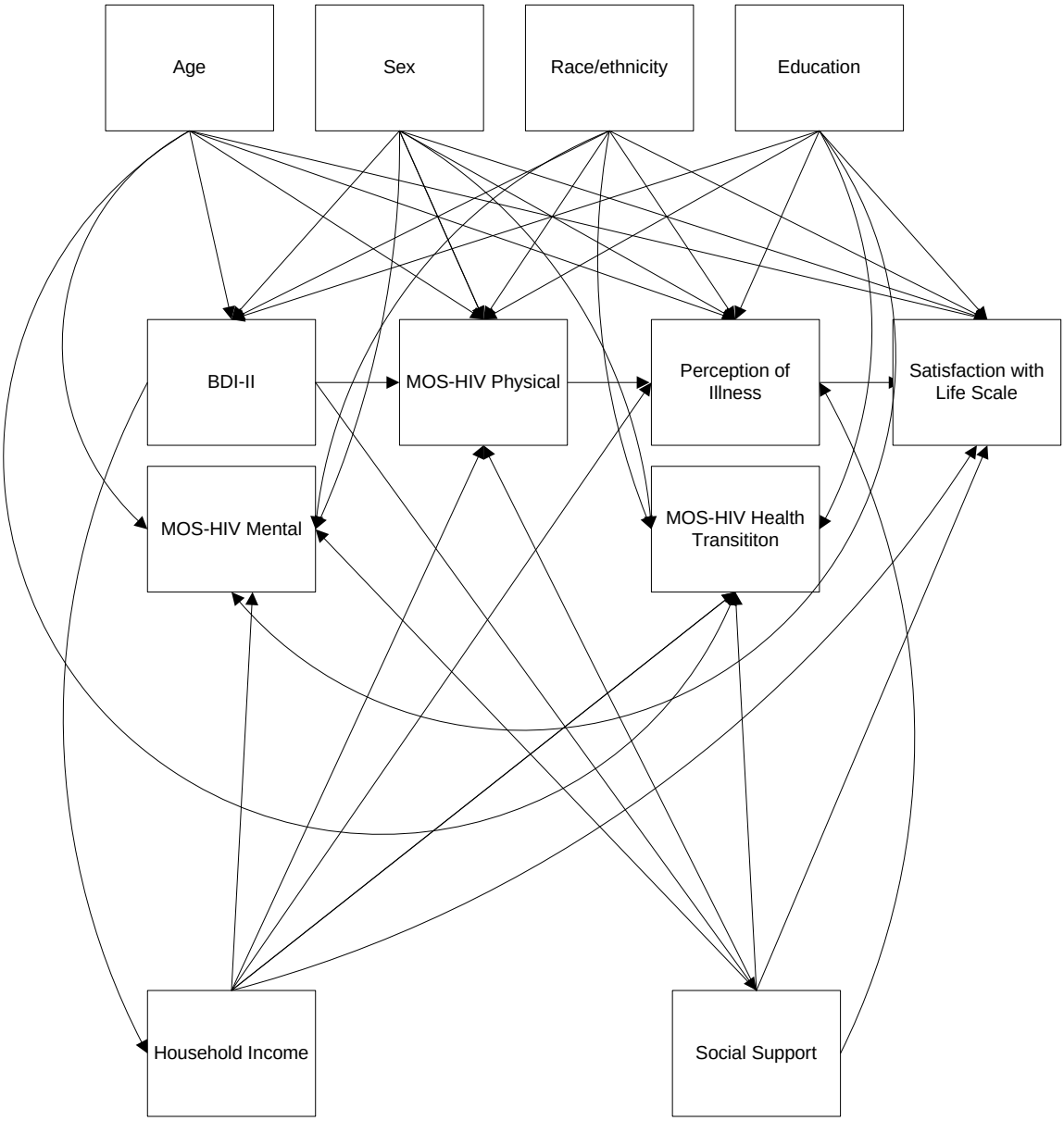


Figure 11. *Additional 36 Covariate Relationships Tested in Exploratory SEM*

The findings of the 36 additive covariance pathways did not improve the multi-sample SEM nor did the added pathways better explain the relationships between the primary model variables. Therefore, none of the covariates (age, sex, race/ethnicity, years of education, ISEL, or household income) were added to the model. Some of the characteristics of the individual and environment had significant independent relationships without affecting the overall model fit. The significant independent relationships are noted below and listed in Table 21.

In the Wilson and Cleary (1995) model of HRQOL the covariate of age, as a measure of characteristics of the individual, only predicted the endogenous variable of functional status, as measured by the MOS-HIV physical summary score (*B*=.069, *z*=-1.984, *p*=.047). Age was not related to measures of symptom status, general health perceptions, or overall QOL. Sex as a covariate in the model did not correlate or predict any of the endogenous variables in the model. Race as a covariate in the model was found to have three independent significant paths. The first path that race predicted was symptom status, as measured by the MOS-HIV mental summary score (*B*=.091, *z*=2.204, *p*=.028). The second path predicted by race was functional status, as measured by the MOS-HIV physical summary score (B=.125, *z*=3.350, *p*=.001). The last path predicted by race was general health perceptions, as measured by the MOS-HIV health transition score (*B*=.148, *z*=3.443, *p*=.001). Race was not related to symptom status, as measured by the BDI-II, or overall QOL, as measured by the Satisfaction with Life Scale. Years of education did not correlate or independently predict any of the endogenous variables in the identified model.

The characteristics of the environment as measured by the ISEL (social support) and household income had significant independent covariant relationships to the model parameters. Specifically, self-reported social support, as measured with the ISEL, had an independent effect

on symptom status at significance levels of <.001 as measured by both the BDI-II (*B*=.517, *z*=-11.936, *p*<.001) and MOS-HIV mental summary score (*B*=.525, *z*=11.685, *p*<.001). The ISEL score as a covariate in the model also independently predicted general health perceptions, as measured by the Perception of Illness visual analogue scale (*B*=.228, *z*=4.180, *p*<.001). Lastly, overall QOL, as measured by the Satisfaction with Life Scale, was independently predicted by the ISEL (*B*=.155, *z*=2.707, *p*=.007). The ISEL score was not independently related to measures of functional status. Gross annual household income, as a measure of characteristics of the environment, had three significant independent paths. First, gross annual household income as a covariate in the model predicted symptom status by both the BDI-II (*B*=.104, *z*=-2.392, *p*=.017) and the MOS-HIV mental summary score (*B*=.113, *z*=2.488, *p*=.013). Gross annual household income also independently predicted functional status, as measured by the MOS-HIV physical summary score (*B*=.165, *z*=4.024, *p*<.001), but did not predict measures of general health perception or overall QOL. The significant retained independent multi-group SEM covariate pathways are depicted in Figure 12.

Table 21. *Covariate z-scores and p-values as Related to Measures Assessing Primary Model Variables*

Variable	Covariates					
	Characteristics of the Individual				Characteristics of the Environment	
Measure	Age *z*-score (*p*-value)	Sex *z*-score (*p*-value)	Race *z*-score (*p*-value)	Education *z*-score (*p*-value)	ISEL *z*-score (*p*-value)	Income *z*-score (*p*-value)
Symptom Status						
BDI	-1.400	.511	-1.284	-.330	-11.936	-2.392
	(.162)	(.609)	(.199)	(.741)	(<.001) ***	(.017) *
MHS	1.136	-1.562	2.204	-.466	11.685	2.488
	(.256)	(.118)	(.028) *	(.641)	(<.001) ***	(.013) *
Functional Status						
PHS	-1.984	.216	3.350	-.165	-1.198	4.024
	(.047) *	(.829)	(.001) **	(.869)	(.231)	(<.001) ***
General Health Perceptions						
POI	-1.009	1.016	-.522	1.234	4.180	-1.224
	(.313)	(.310)	(.602)	(.217)	(<.001) ***	(.221)
HTS	-1.710	1.138	3.443	-.749	.911	-.420
	(.087)	(.255)	(.001) **	(.454)	(.362)	(.674)
Overall Quality of Life						
SLS	.416	.384	.328	-1.539	2.707	.634
	(.677)	(.701)	(.743)	(.124)	(.007) **	(.526)

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. Measures: BDI= Beck Depression Inventory-II; MHS= MOS-HIV Mental Summary Score; PHS= MOS-HIV Physical Summary Score; POI= Perception of Illness; HTS= MOS-HIV Health Transition Score; SLS= Satisfaction with Life; Age= age in years; Sex= male or female; Race= white/non-white; Education= years of education; ISEL= Inventory Support Evaluation List; Income= Total gross annual household income.

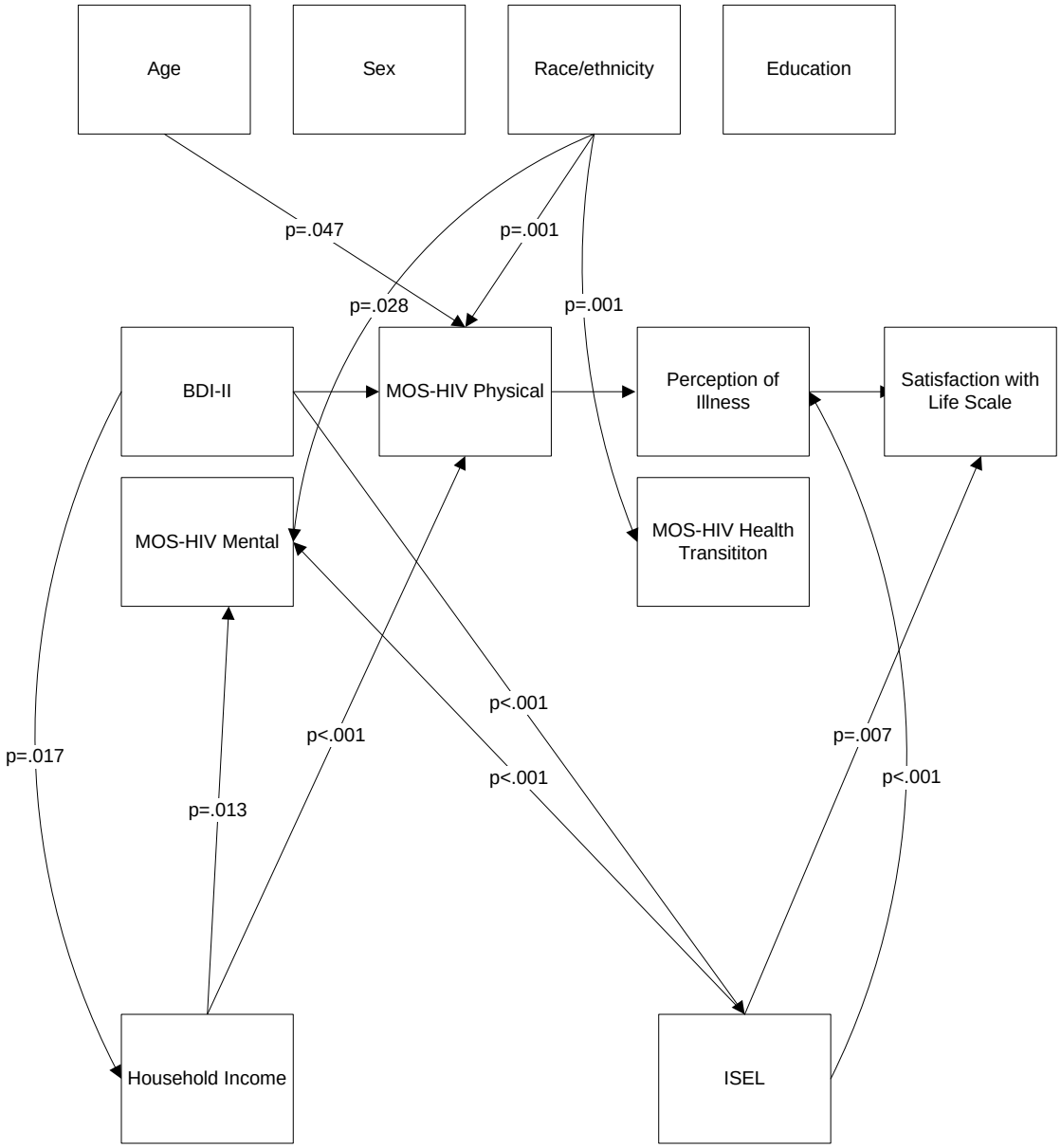


Figure 12. *SEM with Significant Covariate Model Pathways Retained*

6.0 DISCUSSION AND IMPLICATIONS

Over the past decade, persons with human immunodeficiency virus (HIV) are living longer and therefore are more likely to suffer significant comorbidities due to a number of liver related factors (e.g., anemia, infectious hepatitis, lipodystrophy, and hepatocellular carcinoma), many of which may ultimately result in significant morbidity or mortality (Tedaldi et al., 2003). Both HIV and liver disease have been shown to have a significant effect on one's health-related quality of life (HRQOL) (Fleming et al., 2004; Foster et al., 1998; Hickman et al., 2004; Nicholas et al., 2005; Pojoga et al., 2004). Research suggests that persons living with HIV and liver disease (HIV+LD), a growing number of individuals (W. R. Kim, 2002), may have a poorer HRQOL than persons with HIV who do not have liver disease (Tsui et al., 2007).

Wilson and Cleary (1995) have hypothesized a model of HRQOL that has been tested in several studies of persons living with HIV (Clingerman, 2004; Phaladze et al., 2005; Sousa et al., 1999; Sousa & Kwok, 2006; Vidrine et al., 2005). However, after conducting a search of the literature using Medline, Ovid, Pubmed, and Web of Science from 1995-2007, the researcher concluded that the Wilson and Cleary (1995) model of HRQOL had not been tested in persons with HIV+LD. Thus, the research presented herein was novel as it assessed the multi-faceted variables, as hypothesized by Wilson and Cleary (1995), that potentially impact an individual's HRQOL in a total sample (N=532) of persons living with HIV and further divided into persons living with HIV without liver disease (n=305) and persons with HIV+LD (n=227). This chapter

reviews and discusses the main findings of this dissertation, describes the implications this work has for future research, and identifies limitations of the study.

6.1 SUMMARY OF THE STUDY

The purpose of this secondary analysis was to test the fit of the Wilson and Cleary (1995) model of HRQOL in two groups of patients: persons living with HIV without liver disease and persons living with HIV+LD. Wilson and Cleary have theorized that HRQOL has five components: biological/physiological factors, symptom status, functional status, general health perceptions, and overall quality of life (QOL) and proposed a directional model.

The primary aim was to test the null hypothesis, wherein, the hypothesized model will hold true with the components (biological/physiological factors, symptom status, functional status, general health perceptions, and overall QOL) in persons living with HIV without liver disease and in persons living with HIV+LD. The null hypothesis was that there would be no difference in the model in persons living with HIV without liver disease and in persons living with HIV+LD.

The Wilson and Cleary (1995) model of HRQOL was tested with the five components operationalized as follows: 1) biological/physiological factors (HIV viral load, CD4 count), 2) symptom status [Beck Depression Inventory II (Beck et al., 1996), Medical Outcomes Study HIV Health Survey MOS-HIV, (Wu et al., 1997) mental summary score] 3) functional status [missed appointments, (MOS-HIV) physical summary score], 4) general health perceptions [Perception of Illness visual analog scale, (J. A. Erlen, personal communication, February 1, 2006), MOS-HIV health transition score], and 5) overall QOL [Satisfaction with Life Scale

(Diener et al., 1985), MOS-HIV overall QOL]. In addition, characteristics of the individual (age, sex, race/ethnicity, and years of education) and characteristics of the environment (Inventory Support Evaluation List (ISEL), (S. Cohen et al., 1985), gross annual household income) were also explored as covariates after initial model testing.

This secondary analysis used de-identified baseline and medical record review data from a parent study testing interventions to improve medication adherence to antiretroviral therapy in persons living with HIV (R01 NR04749, Principal Investigator, J. A. Erlen). The initial parent study's (Study 1) baseline data were collected between April 1999 and November of 2002 (*n*=215). The continuation of the parent study (Study 2) had baseline data collected between March 2004 and March 2007 (*n*=352). For the purposes of this dissertation, data from Study 2 collected before January 19, 2007 were included in the analysis. Exempt approval was obtained from the University of Pittsburgh Institutional Review Board (IRB) for a retrospective secondary analysis (IRB #0603071, see Appendix B).

Control participants from Study 1 (persons who were not randomized to the intervention arm) were invited to enroll in Study 2. Baseline data collected at the time of their enrollment in Study 2 were used for the secondary data analysis (*n*=35) rather than the Study 1 baseline data. The overall sample for this analysis was 532 persons living with HIV. The overall study algorithm is depicted in Figure 7 of Chapter 5.

6.2 SUMMARY OF THE FINDINGS

The Wilson and Cleary (1995) model of HRQOL stipulates that the five primary model components (biological/physiological factors, symptom status, functional status, general health

perceptions, and overall QOL) build upon one another in a set order. The current study tested the null hypothesis that Wilson and Cleary's model (1995) of HRQOL would hold true for both persons living with HIV without liver disease as well as persons with HIV+LD.

The data were initially screened for missing data, outliers, and normality. Then individuals with comorbid liver disease were identified. Liver disease status was merged first from medical records then from self-reported data. In addition, the primary model measures for the five variables were assessed for internal consistency in both groups and found to have adequate to good reliability (see Table 9 in Chapter 5). The fifth component of the Wilson and Cleary (1995) model of HRQOL, overall QOL, was initially operationalized to include the MOS-HIV overall QOL score and the Satisfaction with Life Scale. After an exploratory factor analysis of the total MOS-HIV tool (see manuscript in Appendix A), the MOS-HIV overall QOL subscale score was found to be included in both the physical and mental summary scores of the MOS-HIV. Therefore, the MOS-HIV overall QOL subscale score perfectly correlated to one of the measures of symptom status (MOS-HIV mental summary score) and one of the measures of functional status (MOS-HIV physical summary score). Because this association would have biased the analysis in favor of finding a good fitting model, the MOS-HIV overall HRQOL was excluded and the Satisfaction with Life Scale was used as the only measure for the primary model variable overall QOL.

Next, the relationships between the measures were assessed separately in persons with HIV without liver disease and in persons with HIV+LD between Study 1 and Study 2 (see Tables 10 and 11 in Chapter 5). The relationships between the grouped data for HIV+LD were similar enough to warrant combining the two studies. Selected demographic characteristics were assessed for the samples from Study 1 and Study 2. Participants in Study 2 were older and more

likely to be non-white; a greater proportion reported incomes below $10,000 as compared to Study 1. The differences in the study measures across Study 1 and Study 2 were also assessed. The only noteworthy difference in the study measures was self-reported depressive symptoms, as measured with the BDI-II. Persons in Study 2 had a score averaging 3.25 points higher on the BDI-II than persons in Study 1.

After the data from Study 1 and Study 2 were merged, the HIV group and HIV+LD groups were identified once again. Selected demographic characteristics were assessed and the two groups (HIV group and HIV+LD group) were found to be relatively homogeneous with regard to sex, race/ethnicity and number of years of formal education (see Table 12 in Chapter 5). Persons in the HIV+LD group were significantly older than those in Study 1 (t=-4.71 (530), p=<.001), on average approximately two and a half years older 40.26 ±7.64 (Study 1) vs. 43.66 ±7.73 (Study 2). A significantly greater percentage of persons in Study 2 (55.1%) reported incomes below $10,000 as compared to Study 1 (37.8%) (χ^2=22.16 (5), p<.001).

The final step before running the structural equation model (SEM) was to assess the correlations and descriptive statistics among the measures for the overall HIV group (n=305), the overall HIV+LD group (n=227), and the overall sample (N=532). Each of the five primary model variables was assessed: biological/physiological was measured with HIV viral load, and CD4 count; symptom status was measured with the BDI-II and MOS-HIV mental summary score; functional status was measured with missed appointments (missed "yes" vs. "no") and the MOS-HIV physical summary score; general health perceptions were measured with the Perception of Illness visual analog score and the MOS-HIV health transition score; and overall QOL was assessed with a single tool (as previously indicated), the Satisfaction with Life Scale. Missed appointments was found to have a weak association with the other model measures in both the

HIV and HIV+LD groups (see correlational matrices in Chapter 5, Tables 15-17). Thus, because a structural equation model (SEM) assesses the relationships between variables, the lack of even a moderate correlation between missed appointments and other variables in the model resulted in this measure being eliminated from the analysis. Therefore, the functional status variable in the model was assessed using only the MOS-HIV physical summary score.

The measures for the variables of the Wilson and Cleary (1995) model of HRQOL were compared between the HIV group and the HIV+LD group (see Table 18 in Chapter 5). Overall, the data showed that persons with HIV+LD had significantly lower CD4 counts (M=492.25, SD±341.98 vs. M=435.43, SD±316.30; t=-2.01, p=.044), and more self-reported depressive symptoms (M=13.89±11.68 vs. M=16.34, SD±11.22; t=-2.42 (525), p=.016) than the HIV group, as measured with the BDI-II. Additionally persons in the HIV group had higher self-reported mental function (t=2.96 (520), p=.003), as measured by the MOS-HIV mental summary score (M=46.77, SD±12.24) compared to the HIV+LD group (M=43.63, SD±11.59) and significantly higher functional status, as measured with the MOS-HIV physical summary score (M=43.47, SD±11.28 vs. M=39.51, SD±11.72; t=3.90 (520), p<.001). There were no other significant differences in the model measures between the two groups.

6.2.1 Primary Aim Findings

In this study, the null hypothesis was found to hold true; all model components (biological/physiological factors, symptom status, functional status, general health perceptions, and overall QOL) were necessary to make up HRQOL in the total sample of persons living with HIV (N=532). A single group robust SEM was performed for both the HIV group without liver disease and the HIV+LD group. Although the initial baseline operationalized Wilson and Cleary

(1995) model of HRQOL did not fit the data well in either group, a good-fitting model was found with relatively few modifications (Satorra-Bentler χ^2=40.307 (38), Comparative Fit Index=.998, Root mean-square error of approximation=.017). Interestingly, there were no significant differences in the SEM between the two groups when using the chi-square difference test. The modified model fit the data in both the HIV group without liver disease and the HIV+ LD group. That is, all five model components were necessary in both groups, such that they followed the same path and had similar fit indices. However, the path from CD4 count to Perception of Illness was different between the HIV group and the HIV+LD group. In the HIV+LD group, the path was not initially identified with the LaGrange Multiplier as making a significant difference in the model chi-square. That is, in the HIV group without liver disease, there was a positive association between CD4 counts and Perception of Illness scores such that higher CD4 counts (better indicator of health) was associated with higher scores on the Perception of Illness scale (better perceived control over managing their illness). In those persons with HIV+LD, this relationship was not found to be as significant based on the change in model chi-square.

To determine if this path (CD4 count to Perception of Illness) existed in the HIV+LD group, the SEM was run again constraining, or forcing this path, to determine model fit. The constrained path from CD4 count to Perception of Illness fit the HIV+LD data and was therefore included. The final multi-group SEM with model parameters constrained allowed for identification of significant pathways influencing HRQOL. Therefore, the null hypothesis was not rejected.

6.2.2 Secondary Aims Findings

The secondary aims were to test if each of the five variables was directly linked as hypothesized by Wilson and Cleary (1995).

There was a significant direct effect of biological/physiological factors on symptom status in both persons with HIV and persons with HIV+LD. CD4 count, as a measure of biological/physiological factors, significantly predicted symptom status, as measured with the MOS-HIV mental summary score in both the HIV (B=.120, z=2.44, p=.015) and HIV+LD groups (B=.113, z=2.44, p=.015). HIV viral load, as a measure of biological/physiological factors, significantly predicted symptom status, as measured with the MOS-HIV mental summary score in both the HIV (B=.103, z=2.10, p=.036) and HIV+LD groups (B=.107, z=2.10, p=.036). The MOS-HIV mental summary score, as a measure of symptom status, significantly predicted functional status, as measured with the MOS-HIV physical summary score, in both the HIV (B=.669, z=11.52, p<.001) and HIV+LD groups (B=.644, z=11.52, p<.001). In both the HIV and HIV+LD groups, the biological/physiologic factors had a significant direct effect on symptom status, which in turn had a significant direct effect on functional status. However, there were no significant direct effects of functional status on general health perceptions or general health perceptions on overall QOL. Thus, only two of the four direct links were found to be significant in this sample of persons living with HIV and HIV+LD.

Additional significant paths were identified using the LaGrange Multiplier from biological/physiological factors to general health perception (CD4 count to Perception of Illness) in both the HIV group (B=.122, z=2.97, p=.003) and the HIV+LD group (B=.103, z=2.97, p=.003), and four paths linking symptom status, as measured by the BDI-II and the MOS-HIV mental summary score, to distal components of the Wilson and Cleary (1995) model of HRQOL.

Three of the identified paths linked symptom status directly to general health perceptions and one linked symptom status directly to overall quality of life (see Figure 10 in Chapter 5). The MOS-HIV mental summary score, as a measure of symptom status, significantly predicted general health perceptions, as measured with the Perception of Illness visual analog scale in both the HIV (B=.410, z=4.63, p<.001) and HIV+LD groups (B=.369, z=4.63, p<.001). The MOS-HIV mental summary score, as a measure of symptom status, significantly predicted general health perceptions, as measured with the MOS-HIV health transition score, in both the HIV (B=.343, z=4.12, p<.001) and HIV+LD groups (B=.319, z=4.12, p<.001). The BDI-II, as a measure of symptom status, significantly predicted general health perceptions, as measured with the MOS-HIV health transition score in both the HIV (B=-.204, z=-2.94, p=.003) and HIV+LD groups (B=-.203, z=-2.94, p=.003). The final added path included the BDI-II, as a measure of symptom status, which significantly predicted overall QOL, as measured with the Satisfaction with Life Scale, in both the HIV (B=.387, z=-6.84, p<.001) and HIV+LD groups (B=.358, z=-6.84, p<.001).

Because the LaGrange Multiplier identified the most influential paths across all of the measures, additional pathways were identified. These additional paths identified links between biological/physiological factors to general health perceptions and symptom status to both general health perceptions and overall QOL. Thus while biological/physiological factors did influence the model, the vast majority of the variability in the model was explained by self-reported depressive symptoms and mental health status regardless of group membership.

6.2.3 Exploratory Aims Findings

The exploratory aim was to assess the relationships between characteristics of the individual (age, sex, race/ethnicity, and years of education) and characteristics of the environment (Inventory Support Evaluation List [ISEL], gross annual household income) as covariates in the SEM. The addition of these covariates did not improve the overall model fit. However, of the 36 covariance pathways that were added to the good-fitting model, 11 individual parameters were found to be significant. There were four significant pathways found stemming from the characteristics of the individual. Three of the four significant pathways came from race/ethnicity and the remaining path related age to functional status. The covariate of age, as a measure of characteristics of the individual, predicted the endogenous variable of functional status, as measured by the MOS-HIV physical summary score (*B*=.069, *z*=-1.984, *p*=.047). Age was not related to measures of symptom status, general health perceptions, or overall QOL. Race as a covariate in the model was found to have three independent significant paths. The first path that race predicted was symptom status, as measured by the MOS-HIV mental summary score (*B*=.091, *z*=2.204, *p*=.028). The second path predicted by race was functional status, as measured by the MOS-HIV physical summary score (B=.125, *z*=3.350, *p*=.001). The last path predicted by race was general health perceptions, as measured by the MOS-HIV health transition score (*B*=.148, *z*=3.443, *p*=.001). Sex and years of education were not significantly related to the main Wilson and Cleary (1995) model components (biological/physiological factors, symptom status, functional status, general health perceptions, and overall QOL).

The characteristics of the environment as measured by the ISEL (social support) and household income had significant independent covariant relationships to the model parameters. Four paths linked from social support and three paths linked from gross annual household

income. Specifically self-reported social support, as measured with the ISEL, had an independent effect on symptom status at a significance level of <.001 as measured by both the BDI-II (*B*=.517, *z*=-11.936, *p*<.001) and MOS-HIV mental summary score (*B*=.525, *z*=11.685, *p*<.001). The ISEL score as a covariate in the model also independently predicted general health perceptions, as measured by the Perception of Illness visual analogue scale (*B*=.228, *z*=4.180, *p*<.001). Lastly, overall QOL, as measured by the Satisfaction with Life Scale, was independently predicted by the ISEL (*B*=.155, *z*=2.707, *p*=.007). Gross annual household income, as a measure of characteristics of the environment, had three significant independent paths. First, gross annual household income as a covariate in the model predicted symptom status by both the BDI-II (*B*=.104, *z*=-2.392, *p*=.017) and the MOS-HIV mental summary score (*B*=.113, *z*=2.488, *p*=.013). Gross annual household income also independently predicted functional status, as measured by the MOS-HIV physical summary score (*B*=.165, *z*=4.024, *p*<.001). The significant retained independent multi-group SEM covariate pathways are depicted in Figure 12 of Chapter 5.

6.3 CONCLUSIONS

This study applied a sophisticated statistical analysis, SEM, to test a theoretical model of HRQOL as described by Wilson and Cleary (1995). The assessment of HRQOL is useful not only for capturing important facets of a person's self-perception of how illness affects everyday functioning, but also as a valid measure of clinical outcome when assessing interventions (Lorenz et al., 2006; Tsui et al., 2007). This model, as initially conceptualized by Wilson and Cleary (1995), has been found useful to describe HRQOL in persons living with HIV (Phaladze

et al., 2005; Sousa & Kwok, 2006; Vidrine et al., 2005). However, persons living with HIV have an increased risk of developing liver disease as related to toxic effects of antiretroviral therapy yielding hepatitis and other liver disease (Lorenz et al., 2006; NIH, 2002; Tsui et al., 2007). No study to date has tested the Wilson and Cleary (1995) model in persons living with HIV+LD. Testing the Wilson and Cleary (1995) model of HRQOL offered information regarding both the nature and direction of the relationships and the structure of the components that make up HRQOL in persons with HIV without liver disease and in persons with HIV+LD. Based on the aforementioned findings it was concluded that a modified Wilson and Cleary (1995) model of HRQOL fit the data in a group of persons living with HIV, as well as persons living with HIV+LD. These findings are similar to other studies that have used the Wilson and Cleary (1995) model in clinical samples with heart failure (Heo et al., 2005), gastrointestinal bleeding (Sousa & Williamson, 2003), diabetes (Chia, 2007), and Hodgkin's lymphoma (Wettergren et al., 2004). Therefore, the model proposed by Wilson and Cleary has now been supported in a sample of individuals with HIV+LD.

6.4 DISCUSSION OF THE FINDINGS

The findings of this research show that both health-related factors, such as CD4 count and HIV viral load, and social factors, such as self-reported mental health and depressive symptoms, were important indicators of HRQOL in this sample of persons living with HIV (*N*=532). These findings imply that symptom status, specifically depressive symptoms and altered mental function, are key issues in determining HRQOL in person with HIV without liver disease and in persons with HIV+LD.

6.4.1 Relationship to the Existing Literature

This study supports prior theoretical work by researchers who tested the Wilson and Cleary Model (1995) of HRQOL in persons living with HIV (Clingerman, 2004; Phaladze et al., 2005; Sousa et al., 1999; Sousa & Kwok, 2006; Vidrine et al., 2005). Although each of the aforementioned researchers used different measures (see Table 1 in Chapter 2) to measure overall QOL, and not all of the researchers tested the model in its entirety, the results were similar in that the Wilson and Cleary (1995) model of HRQOL was found to predict relationships among the variables. The predictions as hypothesized in the model were found when using a series a multiple regressions (Clingerman, 2004; Phaladze et al., 2005; Sousa et al., 1999) and when using SEM (Sousa & Kwok, 2006; Vidrine et al., 2005). In this study, the theoretical framework of HRQOL defined by Wilson and Cleary (1995) was found to be useful in identifying the core relationships that influenced HRQOL in persons with HIV with and without LD as a comorbidity. The current analysis was more sophisticated than a series of multiple or simple linear regressions, since SEM allowed for simultaneous testing of all the relationships among the hypothesized components of HRQOL according to Wilson and Cleary (1995).

Biological/physiological factors (CD4 count, HIV viral load) did have a direct effect, although limited, in the overall analysis, which supports prior findings from HIV studies (Murri et al., 2003). Murri and colleagues (2003) included 809 persons with HIV with a similar percentage of males (68%) as this study who were also taking highly active antiretroviral therapy. However, the current findings from this study do not necessarily support or refute research assessing the relationship between chronic liver disease and specific biologic/physiologic factors and symptom status (Hauser et al., 2004), as this dissertation did not

include a specific measure of biological/physiological liver function (e.g., liver function tests or biopsy). The parent study was not designed to test specific comorbid patient populations who also had HIV infection. Furthermore, as persons living with HIV are living longer CD4 counts may no longer be the best indicator for biological/physiological function. Duration of illness or duration on antiretroviral therapy may be more indicative of disease progression.

There was a significant direct effect of symptom status on functional status in both groups. Symptom status was represented in the model by scores on the BDI-II and the MOS-HIV mental summary score. Furthermore, symptom status had significant effects in the SEM on multiple components of HRQOL. The additional pathways between symptom status and other components, such as overall QOL, have been noted by other researchers (Albert et al., 1995; Anandan, Braveman, Kielhofner, & Forsyth, 2006; Breitbart et al., 1996; Crystal, Fleishman, Hays, Shapiro, & Bozzette, 2000; Henderson, Erlen, & Kim, 2007; Hudson, Lee, & Portillo, 2003; Hughes, 2004; Murri et al., 2003; Phaladze et al., 2005; Sousa et al., 1999; Sousa & Kwok, 2006; Vidrine et al., 2005; Voss, 2005; Wilson & Cleary, 1995; Wu et al., 1997), and suggest that self-reported depressive symptoms and mental function are important indicators of HRQOL. The findings of such a relationship were similar to those of Sousa and colleagues (1999); however, they used different measures, including a HIV symptom specific checklist, and they assessed persons with HIV (*N*=142) that had an AIDS diagnosis prior to the use of highly active antiretroviral therapy. The findings in this study also support those of Reynolds et al. (2004) who found a negative relationship between depressive symptoms and positive general health perceptions in a sample of persons with HIV (*N*=980). Self-reported depressive symptoms were found in both the HIV and HIV+LD groups; this is a common finding in both persons living with

HIV and persons with HIV+LD (Mrus et al., 2006; NIH, 2002; Shiffman, 1998; Soriano et al., 2005).

The measure of missed appointments was not related to the other measures in the primary SEM. Therefore, categorized missed appointments ("yes" or "no" did not miss HIV medical appointments) was not included in the SEM/path analysis. These findings do not support those of Holzemer and colleagues (1999) in which lower CD4 counts and higher HIV viral loads were related to more missed appointments in a sample (N=420, 80% male) living with HIV. The average CD4 count in the sample in Holzemer and colleagues study (1999) was 321 cells/ml which is considerably lower than this study (average CD4 count of 455 cells/ml). Missed appointments were measured continuously by Holzemer and colleagues (1999) with the number of missed appointments quantified annually, which was likely a more powerful measure than the categorical measure used in this study. Moreover, self-reported depressive symptoms were not related to missed appointments as others have reported (Aloisi et al., 2002; Beach et al., 2006; Berg et al., 2005; Giordano et al., 2003; Nacher et al., 2006; Weiser et al., 2006). The lack of a relationship with missed appointments was likely due to the categorical nature of the measure and an inconsistent definition or procedure for what was defined as missed appointments across differing data collection sites.

There was no significant direct effect of functional status on general health perceptions nor was there a significant direct effect of general health perceptions on overall QOL as others have demonstrated in diverse HIV samples (Phaladze et al., 2005; Sousa et al., 1999; Wu, Revicki et al., 1997). The overall SEM did include general health perceptions and overall QOL as they were related to other model variables yielding a more parsimonious model including a direct path from symptom status to general health perceptions and overall QOL as Sousa and

colleagues found (*N*=917) in a recent HIV study (Sousa, Tann, & Kwok, 2006). This was one of the added relationships/pathways that was statistically identified by the LaGrange Multiplier that helped to improve the final SEM model in this dissertation. Sousa and colleagues (2006) found the Wilson and Cleary (1995) model of HRQOL to hold true in persons living with HIV but found similar results as the majority of the model was influenced by symptom status rather than the other model variables.

Other possible factors influencing HRQOL were assessed with the exploratory analyses. Specifically, characteristics of the individual and of the environment were investigated as to their relationship to the model measures. Given the covariates that were considered, an additional 36 parameters were assessed simultaneously. While the scope of this study did not allow for adequate statistical power for these analyses, the exploratory findings did identify that sex and years of education were not significantly related to the five main Wilson and Cleary (1995) model components (biological/physiological factors, symptom status, functional status, general health perceptions, and overall QOL). Although the overall model was not improved by the addition of the covariates, several of the covariates were found to be significantly related to several of the individual measures. The lack of a relationship according to sex may be related to the disproportionate numbers of males and females in the study (70% male, 30% female). Race/ethnicity as a characteristic of the individual was associated with MOS-HIV mental summary scores, MOS-HIV physical summary scores, and MOS-HIV health transition scores. Examining the standardized z-scores (see Chapter 5, Table 21) for these associations, being "non-white" significantly predicted higher scores on these measures. This is an interesting finding as the data and *z*-transformation scoring was based on white males in the United States with HIV in the early to mid 1990's (Wu, 1996; Wu, Hays et al., 1997; Wu, Revicki et al., 1997;

Wu et al., 1991). In a review of the literature addressing African Americans with liver disease, Howell et al. (2000) found outcomes for African Americans to be poorer than Caucasians across a number of measures, including response to treatment, but no studies reported assessing HRQOL. Thus, future studies addressing race and HRQOL would seem to be warranted. Age was related only to MOS-HIV physical summary scores and demonstrated that older age was associated with lower self-reported physical function.

Social support, as measured with the ISEL, was associated with both general health perceptions, as measured by the Perception of Illness visual analog scale, and overall QOL, as measured with the Satisfaction with Life Scale. Social support, as measured with the ISEL, was also significantly related to symptom status, as measured with the BDI-II and MOS-HIV mental summary score. Total gross annual household income was related to MOS-HIV mental and physical summary scores. Thus, characteristics of the environment, as others have shown, have relevance to the components of HRQOL (Dray-Spira & Lert, 2003; McFarland et al., 2003; Rapkin & Schwartz, 2004).

6.5 LIMITATIONS

The following section addresses the limitations of the presented research. These include limitations related to the design, sample, measures, analytical approach, and generalizability.

6.5.1 Design

A significant limitation to this analysis was the secondary nature of the study. The parent study was not designed to test the Wilson and Cleary (1995) model of HRQOL. Thus, the measures selected were those available and may not have been the best means of assessing the variables. There are causal relations within the Wilson and Cleary (1995) model of HRQOL suggesting that one variable may come before and build on the next. To assess the causal relationships, a longitudinal study would be necessary with data gathered from different time points. The data used in this study were cross-sectional and therefore the causal relationships were not able to be assessed.

6.5.2 Sample

Combining data from Study 1 and Study 2 was a potential strength as it better powered the study; however, there were some differences between the samples in the two studies. The timeline of the two studies may have influenced those categorized as having HIV without liver disease and those with HIV+LD as mandatory laboratory reporting of the Hepatitis C virus did not begin until 2002 (NIH, 2002). In addition, persons living with HIV on highly active antiretroviral therapy for a longer duration may have been more likely to suffer liver related complications as their medication regimes can be liver toxic (Sax & Gathe, 2005; Tsui et al., 2007). Duration on highly active antiretroviral therapy was not included as a measure for this analysis as this information was that available from the parent study. Also, treatment issues were not measured in this study. Some of the persons living with HIV+LD may have been or were currently being treated for infectious hepatitis with chemotherapy types of medications that are known to have

effects on depressive symptoms and possibly result in fatigue/anemia and altered cognitive function. Furthermore, liver disease could potentially be a proxy measure of substance abuse, as the hepatitis C virus is most commonly contracted from intravenous drug use and has not been shown to be sexually transmitted (NIH, 2002). This study did not include lipodystropy as a comorbidity that typically goes hand in hand with hyperlipidemia, which is classified as a liver disorder. The category of "other liver diseases" was not very specific; "other liver diseases" was one option that an individual could self-report and was possibly individually defined.

There were additional differences between the samples of Study 1 and Study 2. Overall, participants in Study 2 were older and more likely to be non-white; a greater proportion reported incomes below $10,000 (see Table 12 in Chapter 5). There were higher numbers of non-white minorities enrolled in Study 2 as recruitment sites were added that had different demographics from the Pittsburgh sites used in Study 1. The additional sites (i.e., Cleveland and Akron) had a higher proportion of non-white participants and lower income levels. The difference in age may be spurious. The higher proportion of non-white participants and lower income levels may aid in making this study more generalizable as these differences are more reflective of the overall United States population of persons living with HIV (IOM, 2001).

6.5.3 Measures

The measures used were those available from the parent study and may not have been the best choice for each of the components; however, they were found to have adequate to good reliability in both groups (HIV group and HIV+LD group). Another potential limitation to this study was that the majority of the data were self-reported. Self-reported data are suitable for QOL research as QOL is defined as a subjective perception of the individual. The current study

had mostly self-report measures with the exception of the majority (70% from medical record review) of the biological/physiological factors data. It could be argued that self-reported depressive symptoms may be biased in that scores may be exaggerated or minimized by the participant. It is considered optimal to have both objective and subjective measures of a latent construct for more precise measurement (Byrne, 2006, pp. 261-277). The main findings of a significant relationship between depressive symptoms and other measures could be limiting as there was no objective measure of depression.

Additional measurement limitations were the processes in which all of the data were gathered. There were likely issues of how missed appointments were defined at the various clinics/data collection sites. It may not be clear if a rescheduled appointment was also a missed appointment or if a missed appointment was designated as not calling to cancel the day prior to the appointment. The categorized missed appointment variable was used as this same measure was collected in both Study 1 and Study 2. Continuous measures of annual missed appointments were instituted in Study 2 and would be considered a better measure, but were not available for Study 1 data. Furthermore, there was a potential for bias if missed appointments were not defined in the same way in the various clinics/data collection sites. There may have been issues regarding how the data were recorded, coded, and entered as there were multiple data collectors and research assistants across the nine-year duration of the parent study.

The parent study protocol required that all participants use an electronic medication adherence monitoring device and pen and paper medication diary for 4 weeks prior to the baseline data collection in order to obtain baseline adherence data. This observation period may have influenced the data. That is, most of the self-reported measures asked participants to rate their symptom status, functional status, general health perceptions, and overall QOL for the prior

4 weeks. Possibly the participants may have focused more on their own health during that 4-week period.

6.5.4 Analytical Approach

Analytic issues that may limit the generalizability of the study findings included the possibility that the study was over-powered. If the sample size is large, differences between groups are likely to be found that may not actually exist. Furthermore, SEM is designed to find statistical relationships among the variables. However, these statistical relationships may not be theoretical or actual associations. The findings may be due to the random relationships of the variables or the data fitting those hypothesized relationships (Bentler, 1990; Bentler & Bonett, 1980; Bentler & Yuan, 1999; Byrne, 2006; K. H. Kim, 2005). SEM tests the relationships among the variables. LaGrange Multiplier tests for all possible solutions to aid the researcher in using theoretical wisdom to identify which additional pathways for model fit are appropriate to allow the best fitting solution to the data (Bentler & Wu, 2002; Byrne, 2006). However, these relationships may not be present. Furthermore, even though statistical significance and a good-fitting model were found, these results may not be clinically meaningful to persons living with HIV with or without LD. On the other hand, SEM is useful in testing a theoretical model of HRQOL, as it allows the researcher to test the multiple components simultaneously.

6.5.5 Generalizability

Health-related quality of life (HRQOL) is a subjective perception; however, this study only provided a baseline perspective of the participants at that one particular point in time. The results

of this analysis are not necessarily generalizable to other HIV or HIV+LD populations (Becker, 1998; IOM, 2001; NIH, 2002). This sample had CD4 counts that were not in the low range (i.e., means for both groups were above 400 per/ml, indicating that the average immune status for both the HIV and HIV+LD group was relatively good. The participants in this sample had to be taking antiretroviral therapy, which is indicated for persons with HIV whose CD4 counts are below 350 per/ml. Therefore, the results of this study may not be generalizable to other groups of persons with HIV who are not being treated with highly active antiretroviral therapy.

Care should be taken in interpreting the findings, as persons living with HIV without liver disease and persons living with HIV+LD may or may not have access to state funding for HIV medications and clinic appointments free of charge. There are such state-funded HIV programs available to individuals living in the states in which the data for this study were collected. Additionally, individuals who agreed to participate in the parent study may not have been representative of the population as a whole. HIV disclosure issues or fears of stigmatization may have kept some individuals from participating in the parent studies if they had not disclosed their HIV status to others or if they were uncomfortable talking about their HIV to strangers. In order to be considered for inclusion in the parent study the participant had to have telephone access to receive nurse delivered telephone interventions. Not having access to a telephone may have further biased the sample recruited.

Furthermore, these results may or may not be applicable to different areas of the country or the world. Persons with HIV living in different areas of the United States, such as urban vs. rural, may have other issues, such as limited access to HIV care, lack of social support resources, or increased stigmatization. Culture and cultural differences may be a factor if one tries to apply these findings beyond North America or even within sectors of North America. One's HRQOL

may have a cultural component; what makes one's perceptions of their HRQOL good in one culture may be different in another culture or environment.

6.6 IMPLICATIONS

The first important goal of this study was to make a novel contribution to the literature regarding HRQOL in persons with HIV+LD. Individuals are living longer; multiple factors affect their HRQOL. The findings provide potential support for the use of the Wilson and Cleary (1995) model of HRQOL in individuals with multiple comorbidies or clusters of symptoms (e.g., depression and altered mental function). The findings of this research increase the theoretical understanding of HRQOL and offer guidance to healthcare professionals in regard to potentially modifiable symptoms such as depression. These modifiable symptoms may then be targeted with disease-specific interventions designed to ultimately improve HRQOL in persons with multiple comorbidities.

The Wilson and Cleary (1995) model is useful as it links clinical indicators to patient-related outcomes, thus, bridging the gap between health-related and socially-identified variables. Therefore, this study has clear clinical applications as the findings indicate that biological/physiological factors and symptom status play important roles in the outcome of HRQOL.

6.6.1 Directions for Future Research

This study should be replicated within the HIV+LD population, as well as other chronic diseases as a prospective longitudinal study with both objective and subjective measures across all of the variables in the Wilson and Cleary (1995) model of HRQOL. Such work will allow for identification of potential causality with theoretical models.

There is no cure for HIV. Therefore, persons living with HIV with or without LD are no longer just trying to survive day to day – but are seeing the future of living with HIV as a chronic disease with debilitating long-term consequences. Direction for a future study needs to include better measures of biological/physiological factors that specifically assess current disease status. Specifically, work needs to focus on a specific liver disease that may significantly impact persons living with HIV such as the Hepatitis C virus or on specific symptoms that affect the individual most, such as depressive symptoms.

Depressive and mental symptoms had the strongest relationship to the other model measures suggesting that a focus for clinical intervention would be to more closely address these issues in persons living with HIV+LD. These findings also suggest that a more complete understanding of the symptom experience in persons living with HIV+LD is fundamental to achieve optimal patient outcomes. It may be that specific symptoms, such as depressive symptoms, need to be controlled for in model testing. Future research should consider a symptom-specific tool to look for clusters of symptoms in both HIV and liver disease. This study also found that race, social support, and income were important covariates. Therefore another direction for future research would be to assess differences between racial and socioeconomic status on HRQOL in persons with HIV+LD.

In summary, there are multiple interpretations of HRQOL (see Chapter 2), many of which consider HRQOL to be multidimensional wherein the components make up the whole. The Wilson and Cleary (1995) model of HRQOL is different in that it is a causal model that allowed for identification of the potential causal factors in the overall HRQOL paradigm. Testing the model with SEM was useful as it allowed for testing all of the components of HRQOL simultaneously. A limitation to the approach used in this study was that the symptoms that the researchers operationalized in the symptom status variable (depressive and mental symptoms) may not be the most bothersome symptoms to the person living with HIV+LD. As was found in pilot testing Cella's model of QOL (1994) the variables were too highly correlated and thus oversaturated the model (See Chapter 3). HRQOL variables in general may be too highly correlated and interrelated. It may be difficult to identify one modifiable factor in any analysis as HRQOL is multidimensional.

APPENDIX A

A.1 PILOT #2 MANUSCRIPT

Paragraph RUNNING HEAD: MOS-HIV

Validity of the MOS-HIV as a Measure of Health-Related Quality of Life in Persons Living with HIV and Liver Disease

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Key words: health-related quality of life, HIV, liver disease, MOS-HIV, nursing

Abbreviations: HRQoL - health-related quality of life; HIV - human immunodeficiency virus; LD - liver disease; MOS-HIV - Medical Outcomes Study-HIV Health Survey; HCV - hepatitis C virus

Abstract

Title. Validity of the MOS-HIV as a Measure of Health-Related Quality of Life in Persons Living with HIV and Liver Disease

Aim. The purpose of this study was to validate the HIV Medical Outcomes Survey in persons with human immunodeficiency virus and liver disease.

Background. Persons living with human immunodeficiency virus are living longer and therefore more likely to suffer significant morbidity due to potentially treatable liver diseases. Liver Disease alone has been shown to have a significant effect on one's health-related quality of life. Clinical evidence suggests that persons living with human immunodeficiency virus and liver disease, a growing number of individuals, may have a poorer health-related quality of life than persons with human immunodeficiency virus who do not have liver disease.

Method. To accurately assess health-related quality of life requires the use of a valid instrument for this population. The sample included 215 persons living on antiretroviral therapy (n=119 without and n=96 with liver disease).

Findings. The validity of the HIV Medical Outcomes Survey was supported by testing construct, convergent, discriminative, and predictive validity. The HIV Medical Outcomes Survey was shown to be able to discriminate between those persons living with human immunodeficiency virus with and without liver disease on the basis of the cognitive function subscale scores (p=.018).

Conclusion. This study found the HIV Medical Outcomes Survey to be a valid instrument in persons with human immunodeficiency virus and liver disease.

Key words. health-related quality of life, HIV, liver disease, MOS-HIV, nursing

SUMMARY

What is already known about this topic

- Persons living with human immunodeficiency virus are living longer and are dying from liver related complications.
- Human immunodeficiency virus affects individuals' health-related quality of life.
- The Human Immunodeficiency Virus Medical Outcomes Survey has been tested in a multitude of studies involving persons living with human immunodeficiency virus.

What this paper adds

- The findings support the validity of the Human Immunodeficiency Virus Medical Outcomes Survey in persons living with human immunodeficiency virus and co-morbid liver disease.
- The Human Immunodeficiency Virus Medical Outcomes Survey may be useful in clinical practice to assess HRQOL in individuals living with human immunodeficiency virus and co-morbid liver disease.

Introduction

A diagnosis of human immunodeficiency virus (HIV) is now considered a chronic disease requiring complex medication regimes with multiple co-morbidities that influence all aspects of an individual's well-being. Persons living with HIV are living 20 to 30 years beyond the time of diagnosis (Tedaldi et al. 2002). Aggressive treatment of HIV has prolonged the lives of these patients; however, they are more likely to suffer significant morbidity and mortality from liver related disorders and their complications (anemia, end stage liver disease (LD), and hepatocellular carcinoma) than from their HIV (Cosby et al. 2000, Tedaldi et al. 2002). Because of the toxic effects of antiretrovirals on the liver and co-infection with chronic viral hepatitis, the number of persons with HIV and liver diseases is increasing (Foster et al. 1998, Kim 2002, Sax & Gathe 2005).

More than 50% of persons with HIV are co-infected with chronic viral hepatitis, primarily hepatitis C virus (HCV). Estimates are that the number of cases of HCV in the United States may be four to five times greater than the number of cases of HIV (Alter et al. 1999, National Institutes of Health 2002, United States Census Bureau 2000). Factors that predict a worse prognosis for patients with HCV include co-infection with HIV, obesity, nonalcoholic steatohepatitis syndrome, viral genotype, and advanced age at infection (Lawrence 2000, Soriano et al. 2005).

The co-morbidity of HIV and LD includes various liver conditions (infectious, chronic, steatosis, and cirrhosis). The etiologies of LD in persons with HIV are 85% hepatitis C virus, 20% hepatitis B virus, 7% drug toxicity, and 3% other rare pathologies. Approximately 85% of those with acute LD go on to develop chronic LD. Long-term consequences of chronic LD include decreased health-related quality of life (HRQoL), chronic fatigue and anemia, chronic

viral hepatitis, hepatocellular carcinoma, and it is the primary cause for liver transplant in the United States. These potentially treatable liver conditions have been shown to have a significant effect on a person's HRQoL. (Buti et al. 2006, Fleming et al. 2004, Foster et al. 1998, Hauser et al. 2004, Hickman et al. 2004, Ortiz et al. 2002, Pojoga et al. 2004, Soriano et al. 2005). However, there is no measure of HRQoL that has been validated in the co-infected population.

The empirical support measuring HRQoL in the population with LD has, more often than not, been reported as overall HRQoL or is collapsed into mental and physical summary scores of the Short Form Health Survey (SF-36). Many current studies that have HRQoL as a primary outcome variable are focused on one chronic disease. For example, research has shown that adults with HIV alone, as well as those with chronic LD have impaired physical, mental, and social functioning compared to population norms. There also is a body of literature describing the separate effects of HIV and LD on HRQoL, fatigue, and depression. (Foster et al. 1998, Henderson et al., 2005, Phaladze et al. 2005, Revicki et al. 1995, Sousa et al. 1999, Vidrine et al. 2005, Wilson et al. 1997). One recent study reports that HIV specific instruments need to be redesigned for patients with co-infection with HCV (Buti et al. 2006).

As the first goal of Healthy People 2010 (United States Department of Health and Human Services 2000) is to help individuals of all ages increase life expectancy and improve their HRQoL, the challenge for researchers and practitioners is to determine what aspects of HRQoL are affected for those with multiple co-morbid chronic diseases (Henderson et al., 2006). The domains of importance that predict the overall HRQoL in one population are not necessarily the same for another population. There are few systematic studies evaluating the validity of HRQoL instruments in persons with HIV and LD (Fleming et al. 2004). A study using the MOS-HIV in this population is not yet reported. Thus, there is a need for a valid HRQoL tool that can be used

with persons with HIV and LD. An instrument that assesses the complex nature of HRQoL may assist in identifying and developing specific interventions to improve the well-being of persons with HIV and LD. A validated tool in this population could also provide a patient related outcome measure. The purpose of this study was to examine the validity of the HIV Medical Outcomes Survey (MOS-HIV) (Wu 1996, 1999) as a measure of HRQoL in persons with HIV and LD.

Methods

This study assessed the validity of the two-factor model of the MOS-HIV (Wu 1996, 1999, Wu et al. 1997). This secondary data analysis used cross-sectional data including the MOS-HIV comparing the HRQoL of persons with HIV and persons with HIV and LD from a parent study (number removed for review). The aims of the parent study were to improve medication adherence in persons with HIV on antiretrovirals. Previously de-identified baseline data were extracted by the data manager. The data were collected prior to any adherence interventions. Chart review for clinical indicators and a problem list of medical co-morbidities was completed by project staff. All MOS-HIV questionnaires, medical record reviews, and sociodemographic survey measures were collected as a component of the parent study.

For the parent study, the sample size of 200 participants with poor adherence was estimated to have adequate statistical power (.80) to test for difference in mean adherence between the two treatment groups over time at a significance level of .01. An additional 15 subjects with good medication adherence (>95%) were also enrolled. The inclusion criteria for the parent study were a positive diagnosis by a health care provider of HIV, currently being treated with antiretroviral therapy, males and females of all races and ethnicities, and consent to participate in the parent study. All included participants required telephone access for the

administration of the behavioral adherence intervention. Exclusion criteria included failure of the HIV Dementia Scale (Power et al. 1995) screening, living with someone else already in the study, blindness or motor impairment of the upper extremities, or not presently administering their own medications.

This current secondary analysis study compared baseline data from persons with HIV and persons with HIV and LD who self-reported having liver problems or had a history of LD as recorded in the medical record. The particular type of liver problem was not available in all cases. Persons with HIV with self-reported or chart review history of LD were deemed to be persons with HIV and LD. This descriptive study was granted Institutional Review Board approval as an exempt study. This study involved the use of existing data/documents/records that were provided to the investigator in such a manner that subjects could not be identified, directly or through identifiers linked directly to the subjects. No one was excluded on the basis of gender, race, or ethnic background. Individuals under the age of 18 were excluded.

Measures

The MOS-HIV has been used widely in HIV related clinical trials as an outcome measure (Wu et al., 1997). The two factors or latent constructs that comprise the HRQoL are physical function and mental function. The MOS-HIV was developed from the MOS-Short Form 20 (Stewart et al. 1988). Additional concepts that were pertinent to persons with HIV, such as energy/fatigue, cognitive functioning, health distress, and quality of life were added. The subscales are scored on a 0-100 scale with higher scores yielding better perceived health. Generation of the mental and physical health summary scores, the two factors or latent constructs that comprise HRQoL, was based on an analysis of the subscale scores of over 2,500 persons with HIV in the late 1990's (Revicki et al. 1995). Subscales that loaded highly on the mental

health summary score included mental health, quality of life, health distress, and cognitive function. Subscales that loaded highly on the physical health summary score included physical function, pain, and role function. The remaining three subscales (energy/fatigue, overall health, and social function) loaded on both the mental and physical summary scores.

The social and demographic information was collected with the Sociodemographic Questionnaire, which was developed by the Center for Research in Chronic Diseases (CRCD). The specific self-reported data that were gathered included age (years), gender (male or female), race (collapsed into white or non-white), and education (number of years). Employment status was dichotomized as currently employed or not employed.

The Co-morbidity Conditions/Problem List is a CRCD developed survey that includes a list of medical problems as documented in the most recent medical record reviewed. Medical record reviews were performed within 3 months of the self-reported baseline data collection. The medical co-morbidities were listed and coded. The total number of medical co-morbities was calculated.

Data Analysis

The two factor structure of the MOS-HIV with the components (mental and physical) in both groups was tested. Convergent, discriminative, and predictive validity of the MOS-HIV (Wu 1996 1999, Wu et al. 1991, Wu et al. 1997) are reported in two groups of person with HIV; those with and without LD. The sample's demographic characteristics as measured by the CRCD Sociodemographic Questionnaire are described. The relationship between selected sociodemographic factors and HRQoL in persons with HIV only and persons with HIV and LD was examined. Descriptive statistics, group comparisons, correlations, and exploratory factor analysis with oblique rotation principal components extraction were conducted using SPSS

version 13.0 (SPSS Inc., Chicago, Illinois). Eigenvalues greater than 1 were retained. Convergent validity was assessed with analysis of variance. Statistical significance was pre-determined at $p \leq .05$ two tailed.

Results

Sample

As summarized in Table 1, the sample (N=215) included 119 persons with HIV and 96 persons with HIV and LD. There were no significant differences between the two groups on age, gender, race, education, employment status, or number of medical co-morbidities. The sample of HIV and LD tended to be less educated and have a higher level of unemployment. {Insert Table 1}

MOS-HIV

Table 2 presents the group comparisons across the MOS-HIV subscales. There was a significant difference between the two groups on the cognitive function subscale (p=.018) with the HIV and LD group having significantly lower cognitive function than those with HIV only. The HIV and LD group also showed lower mean scores as compared to those with HIV on role function, pain, overall health, and energy/fatigue subscales (p<.10). There were no other significant differences between the groups with regard to subscale scores. Pearson product moment correlations demonstrated a moderate correlation between income and all MOS-HIV subscale scores for both groups (r>.300). {Insert Table 2}

Exploratory factor analysis of the MOS-HIV with the 10 domain scores, excluding health transition, extracted two primary latent construct with Eigenvalues over one. Thus, a two factor model fit the data and explaining approximately 70% of the variance in persons with HIV. Role function, physical function, social function, and pain loaded on the physical health component

factor or latent construct. The mental health, quality of life, health distress, cognitive function, energy/fatigue, and overall health subscales loaded on the mental health component (See Table 3).

The two factor model explained approximately 61% of the variance in persons with HIV and LD. Role function, physical function, and pain loaded on the physical health component factor. The mental health, quality of life, health distress, and cognitive function subscales loaded on the mental health component. Energy/fatigue, overall health, and social function cross loaded on both factors (See Table 4).

Discussion

The MOS-HIV predicted a two factor model (mental and physical) in both the HIV and HIV and LD groups. This finding supports the construct validity of the MOS SF-36 (Wu et al. 1997).

Convergent validity of the MOS-HIV was supported in both groups by the loadings on the primary component of physical and mental health corresponding with the findings of other studies in HIV only samples. In the sample of persons with HIV only, the factor loading of the subscales that should have cross loaded did not do so. Conversely, the group with both HIV and LD loaded as expected based on the literature with three subscales cross loading. This study showed a potential invariance in factor loadings that were hypothesized to cross load in the HIV only group, but the HIV and LD group loadings performed well. The loading of each subscale on the components or factors that make up the HRQoL is important to assess prior to applying summary scores as opposed to individual subscale scores of the MOS-HIV.

Discriminative validity was supported by the finding of a significant difference (p=.01) in cognitive function as measured by the MOS-HIV when comparing the two groups. Persons with

HIV and LD demonstrated significantly lower self-perceived cognitive function than persons with HIV without LD. This could be due to an interaction effect of unemployment and education in this sample. Further findings of discriminative validity between the two groups showed a difference in mean scores of pain and energy/fatigue with persons with HIV and LD having more pain and fatigue with less perceived energy than persons with HIV alone. These findings are expected given the alteration in synthetic functioning of the liver when it is diseased or has a toxic insult.

Predictive validity was supported by a moderately strong correlation between low role function score and unemployment. Furthermore, those that reported that their health affected their ability to work in the MOS-HIV role function subscale also reported being unemployed on the CRCD Sociodemographic Questionnaire.

Limitations of this study include the relatively small sample size and the secondary nature of the analysis in that the investigators had no control over the data collected. Additionally, the type and cause of liver disease were not always available for analysis. Specifically, this analysis did not isolate LD related to HCV, a growing subgroup. Furthermore, individuals were all screened for AIDS dementia and excluded if there was evidence of dementia. Bias may have been introduced as there was no screening for altered cognitive function related to liver disease.

Conclusion

This study demonstrates that the MOS-HIV is a valid tool for assessing HRQoL in persons with HIV and persons with HIV and LD. This tool encompasses the issues pertinent to the patient with HIV and LD and has been shown to be valid in this sample.

The addition of HRQoL measures has been adopted in a multitude of settings and disease processes. The interest of being able to predict outcomes based on HRQoL is of great interest to many and varied researchers (Wilson & Cleary 1995, Vidrine et al. 2005). Understanding the multiple dimensions of HRQoL may assist in developing nursing interventions for patients with HIV and co-morbid liver disorders (Henderson et al., 2006). Future research is needed with a larger sample size and equally distributed groups. The goal of the measurement of HRQoL and its domains within the population of those persons with HIV and LD would be to empirically identify those areas of HRQoL that are most affected and tailor clinical interventions specific to the individual with the goal of an improved overall quality of life. Reasons for measuring HRQoL in this HIV subset with LD include: (1) assessing differing rehabilitation needs, (2) having a clinically meaningful endpoint in evaluation treatment outcomes, and (3) having a predictor for future treatment (Cella 1992).

Table 1. Sample demographics of persons with HIV (*N*=215)

Characteristics	Total *N*=215	HIV *n*=119	HIV and LD *n*=96	*p* value (2-tailed)
Age (years)	40.6	40.1	41.3	.236
Gender(% male)	67.4	65.6	69.8	.511
Race (% non-white)	38.9	36.4	39.6	.639
Education (years)	13.3	13.6	12.9	.051
Not employed (%)	64.2	58.8	70.8	.081
Comorbidities (*M*)	2.27	2.25	2.30	.825

Table 2. Comparison of MOS-HIV transformed subscales scores by independent sample *t*-test

MOS-HIV Subscale	HIV *n*=119 (M ± SD)	HIV and LD *n*=96 (M ± SD)	*p* value (2-tailed)
Mental Health	64.61±22.38	60.98±20.33	.223
Quality of Life	65.04±23.37	63.02±22.35	.522
Health Distress	69.34±28.82	66.54±27.02	.470
Cognitive Function	76.99±20.69	70.16±21.12	.018*
Energy/Fatigue	52.52±23.13	47.07±22.99	.089
Overall Health	53.99±24.35	48.18±24.13	.082
Role Function	55.51±46.59	43.75±46.03	.066
Physical Function	68.49±33.88	60.76±34.11	.099
Pain	62.02±28.21	55.63±23.97	.079
Social Function	73.95±30.32	69.57±28.39	.283
Health Transition	60.38±24.31	60.68±22.87	.928

Table 3. Convergent validity of the MOS-HIV with exploratory factor analysis in person with HIV (*n*=119)

Domains	Component/Summary Score	
	Mental	Physical
Mental Health	.998	-.174
Quality of Life	.869	-.065
Health Distress	.848	.016
Cognitive Function	.765	.131
Energy/Fatigue	.705	.196
Overall Health	.624	.248
Role Function	-.123	.958
Physical Function	.097	.778
Pain	.244	.610
Social Function	.439	.450

Table 4. Convergent validity of the MOS-HIV with exploratory factor analysis in persons with HIV and LD (*n*=96)

Domains	Component/Summary Score	
	Mental	Physical
Mental Health	.932	-.134
Health Distress	.836	-.025
Cognitive Function	.759	.012
Quality of Life	.644	.179
Energy/Fatigue	.480	.434
Overall Health	.450	.433
Physical Function	-.079	.861
Role Function	-.114	.847
Pain	.110	.634
Social Function	.248	.590

Acknowledgements

The authors would like to acknowledge Donna Caruthers, PhD, RN, Project Director for the parent study, Michelle Meyers, BSN, RN, Recruitment Coordinator for the parent study, Alison Colbert, MSN, RN, graduate student assistant on the parent study, and Young Kim, PhD and Kevin Kim, PhD biostatisticians.

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APPENDIX B

B.1 APPROVALS

Subject:	Permission response
From:	"Rhonda Brown" <Rhonda.Brown@ama-assn.org>
Date:	Wed, July 18, 2007 12:15 pm
To:	wendyh@pitt.edu
Priority:	Normal
Options:	View Full Header | View Printable Version

July 18, 2007

Wendy A. Henderson
University of Pittsburgh
School of Nursing Pittsburgh
440 Victoria Building
3500 Victoria Street
Pittsburgh PA 15261

Journal Name	Year	Citation	Item(s) used
JAMA	1995	273;59-65	Diagram

Intended Material will be used Phd dissertation.

Thank you for your interest in JAMA, Archives and AM News. Rights granted herein are non-exclusive and limited to one time only reproduction as specified in this request, in printed format in the English Language. Your credit line must include the name of the publication, issue date, volume and page number, as well as "Copyright © (Year of Publication), American Medical Association. All Rights reserved."

Best wishes,

Rhonda Bailey Brown
Permission Assistant
Publishing Operations
AMA

University of Pittsburgh
Institutional Review Board

Exempt and Expedited Reviews

University of Pittsburgh FWA: 00006790
University of Pittsburgh Medical Center: FWA 00006735
Children's Hospital of Pittsburgh: FWA 00000600

3500 Fifth Avenue
Suite 100
Pittsburgh, PA 15213
Phone: 412.383.1480
Fax: 412.383.1508

TO: Ms. Wendy Henderson

FROM: Christopher M. Ryan, Ph.D., Vice Chair

DATE: January 19, 2007

PROTOCOL: Quality of Life in Persons with HIV and Liver Disease

IRB Number: 0603071

The Institutional Review Board reviewed the recent modifications to your exempt protocol and finds them acceptable for administrative review. These changes, noted in your submission of January 3, 2007, are approved. Based on the information provided in the IRB protocol, this project still meets all the necessary criteria for an exemption.

- Please advise the IRB when your project has been completed so that it may be officially terminated in the IRB database.
- This research study may be audited by the University of Pittsburgh Research Conduct and Compliance Office.

Original Approval Date: March 7, 2006
Modification Approval Date: January 19, 2007

CR: kh

University of Pittsburgh
Institutional Review Board

Exempt and Expedited Reviews

University of Pittsburgh FWA: 00006790
University of Pittsburgh Medical Center: FWA 00006735
Children's Hospital of Pittsburgh: FWA 00000600

3500 Fifth Avenue
Suite 100
Pittsburgh, PA 15213
Phone: 412.383.1480
Fax: 412.383.1508

TO: Ms. Wendy Henderson

FROM: Sue R. Beers, Ph.D., Vice Chair

DATE: April 7, 2006

PROTOCOL: Quality of Life in Persons with HIV and Liver Disease

IRB Number: 0603071

The above-referenced protocol has been reviewed by the University of Pittsburgh Institutional Review Board. Based on the information provided in the IRB protocol, this project meets all the necessary criteria for an exemption, and is hereby designated as "exempt" under section 45 CFR 46 101(b)(4).

The regulations of the University of Pittsburgh IRB require that exempt protocols be re-reviewed every three years. If you wish to continue the research after that time, a new application must be submitted.

- If any modifications are made to this project, please submit an 'exempt modification' form to the IRB.
- Please advise the IRB when your project has been completed so that it may be officially terminated in the IRB database.
- This research study may be audited by the University of Pittsburgh Research Conduct and Compliance Office.

Approval Date: March 7, 2006
Expiration Date: March 7, 2009

SRB:kh

University of Pittsburgh
Institutional Review Board

Exempt and Expedited Reviews

University of Pittsburgh FWA: 00006790
University of Pittsburgh Medical Center: FWA 00006735
Children's Hospital of Pittsburgh: FWA 00000600

3500 Fifth Avenue
Suite 100
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Phone: 412.383.1480
Fax: 412.383.1508

TO: Wendy A. Henderson

FROM: Christopher M. Ryan, Ph.D., Vice Chair

DATE: July 28, 2005

PROTOCOL: Quality of Life in Persons with HIV and Liver Disease

IRB Number: 0410130

The Institutional Review Board reviewed the recent modifications to your exempt protocol and finds them acceptable for administrative review. These changes, noted in your submission of July 8, 2005 are approved. Based on the information provided in the IRB protocol, this project still meets all the necessary criteria for an exemption.

- Please advise the IRB when your project has been completed so that it may be officially terminated in the IRB database.
- This research study may be audited by the University of Pittsburgh Research Conduct and Compliance Office.

Original Approval Date: October 29, 2004
Modification Approval Date: July 28, 2005
Expiration Date: October 29, 2007

CR: ky

University of Pittsburgh
Institutional Review Board

3500 Fifth Avenue
Ground Level
Pittsburgh, PA 15213
(412) 383-1480
(412) 383-1508 (fax)

MEMORANDUM

TO: Judith Erlen, Ph.D., RN, FAAN

FROM: Sue R. Beers, Ph.D., Vice Chair

DATE: March 2, 2006

SUBJECT: IRB #970958: Managing Medications

Your renewal of the above-referenced proposal has received expedited review and approval by the Institutional Review Board under 45 CFR 46.110 (7).

Please include the following information in the upper right-hand corner of all pages of the consent form:

Approval Date: March 2, 2006
Renewal Date: March 1, 2007
University of Pittsburgh
Institutional Review Board
IRB #970958

Please note that it is the investigator's responsibility to report to the IRB any unanticipated problems involving risks to subjects or others [see 45 CFR 46.103(b)(5) and 21 CFR 56.108(b)]. The IRB Reference Manual (Chapter 3, Section 3.3) describes the reporting requirements for unanticipated problems which include, but are not limited to, adverse events. If you have any questions about this process, please contact the Adverse Event Coordinator at 412-383-1504.

The protocol and consent forms, along with a brief progress report must be resubmitted at least **one month prior** to the renewal date noted above as required by FWA00006790 (University of Pittsburgh), FWA00006735 (University of Pittsburgh Medical Center), FWA00000600 (Children's Hospital of Pittsburgh).

Please be advised that your research study may be audited periodically by the University of Pittsburgh Research Conduct and Compliance Office.

SRB:kh

University of Pittsburgh

School of Nursing

Center for Research and Evaluation
360 Victoria Building
3500 Victoria Street
Pittsburgh, PA 15261
412-624-4854
Fax: 412-624-1201
http://cre.nursing.pitt.edu/

PROPOSAL REVIEW VERIFICATION FORM

The attached proposal,

TITLE: Quality of Life in Person with HIV and Liver Disease

PRINCIPAL INVESTIGATOR: Wendy Henderson

has been scientifically reviewed and is approved for submission to the University of Pittsburgh Institutional Review Board.

Janice S. Dorman, PhD
Associate Dean for Scientific and International Affairs

3-6-06
Date

RECEIVED
MAR 8 2006
IRB OFFICE

IRB COVER SHEET:
Secondary Data Analyses with De-Identified Data

☒ NEW SUBMISSION ☐ RESPONSE TO COMMENTS v. 101405	**To be completed by IRB staff:** IRB # _____ **Date Received:** **By:** **§46.101b(4)** ☐

Title of Study: Quality of life in persons with HIV and liver disease.

Principal Investigator: Last name: **Henderson** First name: **Wendy**
Title: Doctoral Student Department: **Nursing**
Pitt Faculty ☐; Pitt/UPMC staff ☐; Pitt student ☒; Other:
School: Arts & Sciences ☐ Business ☐; Dental ☐; Educ ☐; Heath & Rehab Sci ☐; Info Sci ☐; Medicine ☐; Nursing ☒; Pharmacy ☐; Pub Health ☐; Social Work ☐; LRDC ☐; Other (specify):
Office Address: 440 Victoria Building , 3500 Victoria Street
Phone number: 412-780-8471 **Fax number**: 412-624-8521 E-mail address: **wendyh@pitt.edu**

Co-Investigators: Elizabeth Schlenk, PhD, RN

If PI is student, list name of **faculty sponsor** *or* **mentor** *who will take responsibility for the oversight of this research, and has signed the attached Faculty/Mentor assurance*:
Name: Judith A. Erlen, PhD, RN, FAAN; E-mail: jae001@pitt.edu

To whom should IRB correspondence be sent: PI? Yes ☒ No ☐; Other Name?
Other Fax: Other E-mail:

Where will study take place? University of Pittsburgh ☒; UPMC Oakland Campus ☐; CHP ☐; Magee ☐; Other UPMC Hospitals ☐, (specify): ; Other (specify) – U.S. ☐; foreign ☐
*Is documentation attached authorizing conduct of research at non-Pitt/UPMC site? No ☐ Yes ☐

Estimated duration of entire study: 3 years

Source of Financial Support: Federal (e.g., NIH, NSF, CDC) ☐; Department of Education ☐;
Provide one complete copy of the federal grant application if federally funded.
Commercial Sponsor ☐ name: ; Other ☐; None ☒.

Does the principal investigator, any co-investigator or research coordinator involved in this study (or in aggregate with his/her spouse, dependents or members of his/her household) have a conflict of interest, as defined below. No ☒ Yes ☐: If yes, do they
(a) possess an equity interest in the entity that sponsors this research or the technology being evaluated that exceeds 5% ownership interest or a current value of $10,000? No ☐ Yes ☐
(b) receive salary, royalty or other payments from the entity that sponsors this research or the technology being evaluated that is expected to exceed $10,000 per year? No ☐ Yes ☐
(c) have an agreement with the University or an external entity that would entitle sharing current or future commercial proceeds related to the technology being evaluated (e.g., royalties through a license agreement)? No ☐ Yes ☐
(d) have a financial relationship with a start-up company (which is being monitored by the Entrepreneurial Oversight Committee) that has an option or license to utilize the technology being evaluated? No ☐ Yes ☐
If yes, please attach detailed information to permit the IRB to determine if such involvement should be disclosed to potential research subjects.

Check type(s) of documents to be studied:
☐ Publically available information; ☒ Research Records; ☐ Other (describe):
How will information be recorded? (check all that apply)
☒ Information recorded anonymously (no identifiers or linkage codes) by an investigator involved in the initial research study that collected these data; that individual is not an investigator in this secondary analysis;
☐ An independent honest broker, not associated with this, or the initial, research study, will de-identify information prior to providing it to the Principal Investigator;

- The following individual has agreed to serve as independent honest broker and has signed the attached authorization form: Name: .

* Is a copy of data extraction form or a list of variables attached? No ☐ Yes ☐. If no, why not?

- Will the study involve accessing identifiable private information? No ☒ Yes ☐
- Will the investigator receive data with identifiable private information? No ☒ Yes ☐
- Are the data coded in such that a link exists that could allow the data to be re-identified? No ☒ Yes ☐. If '*yes.*' Is there a written agreement that prohibits the PI and the research staff access to the link? No ☐ Yes ☐
- Will any information from this project be submitted to the FDA or held for inspection by the FDA? No ☒ Yes ☐
- Does the study involve any use of a drug or medical device not approved by the FDA, regardless of the presence of an IND or IDE? No ☒ Yes ☐
- Does the study involve any use of a drug in any manner (even if approved and even if used in an activity which does not meet the DHHS definition of research) other the use of an FDA approved drug in the course of medical practice? No ☒ Yes ☐
- Does the study involve any use of a medical device in any manner (even if approved and even if used in an activity which does not meet the DHHS definition of research) other the use of an FDA approved medical device in the course of medical practice? No ☒ Yes ☐

All data, documents or records to be studied are currently in existence (i.e., new data will not be added to this study after today): ☐ No; ☒ Yes

IRB Protocol

1. **Study Aims**

(a) **What is this research intended to accomplish**? The purpose of this study is to examine the relationships between and among the variables affecting quality of life (QoL) utilizing Wilson and Cleary's model (7). The specific aims are to (1) examine the relationships between and among the variables of QoL according to Wilson and Cleary's model in persons living with HIV (PWHIV) and persons living with HIV and liver disease (PWHIV+LD); (2) explore the relationships between and among the characteristics of the individual and the environment that may influence QoL; and (3) explore testing the Wilson and Cleary model in PWHIV and PWHIV+LD. This study will use previously collected data from questionnaires and medical record review, which have been de-identified previously. Prior studies have shown correlations between some of the variables (ie. clinical indicators, symptoms, functional, physical, and life satisfaction) that make up Qol (1-6), thereby postulating conceptualizations but not guiding clinical practice. The proposed study will attempt to identify what factors influence or predict the outcome; persons' QoL.

2. **Background and Significance**

   (a) **What observations or prior scientific findings serve as the basis for this study**? Clinical evidence suggests that PWHIV+LD may have poorer QoL than PWHIV without LD. Additionally, patients with multiple co-morbid conditions may have a decreased QoL (Cosby et. al, 2000); PWHIV with or without LD may respond similarly. Because little research exists to support this observation, this study will examine QoL in PWHIV and PWHIV+LD.

   (b) **Why is it important to conduct this research**? The number of PWHIV+LD is increasing. These individuals are living longer and are more likely to suffer significant morbidity (Kim, 2002). Understanding the multiple dimensions of QoL may assist in developing nursing interventions to improve specific aspects of QoL for PWHIV and PWHIV+LD.

3. **Data to be analyzed**

   (a) **From what source(s) will data be obtained**? This cross–sectional analysis will use baseline data and medical record review data from Dr. Erlen's parent study (1R01 NR04749 and continuation 2R01 NR04749).

   (b) **Were these data were collected as part of a prior study? No ☐ Yes ☒.**
   - **If yes**, briefly describe that study, provide the IRB number, and attach a copy of the relevant consent form. See attached. **IRB Number**: 970958
   - **Note:** Investigators on that original study cannot serve as investigators on this new exempt application.

   (c) **Researchers cannot analyze data which are linked to subject identifiers. Are personal identifiers associated with the data included in this secondary analysis? ☒ No; ☐ Yes**

   - **If records currently have identifiers, describe how they will be de-identified prior to being provided to the investigator conducting this secondary analysis** (if applicable).

   - **If linkage codes will be maintained, identify person responsible (i.e., independent "honest broker"), describe their right to access these data, and discuss the process of (i) collating data from one or more data or record sets and (ii) assigning linkage codes** (if applicable).

4. **Methods**

   (a) **Will subjects be contacted by investigator? No ☒ Yes ☐; If yes, describe how and why:**

5. **Analysis**

(a) **Describe, in general terms, how data will be analyzed to determine that study aims have been met** This secondary data analysis will use data on all participants that meet the eligibility criteria from the parent studies (1R01 NR04749, 2R01 NR04749). The factors influencing QoL will be assessed as follows: biological/physiologic factors (Hepatits C Virus (HCV) and HIV viral load, CD4 counts), symptom status (Beck Depression Inventory II, MOS-HIV mental function), functional status (missed appointments, MOS-HIV physical function), and general health perceptions (Perceived burden visual analogue scale, MOS-HIV health transition). The outcome variable is QoL (Satisfaction with Life Scale, single item MOS-HIV overall QoL). The characteristics of the individual that will be assessed include gender, race, age, education, and HCV viral genotype. The characteristics of the environment include social support (Interpersonal Support Evaluation List), and household income. These data have been de-identified, and compiled from the baseline data and medical record review. Descriptive statistics and correlations using parametric or non-parametric techniques as appropriate will be employed. The analysis may involve the use of multivariate linear regression, path analysis, and structural equation modeling. Psychometric properties of the instruments will also be evaluated. The findings from this study will provide the foundation for future bio-behavioral nursing intervention research relating to QoL.

6. **Summarize the qualifications and experience of the Principal Investigator that are relevant to the conduct this research study:** I have been a nurse for 11 years and a nurse practitioner for 6 years, and research coordinator or co-investigator for the past 9 years. I worked as a Graduate Student Researcher from January of 2004 to January of 2006 with Dr. Erlen. This study will be my doctoral dissertation. My advisor, Dr. Erlen, is an expert in nursing research and ethics internationally.

7. **Additional Information, Clarification, or Comments for the IRB Reviewer**:

1.) Cosby, C., Holzemer, W. L., et al. (2000). Hematological complications and quality of life in hospitalized AIDS patients. AIDS Patient Care & Stds 14(5): 269-79.

2.) Davis, A. L., Holman, E. J., et al. (2000). Documentation of care outcomes in an academic nursing clinic: an assessment. Journal of the American Academy of Nurse Practitioners 12(12): 497-502.

3.) Henry, S. B. & Costantino, M. (1996). The role of ambulatory care information systems in supporting the provision of holistic care for persons infected with the human immunodeficiency virus. Holistic Nursing Practice 11(1): 39-47.

4.) Holzemer, W. L., Corless, I. B., et al. (1999). Predictors of self-reported adherence in persons living with HIV disease. AIDS Patient Care & Stds 13(3): 185-97.

5.) Kim, W. R. (2002). The burden of hepatitis C in the United States. Hepatology, 36, (5) Suppl 1, S30-4.

6.) Phaladze, N. A., Human, S., et al. (2005). Quality of life and the concept of "living well" with HIV/AIDS in sub-Saharan Africa. Journal of Nursing Scholarship 37(2): 120-6.

7.) Sousa, K. H. and Chen, F. F. (2002). A theoretical approach to measuring quality of life. Journal of Nursing Measurement 10(1): 47-58.

8.) Wilson, I.B., & Cleary, P.D. (1995). Linking clinical variables with health-related quality of life: A conceptual model of patient outcomes. JAMA, 273 (1), 59-65.

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CERTIFICATION OF INVESTIGATOR RESPONSIBILITIES

By signing below I agree/certify that:

1. I am cognizant of, and will comply with, current federal regulations and IRB requirements governing human subject research.

2. I have reviewed this protocol submission in its entirety and that I am fully aware of, and in agreement with, all submitted statements.

3. I will conduct this research study in strict accordance with all submitted statements.

4. I will request and obtain IRB approval of any proposed modification to the research protocol prior to implementing such modification.

5. I will ensure that all co-investigators, and other personnel assisting in the conduct of this research study have been provided a copy of the entire current version of the research protocol.

6. Neither I nor members of my research team will record identifiers (e.g., name, SSN, medical record number, street address, phone number, etc.).

7. I will not begin recording data from records or conducting analyses until the exempt status of this application has been determined by the IRB and I have been informed in writing.

8. I will ensure that if linkage codes *are* recorded with these data, the person or persons responsible for recording linkage codes is completely independent of this project and that those individuals have certified their willingness (see below) to perform this task.

9. I will respond promptly to all requests for information or materials solicited by the IRB or IRB Office.

10. I will maintain adequate, current, and accurate records of research data.

11. I will not knowingly include data from prisoners.

12. Neither I, nor any member of my research team, will intervene or interact with identified human subjects during the conduct of this research project.

Principal Investigator Name: Wendy A.Henderson	Signature:	Date: 3/06/06

Managing Medications

Abstract

The primary aim of this study is to compare the effect of an individualized adherence intervention (T_I) and a structured adherence intervention (T_S) to usual care on adherence to antiretroviral therapy in persons infected with HIV (PWHIV). The secondary aims address the relationship between adherence and quality of life (QOL), and between adherence and clinical response. The exploratory aims focus on examining the effect of self-efficacy on the relationship between the intervention and adherence, the effect of adherence on the relationship between self-efficacy and outcomes (clinical response and quality of life), as well as the effects of symptoms, alcohol and/or drug use, chronic interpersonal problems, mood, social support, optimism, perceived burden of medication regimen, perceived stigma, purpose in life, co-morbidity, personality, literacy, and intimate partner abuse on self-efficacy, and psychometric analyses of the instruments. The sample of 300 (plus 51 dropouts) PWHIV who are taking antiretroviral therapy and without cognitive dysfunction will be randomly assigned to one of two treatment arms. Those individuals who are deemed to be 100% adherers (approximately 25-50) will be assigned to the control group, but will be followed separately as a natural history substudy and interviewed. Data will be collected at baseline, post-treatment, post-maintenance, post-booster, and 18 months. Electronic event monitors, diaries, the Self-reported Medication-taking Scale, and the ACTG Adherence Follow-up Questionnaire will be used to assess adherence. The Digit Vigilance Test will be used to assess the effect of sustained attention on adherence. QOL will be measured using the MOS-HIV, the Satisfaction with Life Scale, and the Perception of Illness Visual Analogue Scale. Clinical response will be assessed using viral load, CD4 T-cell count, AIDS defining conditions, and hospitalizations. Variables influencing self-efficacy (measured with an investigator-developed Self-efficacy Scale) will be examined: symptoms (CRCD Symptom Checklist), alcohol and/or drug use (AUDIT), chronic interpersonal problems (IIP), social support (Interpersonal Support Evaluation List), optimism (Life Orientation Test), anxiety (Beck Anxiety Inventory) and Beck Depression Inventory II), perceived burden of regimen (visual analog scales), perceived stigma (Perceived Stigma of HIV Scale), purpose in life (Purpose in Life Scale), co-morbidity (CRCD Co-Morbidity Scale), personality characteristics (NEO-FFI), health literacy (Test of Functional Health Literacy in Adults), knowledge about HIV medication adherence (HIV Medication Adherence Knowledge), and intimate partner abuse (Abuse Assessment Screen). A repeated measures model with planned comparisons will be used to test the hypotheses for the primary aim. Structural equation modeling will be used to examine the relationships identified in the secondary and exploratory aims. PWHIV who adhere to their therapy may live longer, require fewer hospitalizations, and have an improved QOL.

Version # 7: 06/13/05

University of Pittsburgh

School of Nursing

3500 Victoria Street
Pittsburgh, Pennsylvania 15261
Fax: 412-624-2401

Approval Date: 3/2/06
Renewal Date: 3/1/07
Institutional Review Board
University of Pittsburgh
IRB Number: 970958

CONSENT FORM
CONSENT TO ACT AS A SUBJECT IN AN EXPERIMENTAL STUDY
TITLE: Managing Medications

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University of Akron College of Nursing
209 Carroll Street
Akron, Ohio 44325
Telephone: (330)972-6926

SOURCE OF SUPPORT: NIH/NINR (2R01 NR04749)

DESCRIPTION: You are invited to take part in this study to test whether a program involving a series of telephone calls will help people who are taking certain medications stick with the complex schedule required by these drugs. You are being asked to participate because you are currently taking antiretroviral therapy. There will be three groups in the study; there will be a minimum of 100 people per group. Both men and women who are at least 18 years of age will participate.

After it is determined that you are eligible for the study, and you agree to participate, the responsibilities for the study are as follows:

- You will continue to receive usual care from your health care provider.

- You will use a pill bottle with a special cap for one of your medications. This special cap will record when the pill bottle is closed. You will continue to take your medications as instructed by your health care provider. You will have the option of choosing a child-proof cap. This cap will be used for the first 4 months of the study, and 1 month prior to the 3 remaining data collection sessions.

- You will complete a daily diary for the first 4 months of the study, and 1 month prior to the 3 remaining data collection sessions.

- You will be asked to attend 5 data collection sessions over a time period of 19 months. Data collection sessions will be at 1) one month; 2) 4 months; 3) 7 months; 4) 13 months; and 5) 19 months. The procedure for data collection includes:

  -A questionnaire booklet will be mailed to your home, or you may complete it in a private conference room at the School of Nursing or data collection sites. It will take a maximum of 90 minutes to complete the questionnaires.

  -You will meet with a research staff member in a private conference room in the School of Nursing or data collection sites. This meeting will take approximately 45 minutes. You will bring in your special pill bottle and cap, and complete questionnaires onsite. The researcher will review your completed questionnaires to be certain they are complete.

  -The data collection session may be audiotaped, however you can refuse to be audiotaped. All audiotapes will be kept in a locked cabinet, retained only for the duration of this study, and then erased.

  -You will receive a brief telephone call once a month to ask you if you have any questions about the study and if you have had a change in your medication.

  -Your health care provider may be contacted to obtain your new telephone number and address if the researcher is unable to contact you by phone or mail.

  -If unable to attend data collection 2-5, alternative arrangements will be discussed, such as returning completed questionnaires via mail in postage paid envelopes provided by the study with a follow-up phone interview.

- After the first data collection session (I month) you will be randomly assigned to one of 3 groups. Along with the continuation of the above responsibilities, you will continue to receive usual care from you health care provider. The groups are as follows:

  -Group 1
  - Will receive a series of telephone calls that include topics in a specific order and focus on strategies to help you with taking your medications

  -Group 2
  - Will receive a series of telephone calls that include topics that are variable and focus on strategies to help you with taking your medications

  -Group 1 & 2 will both receive the following:
  - Telephone calls will be made by the interventionist at a telephone number you designate and at a time that is mutually decided
  - Telephone calls will be scheduled weekly for 12 weeks, and last approximately 20 – 30 minutes
  - A maintenance program will follow that will reinforce the skills that you learned during the intervention, and include a series of 6 brief telephone calls lasting approximately 5 minutes over a 3 month period.
  - You may or may not receive a booster program that includes 3 brief phone calls lasting approximately 5 minutes over a 3 month period.
  - Each phone session will be audiotaped, however you can refuse to be audiotaped. All audiotapes will be kept in a locked cabinet, retained only for the duration of this study and then erased.
  - You will be asked to complete 9 brief homework assignments. You will be asked to submit the 9 homework assignments to the project office.

  - Group 3
  - You will receive usual care only

  - Interview
  - You may be asked to participate in an audio-taped face-to-face interview. This interview will be conducted in a private conference room at the School of Nursing and will last approximately 1 hour.

RISKS AND BENEFITS: There are minimal risks to your participation in this study. If you are in the groups receiving the telephone calls, you may become tired because of the length of the telephone conversations. If that occurs, the interventionist will call you at another agreed upon time. You could also tire during the data collection sessions. To help to shorten these sessions you will be given a copy of the questionnaires to refer to as the data collector reads the various items.

You are not at risk if you are assigned to the nonintervention group (Group 3) since you will continue to receive your usual care, and the special pill bottle cap is no more difficult to use than a regular cap. You could also become tired during the data collection. If that occurs, the data collector will allow time for rest or reschedule the data collection session at another agreed upon time. If this makes you uncomfortable, you can change your mind about participating in the study. The benefits of participating in the study are to help health care providers gain information so that they can assist future patients to adhere to the required medication regimen. In addition, your participation in this study may enable you to better manage your medication regimen. If after answering questions and completing checklists, your responses give the data collectors reason for concern regarding your mental health and/or safety, we will discuss this with you and then we will call your health care provider for appropriate intervention.

ALTERNATIVE TREATMENTS: Your physician, nurse, and pharmacist are available to you if you have questions about your medications and how to take them. There are also support groups and counseling services available should you need them. The intervention that is proposed in this study does not replace any of these sources of help, and therefore, you may continue to use them.

NEW INFORMATION: You, or your representative, will be promptly notified if any new information, either good or bad, about the intervention during the course of this study and which may cause you to change your mind about continuing to participate.

COSTS AND PAYMENTS: There is no cost to you to participate in this study. You will receive a total of $220 for your participation in this research study. You will receive $20 after you take the questionnaires to determine if you are eligible for the study. Following each of the five data collection sessions you will be given $40. You will receive $20 if you are selected to participate in the interview. You will also receive a small gift valued at approximately $10 if an individual you refer to the study is enrolled.

COMPENSATION FOR INJURY: University of Pittsburgh investigators and their associates who provide services at the UPMC Health System (UPMC HS) recognize the importance of your voluntary participation to their research studies. These individuals and their staffs will make reasonable efforts to minimize, control, and treat any injuries that may arise as a result of this research. If you believe that you are injured as the result of the research procedures being performed, please contact the Principal Investigator listed on the cover sheet of this form or the University of Pittsburgh Institutional Review Board (412-383-1480).

Emergency medical treatment for injuries solely and directly relating to your participation in this research will be provided to you by hospitals of the UPMC HS. It is possible that the UPMC HS may bill your insurance provider for the costs of this emergency treatment, but none of these costs will be charged directly to you. If your research-related injury requires medical care beyond this emergency treatment, you will be responsible for the costs of this follow-up care unless otherwise specifically stated below. You will not receive monetary payment for, or associated with, any injury that you suffer in relation to this research.

Approval Date: 3/2/06
Renewal Date: 3/1/07
Institutional Review Board
University of Pittsburgh
IRB Number: 970958

CONFIDENTIALITY:

Who will know about my participation in this research study?

Any information about you obtained from or for this research study will be kept as confidential (private) as possible. All records pertaining to your involvement in this research study will be stored in a locked file cabinet in the School of Nursing. Your identity on these records will be indicated by a case number rather than your name, and the information linking these case numbers with your identity will be kept separate from the research records. You will not be identified by name in any publication of the research results unless you sign a separate consent form giving your permission (release).

Will this research study involve the use or disclosure of my identifiable medical record information?

This research study will involve the recording of current and/or future identifiable medical information from your hospital and/or other health care provider (e.g., physician office) records. The information that will be recorded will be limited to medical and specific human immunodeficiency virus (HIV) information. This will include, laboratory results, current medications, current illness, hospitalizations, emergency room visits, outpatient procedures, current drug and alcohol use, and missed medical appointments. This information will be used for the purpose of identifying factors that may influence managing HIV medications.

Who will have access to identifiable information related to my participation in this research study?

In addition to the investigators listed on the first page of this authorization (consent) form and their research staff, the following individuals will or may have access to identifiable information (which may include your identifiable medical record information) related to your participation in this research study:

Authorized representatives of the University of Pittsburgh Research Conduct and Compliance Office may review your identifiable research information (which may include your identifiable medical record information) for the purpose of monitoring the appropriate conduct of this research study.

In unusual cases, the investigators may be required to release identifiable information (which may include your identifiable medical record information) related to your participation in this research study in response to an order from a court of law. If the investigators learn that you or someone with whom you are involved is in serious danger or potential harm, they will need to inform, as required by Pennsylvania law, the appropriate agencies.

Approval Date: 3/2/06
Renewal Date: 3/1/07
Institutional Review Board
University of Pittsburgh
IRB Number: 970958

For how long will the investigators be permitted to use and disclose identifiable information related to my participation in this research study?

The investigators may continue to use and disclose, for the purposes described above, identifiable information (which may include your identifiable medical record information) related to your participation in this research study for the length of this research study. It is a University policy that all research records must be maintained for at least 5 years following study completion. At the termination of this research study, your research records will be destroyed.

RIGHT TO WITHDRAW:

Is my participation in this research study voluntary?

Your participation in this research study, to include the use and disclosure of your identifiable information for the purposes described above, is completely voluntary. (Note, however, that if you do not provide your consent for the use and disclosure of your identifiable information for the purposes described above, you will not be allowed, in general, to participate in the research study.) Whether or not you provide your consent for participation in this research study will have no affect on your current or future relationship with the University of Pittsburgh.

Whether or not you provide your consent for participation in this research study will have no affect on your current or future medical care at a UPMC Health System hospital or affiliated health care provider or your current or future relationship with a health care insurance provider.

Your doctor may be involved as an investigator in this research study. As both your doctor and research investigator, s/he is interested both in your medical care and the conduct of this research study. Before agreeing to participate in this research study, or at any time during your study participation, you may discuss your care with another doctor who is not associated with this research study. You are not under any obligation to participate in any research study offered by your doctor.

May I withdraw, at a future date, my consent for participation in this research study?

You may withdraw, at any time, your consent for participation in this research study, to include the use and disclosure of your identifiable information for the purposes described above. (Note, however, that if you withdraw your consent for the use and disclosure of your identifiable information for the purposes described above, you will also be withdrawn, in general, from further participation in this research study.) Any identifiable research or medical record information recorded for, or resulting from, your participation in this research study prior to the date that you formally withdrew your consent may continue to be used and disclosed by the investigators for the purposes described above.

To formally withdraw your consent for participation in this research study you should provide a written and dated notice of this decision to the principal investigator of this research study at the address listed on the first page of this form.

Your decision to withdraw your consent for participation in this research study will have no affect on your current or future relationship with the University of Pittsburgh. Your decision to withdraw your consent for participation in this research study will have no affect on your current or future medical care at UPMC Health System hospital or affiliated health care provider or your current or future relationship with a health care insurance provider.

If I agree to participate in this research study, can I be removed from the study without my consent?

You may be removed from the study by investigators in the event of persistent fatigue or emotional distress while participating in the intervention or completing any of the questionnaires.

****

VOLUNTARY CONSENT: I certify that I have read the preceding, or it has been read to me, and I understand its contents. Any questions I have pertaining to the research have been, and will continue to be answered by the investigators listed at the beginning of this consent form at the phone numbers given. Any questions I have concerning my rights as a research subject will be answered by the Human Subjects Protection Advocate at the University of Pittsburgh IRB Office (1-866-212-2668). A copy of this consent form will be given to me. My signature below means that I have freely agreed to participate in this project.

I understand that the data collection session may be audiotaped and I am willing to permit _____ or not permit___ the taping.

If I am in the groups receiving the interventions, I understand that the sessions will be audiotaped and I am willing to permit _____ or not permit___ the taping.

I am willing_____ or not willing_____ to be contacted for future or follow-up studies.

_____ _____

Participant's Signature Date

_____

Participant's Printed Name

INVESTIGATOR'S CERTIFICATION: I certify that the nature and purpose, the potential benefits, and possible risks associated with participation in this research study have been explained to the above individual and that any questions about this information have been answered.

_____ _____

Printed Name of Person Obtaining Consent Role in Research Study

_____ _____

Signature of Person Obtaining Consent Date

APPENDIX C

C.1 INSTRUMENTS

Instrument Number: 3 1 1
(For internal use only)

Study ID: 0 7 1

CO-MORBIDITY QUESTIONNAIRE

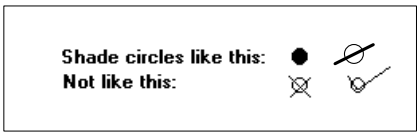
Center for Research in Chronic Disorders

ID Number: | | | | | | | | | | | Administration Date: | | / | | / | | | | |
(month) (day) (year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

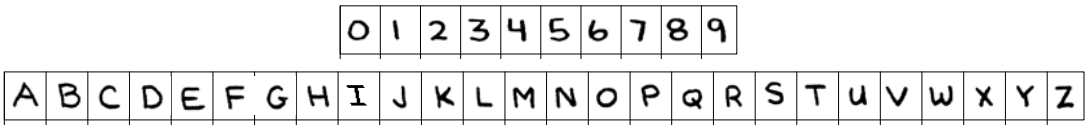
(FOR STAFF USE ONLY)

Please keep these rules in mind when responding to the questions....



If you mark the wrong answer, put an X over it and mark the desired response.

For optimum accuracy, it is recommended that characters be written block style without touching the sides of the blocks, such as in the following examples. Place only one letter or one number in each box as shown....



Some people have more than one health condition. We are interested in your health history. The following is a list of conditions and symptoms you may have experienced. Please complete the following questions for each condition.

1. Have you ever had a heart attack? (myocardial infarction or MI)

○ 2 No ----> Go to question 2.

○ 1 Yes ----> Please complete the following questions. This condition:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

ID Number: _ _ _ _ _ _ _ _ _ _ (for internal use only) Date: _ _ / _ _ / _ _ (for internal use only)

2. Have you ever been hospitalized or treated for heart failure? (You may have felt more short of breath and the doctor may have told you that you had fluid in your lungs or that your heart was not working efficiently.)

○ 2 No ----> Go to question 3.

○ 1 Yes ----> Please complete the following questions. This condition:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

f. Did you ever have any of the following with your hospitalization for heart failure?

1. Heart attack	○ 1 Yes	○ 2 No	○ 3 Don't know
2. Rapid irregular heart beat	○ 1 Yes	○ 2 No	○ 3 Don't know
3. Total body infection (Sepsis)	○ 1 Yes	○ 2 No	○ 3 Don't know
4. Inflammation of the heart muscle wall (Endocarditis)	○ 1 Yes	○ 2 No	○ 3 Don't know
5. Pregnancy	○ 1 Yes	○ 2 No	○ 3 Don't know

Directions for questions beginning on the next page:

For the questions that look like this:

	Medical Condition	a. Do you have this condition? Yes 1 No 2	b. was diagnosed by a healthcare provider: Yes 1 No 2	c. was present in the last 5 years: Yes 1 No 2	d. is currently treated with the following: 1 = Drugs 2 = Diet 3 = Exercise 4 = Other 5 = None 1 2 3 4 5	e. required hospital admission: Yes 1 No 2	f. has decreased your quality of life: 0 = Not at all 1 = Slightly 2 = Moderately 3 = Greatly 4 = Extremely 0 1 2 3 4
	Example:	○ ●	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○
1.	Headaches						
	Example:	● ○	● ○	○ ●	● ○ ● ● ○	○ ●	○ ○ ○ ● ○
2.	Tuberculosis						

If your response is "No," DO NOT ANSWER b through f and go to the next question.

If your response is "Yes," PLEASE ANSWER b through f and then go to the next question.

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

Please answer the following questions regarding the medical conditions listed below as they pertain to you.

	Medical Condition	a. Do you have this condition? Yes 1	a. No 2	b. was diagnosed by a healthcare provider: Yes 1	b. No 2	c. was present in the last 5 years: Yes 1	c. No 2	d. is currently treated with the following: 1 = Drugs 2 = Diet 3 = Exercise 4 = Other 5 = None 1	2	3	4	5	e. required hospital admission: Yes 1	e. No 2	f. has decreased your quality of life: 0 = Not at all 1 = Slightly 2 = Moderately 3 = Greatly 4 = Extremely 0	1	2	3	4
3.	**Coronary Artery Disease**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
4.	**Irregular Heart Rate**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
5.	**Heart Valve Disorders**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
6.	**Other Heart Disorders** *Specify condition(s):* _____	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
7.	**High Blood Pressure**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
8.	**Anemia**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
9.	**Other Blood Disorders** *Specify condition(s):* _____	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

ID Number: _ _ _ _ _ _ _ _ _ _ _ _ (for internal use only) Date: _ _ / _ _ / _ _ (for internal use only)

10. Do you cough first thing in the morning in the winter? (Exclude clearing the throat.)

○ 2 No ----> Go to question 11.

○ 1 Yes ----> Please complete the following questions:

a. Do you cough during the day in the winter?	○ 1 Yes	○ 2 No
b. Do you cough during the night in the winter?	○ 1 Yes	○ 2 No
c. Do you cough like this for most days for 3 months every year?	○ 1 Yes	○ 2 No
d. Do you cough up mucus on most of these days?	○ 1 Yes	○ 2 No
e. Has this gone on for at least 2 years?	○ 1 Yes	○ 2 No

Please answer the following questions regarding the medical conditions listed below as they pertain to you.

	Medical Condition	a. Do you have this condition? Yes 1	a. No 2	b. was diagnosed by a healthcare provider: Yes 1	b. No 2	c. was present in the last 5 years: Yes 1	c. No 2	d. is currently treated with the following: 1 = Drugs 2 = Diet 3 = Exercise 4 = Other 5 = None 1	2	3	4	5	e. required hospital admission: Yes 1	e. No 2	f. has decreased your quality of life: 0 = Not at all 1 = Slightly 2 = Moderately 3 = Greatly 4 = Extremely 0	1	2	3	4
11.	**Asthma or Wheezing**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
12.	**Emphysema**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
13.	**Pneumonia**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
14.	**Tuberculosis**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
15.	**Pulmonary Fibrosis ("stiff lungs")**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

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16. Have you had pain in either leg when walking other than pain in your joints?

○ 2 No ----> Go to question 17.

○ 1 Yes ----> Please complete the following questions. This condition:

a. was diagnosed by a healthcare provider as Peripheral Vascular Disease (PVD) or Claudication:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

f. Does the leg pain begin when you are standing still?

○ 1 Yes
○ 2 No

g. Where in your leg does the pain begin?

○ 1 Calf included
○ 2 Does not include calf

h. Do you get leg pain if you walk uphill or hurry?

○ 1 Yes
○ 2 No
○ 3 Do not walk up hill

i. Does standing still relieve your leg pain?

○ 1 Yes
○ 2 No

j. What do you do when you get leg pain while walking?

○ 1 Stop or slow down
○ 2 Keep walking at the same pace

k. How soon until your leg pain goes away?

○ 1 More than 10 minutes
○ 2 Less than 10 minutes

l. Have you had a peripheral bypass operation for this problem?

○ 1 Yes
○ 2 No

Please answer the following questions regarding the medical conditions listed below as they pertain to you.

	Medical Condition	a. Do you have this condition? Yes 1 / No 2	b. was diagnosed by a healthcare provider: Yes 1 / No 2	c. was present in the last 5 years: Yes 1 / No 2	d. is currently treated with the following: 1 = Drugs, 2 = Diet, 3 = Exercise, 4 = Other, 5 = None — 1 2 3 4 5	e. required hospital admission: Yes 1 / No 2	f. has decreased your quality of life: 0 = Not at all, 1 = Slightly, 2 = Moderately, 3 = Greatly, 4 = Extremely — 0 1 2 3 4
17.	**Headaches**	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○
18.	**Seizures or Epilepsy**	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○
19.	**Neuromuscular Disorders** (examples: Parkinson Disease; Multiple Sclerosis) *Specify condition(s):* _____ ☐☐☐	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○

20. In the last year, have you had any sudden weakness in your arms or legs?

○ 2 No ----> Go to question 21.

○ 1 Yes ----> Please complete the following questions:

a. Did this weakness come on suddenly and then clear up completely each time?

○ 1 Yes
○ 2 No

b. Did the weakness occur with pain?

○ 1 Yes
○ 2 No

c. Did this weakness last more than a second or two, but less than a day?

○ 1 Yes
○ 2 No

d. How has this weakness decreased your quality of life?

○ 0 Not at all
○ 1 Slightly
○ 2 Moderately
○ 3 Greatly
○ 4 Extremely

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21. In the last year, have you had numbness or tingling or loss of feeling in your arms, legs, or face -- that didn't happen because your arm just fell asleep?

○ 2 No ----> Go to question 22.

○ 1 Yes ----> Please complete the following questions:

a. Each time, did this numbness or loss of feeling come on suddenly and then clear up completely?

○ 1 Yes
○ 2 No

b. Did this numbness or loss of feeling occur with pain in the same place?

○ 1 Yes
○ 2 No

c. Did this numbness or loss of feeling last more than a second or two, but less than a day?

○ 1 Yes
○ 2 No

d. How has this numbness decreased your quality of life?

○ 0 Not at all
○ 1 Slightly
○ 2 Moderately
○ 3 Greatly
○ 4 Extremely

22. In the last year, have you had loss of speech, slurring of speech, or changes in speech?

○ 2 No ----> Go to question 23.

○ 1 Yes ----> Please complete the following questions:

a. Did this speech change come on suddenly and then clear up completely?

○ 1 Yes
○ 2 No

b. Each time, did this change in speech last more than a second or two, but less than a day?

○ 1 Yes
○ 2 No

c. How has this speech change decreased your quality of life?

○ 0 Not at all
○ 1 Slightly
○ 2 Moderately
○ 3 Greatly
○ 4 Extremely

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23. Have you ever had a stroke, "mini strokes," or "TIA's?"

○ 2 No ----> Go to question 24.

○ 1 Yes ----> Please complete the following questions. This condition:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

f. Do you have difficulty moving an arm or leg as a result of your stroke?

○ 1 No difficulty
○ 2 Yes, with slight one-sided weakness or paralysis
○ 3 Yes, with considerable one-sided weakness or paralysis

Please answer the following questions regarding the medical conditions listed below as they pertain to you.

	Medical Condition	a. Do you have this condition? Yes 1 / No 2	b. was diagnosed by a healthcare provider: Yes 1 / No 2	c. was present in the last 5 years: Yes 1 / No 2	d. is currently treated with the following: 1 = Drugs, 2 = Diet, 3 = Exercise, 4 = Other, 5 = None — 1 2 3 4 5	e. required hospital admission: Yes 1 / No 2	f. has decreased your quality of life: 0 = Not at all, 1 = Slightly, 2 = Moderately, 3 = Greatly, 4 = Extremely — 0 1 2 3 4
24.	**Thyroid or Endocrine Disorders** (examples: Low Thyroid; Goiter)	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○
25.	**Diabetes or High Blood Sugar** (do not include high blood sugar during pregnancy)	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○

If "No," go to question 26 on the following page.

g. Have you had any of the following problems with your diabetes?

1. Kidney problems	○ 1 Yes	○ 2 No	○ 3 Don't know
2. Eye problems requiring treatment with an eye doctor	○ 1 Yes	○ 2 No	○ 3 Don't know
3. Changes in the feeling of your feet or legs	○ 1 Yes	○ 2 No	○ 3 Don't know
4. Diarrhea at night	○ 1 Yes	○ 2 No	○ 3 Don't know
5. Other bowel problems	○ 1 Yes	○ 2 No	○ 3 Don't know
6. Impotence (difficulty with erections)	○ 1 Yes	○ 2 No	○ 3 Don't know

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Please answer the following questions regarding the medical conditions listed below as they pertain to you.

	Medical Condition	a. Do you have this condition? Yes 1 / No 2	b. was diagnosed by a healthcare provider: Yes 1 / No 2	c. was present in the last 5 years: Yes 1 / No 2	d. is currently treated with the following: 1 = Drugs, 2 = Diet, 3 = Exercise, 4 = Other, 5 = None — 1 2 3 4 5	e. required hospital admission: Yes 1 / No 2	f. has decreased your quality of life: 0 = Not at all, 1 = Slightly, 2 = Moderately, 3 = Greatly, 4 = Extremely — 0 1 2 3 4
26.	**Bladder Problems** *Specify condition(s):* _____	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○
27.	**Prostate Problems** *Specify condition(s):* _____	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○
28.	**Kidney Problems** *Specify condition(s):* _____	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○

> If "No," go to question 29 below.

g. Have you had any of the following problems with your kidneys?

1. Decreased kidney function (example: passing water less frequently)	○ 1 Yes	○ 2 No	○ 3 Don't know
2. Kidney removal	○ 1 Yes	○ 2 No	○ 3 Don't know
3. Kidney dialysis	○ 1 Yes	○ 2 No	○ 3 Don't know
4. Kidney transplant	○ 1 Yes	○ 2 No	○ 3 Don't know

29. Have you had liver trouble?

○ 4 No ----> Go to question 30 on the following page.
○ 3 Yes, temporary hepatitis only ——>
○ 2 Yes, chronic or permanent hepatitis ——>
○ 1 Yes, other ——>

> This condition:

a. was diagnosed by a healthcare provider: Yes 1 / No 2	b. was present in the last 5 years: Yes 1 / No 2	c. is currently treated with the following: 1 = Drugs, 2 = Diet, 3 = Exercise, 4 = Other, 5 = None — 1 2 3 4 5	d. required hospital admission: Yes 1 / No 2	e. has decreased your quality of life: 0 = Not at all, 1 = Slightly, 2 = Moderately, 3 = Greatly, 4 = Extremely — 0 1 2 3 4
○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○

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30. Do you have cirrhosis (or hardening) of the liver?

○ 2 No ----> Go to question 31.

○ 1 Yes ----> Please complete the following questions. This condition:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

f. Have you had any of the following problems with your cirrhosis?

1. Fluid in the abdomen ○ 1 Yes ○ 2 No ○ 3 Don't know
2. Enlarged spleen ○ 1 Yes ○ 2 No ○ 3 Don't know
3. Bleeding ○ 1 Yes ○ 2 No ○ 3 Don't know

Please answer the following questions regarding the medical conditions listed below as they pertain to you.

	Medical Condition	a. Do you have this condition? Yes 1 / No 2	b. was diagnosed by a healthcare provider: Yes 1 / No 2	c. was present in the last 5 years: Yes 1 / No 2	d. is currently treated with the following: 1 = Drugs, 2 = Diet, 3 = Exercise, 4 = Other, 5 = None	e. required hospital admission: Yes 1 / No 2	f. has decreased your quality of life: 0 = Not at all, 1 = Slightly, 2 = Moderately, 3 = Greatly, 4 = Extremely
31.	**Digestive Disorders** (examples: Crohn's Disease; Colitis) *Specify condition(s):* _____	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○
32.	**Ulcers of Stomach or Intestines**	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○

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33. Have you had cancer? (Ignore skin cancer except for melanoma.)

○ 2 No ----> Go to question 34.

○ 1 Yes ----> Please answer the following questions:

My cancer(s):

a. was/were diagnosed by a healthcare provider:	b. was/were present in the last 5 years:	c. is/are currently treated with the following:	d. required hospital admission:	e. has/have decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

f. Is/are your cancer(s) completely controlled?

○ 1 Yes
○ 2 No

g. Has/have your cancer(s) spread from its original site to other parts of the body?

○ 1 Yes
○ 2 No

h. Please mark the following cancer(s) that you have now or had in the past: (Choose all that apply)

1. Bladder	○ 1 Yes	11. Melanoma	○ 1 Yes
2. Brain	○ 1 Yes	12. Mouth	○ 1 Yes
3. Breast	○ 1 Yes	13. Neck (throat)	○ 1 Yes
4. Cervical	○ 1 Yes	14. Ovarian	○ 1 Yes
5. Colon	○ 1 Yes	15. Pancreatic	○ 1 Yes
6. Gastric (stomach/esophageal)	○ 1 Yes	16. Prostate	○ 1 Yes
7. Leukemia	○ 1 Yes	17. Rectal	○ 1 Yes
8. Liver	○ 1 Yes	18. Sarcoma/Bone	○ 1 Yes
9. Lung	○ 1 Yes	19. Thyroid	○ 1 Yes
10. Lymphoma	○ 1 Yes	20. Uterine	○ 1 Yes
		21. Other	○ 1 Yes

Specify condition(s): _____

34. Have you had any arthritis or rheumatic disease?

○ 2 No ----> Go to question 35.

○ 1 Yes ----> Please answer the following questions:

My arthritis or rheumatic disease(s):

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

f. Please mark the following types(s) of rheumatic disease that you have now or had in the past: (Choose all that apply)

1. Ankylosing Spondylitis	○ 1 Yes	11. Raynaud's disease	○ 1 Yes
2. Colitic arthritis	○ 1 Yes	12. Reiter's disease	○ 1 Yes
3. Fibromyalgia	○ 1 Yes	13. Rheumatoid arthritis	○ 1 Yes
4. Lupus	○ 1 Yes	14. Scleroderma	○ 1 Yes
5. Lyme disease	○ 1 Yes	15. Sjogren's	○ 1 Yes
6. Mixed connective tissue disease	○ 1 Yes	16. Other	○ 1 Yes
7. Osteoarthritis	○ 1 Yes	*Specify condition(s):*	
8. Polymyalgia rheumatic/temporal arthritis	○ 1 Yes		☐☐☐
9. Polymyositis	○ 1 Yes		
10. Psoriatic arthritis	○ 1 Yes		

35. Do you have Osteoporosis?

○ 2 No ----> Go to question 36.

○ 1 Yes ----> Please complete the following questions. This condition:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

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36. Have you ever had a bone fracture?

○ 2 No ----> Go to question 37.

○ 1 Yes ----> Please specify the nature of the fracture for each. Specify the most recent one first.

A. What was the fracture? _____ ☐☐☐

This fracture:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

B. Was there another fracture?

○ ***1 Yes ----> What was the fracture?*** _____ ☐☐☐

○ ***2 No***

This fracture:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes
d. required hospital admission:		**e. has decreased your quality of life:**
○ 1 Yes ○ 2 No		○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

C. Was there another fracture?

○ ***1 Yes ----> What was the fracture?*** _____ ☐☐☐

○ ***2 No***

This fracture:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes
d. required hospital admission:		**e. has decreased your quality of life:**
○ 1 Yes ○ 2 No		○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

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37. Are you HIV positive?

○ 2 No ----> Go to question 38.

○ 1 Yes ----> This condition:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

f. Do you have Acquired Immune Deficiency Syndrome (AIDS)?

○ 1 Yes
○ 2 No
○ 3 Don't know

Please answer the following questions regarding the medical conditions listed below as they pertain to you.

	Medical Condition	a. Do you have this condition? Yes 1 / No 2	b. was diagnosed by a healthcare provider: Yes 1 / No 2	c. was present in the last 5 years: Yes 1 / No 2	d. is currently treated with the following: 1 = Drugs, 2 = Diet, 3 = Exercise, 4 = Other, 5 = None	e. required hospital admission: Yes 1 / No 2	f. has decreased your quality of life: 0 = Not at all, 1 = Slightly, 2 = Moderately, 3 = Greatly, 4 = Extremely
38.	**Skin Disorders** (examples: Acne; Eczema) *Specify condition(s):* _____	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○
39.	**Depression**	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○
40.	**Anxiety**	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○
41.	**Other Mental Problems** *Specify condition(s):* _____	○ ○	○ ○	○ ○	○ ○ ○ ○ ○	○ ○	○ ○ ○ ○ ○

42. Other health conditions?

○ 1 Yes ----> Please specify condition(s): _____

○ 2 No

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Symptom Checklist

Please indicate which of the following symptoms *currently* apply to you:

	Symptom	a. Do you have this symptom?		b. Has this symptom decreased your quality of life?				
		Yes 1	No 2	Not at all 0	Slightly 1	Moderately 2	Greatly 3	Extremely 4
43.	**Skin rashes**	○	○	○	○	○	○	○
44.	**Itching**	○	○	○	○	○	○	○
45.	**Night sweats**	○	○	○	○	○	○	○
46.	**Fever**	○	○	○	○	○	○	○
47.	**Fatigue**	○	○	○	○	○	○	○
48.	**Weight loss**	○	○	○	○	○	○	○
49.	**Weight gain**	○	○	○	○	○	○	○
50.	**Nausea**	○	○	○	○	○	○	○
51.	**Vomiting**	○	○	○	○	○	○	○
52.	**Diarrhea**	○	○	○	○	○	○	○
53.	**Constipation**	○	○	○	○	○	○	○
54.	**Loss of appetite**	○	○	○	○	○	○	○
55.	**Over-eating**	○	○	○	○	○	○	○
56.	**Vision problems**	○	○	○	○	○	○	○
57.	**Hearing problems**	○	○	○	○	○	○	○
58.	**Dizziness or light-headedness (with standing)**	○	○	○	○	○	○	○
59.	**Dizziness or light-headedness (sitting or lying)**	○	○	○	○	○	○	○

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Symptom Checklist (continued)

	Symptom	a. Do you have this symptom?		b. Has this symptom decreased your quality of life?				
		Yes 1	No 2	Not at all 0	Slightly 1	Moderately 2	Greatly 3	Extremely 4
60.	Fainting or blackouts	○	○	○	○	○	○	○
61.	Leg or arm weakness	○	○	○	○	○	○	○
62.	Leg or arm paralysis	○	○	○	○	○	○	○
63.	Shortness of breath	○	○	○	○	○	○	○
64.	Chest palpitations	○	○	○	○	○	○	○
65.	Pain (generalized)	○	○	○	○	○	○	○
66.	Chest pain	○	○	○	○	○	○	○
67.	Abdominal pain	○	○	○	○	○	○	○
68.	Back pain	○	○	○	○	○	○	○
69.	Joint pain	○	○	○	○	○	○	○
70.	Leaking urine	○	○	○	○	○	○	○
71.	Frequent urination	○	○	○	○	○	○	○
72.	Sleep problems	○	○	○	○	○	○	○
73.	Mobility (walking) problems	○	○	○	○	○	○	○
74.	Balance problems	○	○	○	○	○	○	○

75. What is your weight in pounds? ☐☐☐ *(pounds)*

76. What is your height? ☐☐ *(feet)* ☐☐ *(inches)*

THANK YOU for completing this questionnaire

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(staple here)

Study ID: 0 7 1

Sociodemographic Questionnaire

Center for Research in Chronic Disorders
University of Pittsburgh

ID Number: | | | | | | | | | | |

Administration Date: | | | / | | | / | | | | |
(month) (day) (year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

(FOR STAFF USE ONLY)

Directions: The information requested is important to understand more about you and your health. A person's characteristics have been shown to influence health, either through heredity or current and past lifestyle practices. The information that you provide will be used for research purposes only and will be held in **confidence**. For each question, please select the response that best describes you. If you do not know the information requested, mark "Do Not Know" or "Unknown" as indicated. If you feel that a question does not apply to you, mark "Not Applicable."

1. What is your sex?

○ (1) Male
○ (2) Female

2. What is your date of birth?

| | | / | | | / | | | | |
(month) (day) (year)

3. What is your age? *(Please list your age at your last birthday.)*

| | | | (years)

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

4. Which one of the following best describes your current marital status?

- ○ (1) Never married
- ○ (2) Currently married
- ○ (3) Living with partner/significant other
- ○ (4) Widowed
- ○ (5) Separated
- ○ (6) Divorced
- ○ (7) Other (specify) ----> | | | | | | | | | | | | | | | | | |

5. How many years have you been at your current marital status? *(If less than one year, please write "00")*

| | | (years)

Given the ever-increasing ethnic diversity of the population in the United States of America, the following questions are being asked to gather information on your racial/ethnic background....

6. Do you consider yourself to be Hispanic or Latino, that is, of Mexican, Puerto Rican, Cuban, Caribbean, or of Latin American descent?

- ○ (1) Yes
- ○ (2) No
- ○ (3) Do Not Know

7. What is your race? *(Please choose ALL categories that apply)*

(a.) White	○ (1) Yes
(b.) Black or African American	○ (1) Yes
(c.) American Indian	○ (1) Yes
Please specify the tribe: _____	
(d.) Alaska Native	○ (1) Yes
(e.) Native Hawaiian or other Pacific Islander	○ (1) Yes
(f.) Asian	○ (1) Yes
(g.) Unknown	○ (1) Yes
(h.) Other	○ (1) Yes
Please specify: _____	

8. Is English your primary language (the one you speak most often)?

- ○ (1) Yes
- ○ (2) No -----> Please specify language: _____

(for office use only) | | | |

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

9. Where do you live?

a. Please enter the 5-digit ZIPCODE of your <u>PRIMARY RESIDENCE</u>:
(where you live most of the time)

b. Please enter the 5-digit ZIPCODE of your <u>SECONDARY RESIDENCE</u>:
(where you live second most of the time)

○ **N/A**
(No Secondary Residence)

10. In what type of area did you live most of your childhood?

○ (1) Urban, large city
○ (2) Urban, small city
○ (3) Suburb of large city
○ (4) Suburb of small city
○ (5) Rural, farm
○ (6) Rural, non-farm
○ (7) Other (please specify) --->_____

(for office use only)

11. How many years of formal education have you completed?

(For example, if you completed high school in the USA, you would have had 12 years of education.)

(years)

ID Number: _ _ _ _ _ _ _ _ _ _ (for internal use only) Date: _ _ / _ _ / _ _ (for internal use only)

12. What is your educational background? *(Please complete to the highest level of education attained.)*

School:	Number of years attended:	Did you finish this school?	If earned a degree, specify the major area of emphasis:
a.) **Grade school** *(Grades 1- 8)*	*1)*	*2)* ○ **(1) Yes**	*(Not Applicable)*
b.) **High school** *(Grades 9 - 12)*	*1)*	*2)* ○ **(1) Yes**	*(Not Applicable)*
c.) **Earned G.E.D.** *(Graduate Equivalent Diploma)*	*(Not Applicable)*	*2)* ○ **(1) Yes**	*(Not Applicable)*
d.) **Vocational / Technical school**	*1)*	*2)* ○ **(1) Yes**	_____
e.) **2 year college** *(Associate's level)*	*1)*	*2)* ○ **(1) Yes**	_____
f.) **4 year college** *(Bachelor's level)*	*1)*	*2)* ○ **(1) Yes**	_____
g.) **Graduate school** *(Master's level)*	*1)*	*2)* ○ **(1) Yes**	_____
h.) **Professional school** *(ex: MD, D.V.M., JD)*	*1)*	*2)* ○ **(1) Yes**	_____
i.) **Graduate school** *(Doctoral level) (ex: Ph.D., Ed.D.)*	*1)*	*2)* ○ **(1) Yes**	_____
j.) **Other;** *please specify:* _____	*1)*	*2)* ○ **(1) Yes**	_____

13. What is your current employment status?

○ (1) Full time (working at least 35 hours a week)
○ (2) Part time (working less than 35 hours a week)
○ (3) Laid off or unemployed, but looking for work
○ (4) Laid off or unemployed, but not looking for work
○ (5) Retired, not working at all
○ (6) Retired, but working part or full time
○ (7) Disabled/unable to work
○ (8) Full time homemaker
○ (9) Student
○ (10) Other (specify) ---->

ID Number: _ _ _ _ _ _ _ _ _ _ _ (for internal use only) Date: _ _ / _ _ / _ _ (for internal use only)

14. Are you currently employed?

○ (1) Yes ----> a.) What is your primary occupation? (the one where you work the most hours per week):

Write in job title: _____ (for office use only) [ ][ ][ ]

b.) Has this been your primary occupation for most of your working life?

○ (1) Yes

○ (2) No ----> c.) What was your primary occupation?

Write in job title: _____ (for office use only) [ ][ ][ ]

d.) Did you change occupations since your illness?

○ 1 Yes ----------> e.) Select all that apply:

- 1. Because of the **physical** demands of my job. ○ (1) Yes
- 2. Because of the **mental** demands of my job. ○ (1) Yes
- 3. Other (specify) ○ (1) Yes

V

_____

○ 2 No; my change in occupation was not because of my illness.

○ (2) No

○ (3) I have NEVER been employed

----> f.) When you were employed, what was your primary occupation?

Write in job title: _____ (for office use only) [ ][ ][ ]

g.) When was the last year that you were employed? [ ][ ][ ][ ]

h.) Did you stop working because of your illness?

○ 1 Yes ----------> i.) Select all that apply:

- 1. Because of the **physical** demands of my job. ○ (1) Yes
- 2. Because of the **mental** demands of my job. ○ (1) Yes
- 3. Other (specify) ○ (1) Yes

V

_____

○ 2 No; my stopping work was not because of my illness.

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

15. Do you have any children?

○ (1) Yes ----> a.) Please specify the number of children: ☐☐

○ (2) No

16. How many people *presently* live in your household including yourself?

a. ☐☐ (adults)

b. ☐☐ (children under age 18)
If NONE, enter 00.

17. Do you have a religious background or preference?

○ (1) Yes ----> a.) Please specify: (Choose one response only)

○ (1) Catholic (ex: Roman Catholic)
○ (2) Jewish
○ (3) Protestant (ex: Lutheran; Presbyterian; Methodist; Unitarian)
○ (4) Other (specify) ----> _____

(for office use only) ☐☐☐

○ (2) No

b.) To what extent do you follow the customs and practices of your religion?

○ (1) Never
○ (2) Sometimes
○ (3) Frequently
○ (4) Always

18. How important is religion or spirituality in your life?

○ (1) Not at all important
○ (2) Somewhat important
○ (3) Extremely important

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

19. Do you have health care insurance?

○ (1) Yes --->
○ (2) No

a.) What type(s) of insurance do you have? (Choose all that apply.)

1.) Medicare	○ (1) Yes
2.) Medicaid	○ (1) Yes
3.) SSI	○ (1) Yes
4.) Veterans Administration	○ (1) Yes
5.) Workers Compensation	○ (1) Yes
6.) Private health insurance	○ (1) Yes
7.) Other (specify) V _____	○ (1) Yes

b.) Does your insurance cover the cost of <u>medication</u>?

○ (1) Yes, all
○ (2) Yes, some of the cost ---> Please specify in what way: _____
○ (3) No
○ (4) Unknown

c.) Does your insurance cover the cost of <u>health care</u>?

○ (1) Yes, all
○ (2) Yes, some of the cost ---> Please specify in what way: _____
○ (3) No
○ (4) Unknown

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

The following questions concern family and individual income. We recognize the sensitive nature of these questions. This information is important in order to understand the economic impact of the chronic illness on the family and individual. Your answers will be held in strict confidence.

20. What are all the sources of <u>your own</u> total gross <u>annual</u> income (before taxes and deductions):

(a.) Wages, salaries, commisions, bonuses, or tips from all jobs	○ (1) Yes
(b.) Self-employment income from farm or non-farm business	○ (1) Yes
(c.) Interest, dividend, net rental income, royalty income, or income from estates or trusts	○ (1) Yes
(d.) Social security or railroad retirement	○ (1) Yes
(e.) Supplemental security income or other public assistance income	○ (1) Yes
(f.) Retirement, survivor, or disability pensions	○ (1) Yes
(g.) Other (specify): _____	○ (1) Yes

21. If you are currently employed, please select <u>your own</u> gross annual income from <u>wages only</u> (before taxes and deductions):

○ (1) Under $10,000	○ (8) $60,000 to $69,999	○ **N/A (Not Employed)**
○ (2) $10,000 to $14,999	○ (9) $70,000 to $79,999	
○ (3) $15,000 to $19,999	○ (10) $80,000 to $99,999	
○ (4) $20,000 to $29,999	○ (11) $100,000 to $150,000	
○ (5) $30,000 to $39,999	○ (12) Over $150,000	
○ (6) $40,000 to $49,999	○ (13) Unknown	
○ (7) $50,000 to $59,999	○ (14) Refused	

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

22. If you are not currently employed, but were employed in the past, please select <u>your own</u> gross annual income from <u>wages</u> (before taxes and deductions) for the last year you worked:

○ (1) Under $10,000
○ (2) $10,000 to $14,999
○ (3) $15,000 to $19,999
○ (4) $20,000 to $29,999
○ (5) $30,000 to $39,999
○ (6) $40,000 to $49,999
○ (7) $50,000 to $59,999
○ (8) $60,000 to $69,999
○ (9) $70,000 to $79,999
○ (10) $80,000 to $99,999
○ (11) $100,000 to $150,000
○ (12) Over $150,000
○ (13) Unknown
○ (14) Refused

○ **N/A (Never Employed)**

23. What is the total gross <u>annual</u> income for your <u>household</u> from all sources (before taxes and deductions):

○ (1) Under $10,000
○ (2) $10,000 to $13,000
○ (3) $13,000 to $20,000
○ (4) $20,000 to $30,000
○ (5) $30,000 to $50,000
○ (6) Over $50,000

24. Does your current household income meet your basic needs (such as food, housing, utilities, and health care):

○ (1) Yes
○ (2) No

Instrument Number: 3 0 3
(For internal use only)

(staple here)

Study ID: 0 7 1

Sociodemographic Questionnaire (continued)

Center for Research in Chronic Disorders
University of Pittsburgh

ID Number: | | | | | | | | | | |

Administration Date: | | | / | | | / | | | | |
(month) (day) (year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

(FOR STAFF USE ONLY)

25. How difficult is it to pay for your basic needs?

○ (1) Not at all difficult
○ (2) Somewhat difficult
○ (3) Extremely difficult

Instrument Number: 8 2 2
(For internal use only)

Study ID: 0 7 1

HEALTH SURVEY

Center for Research in Chronic Disorders

ID Number: | | | | | | | | | | |

Administration Date: | | / | | / | | | | |
(month) (day) (year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

(FOR STAFF USE ONLY)

Please complete the following questions to the best of your ability.

1. Most recent CD4 T-Cell Count:

2. Is your viral load detectable?

○ 1 Yes ------> a. Most recent viral load:

○ 2 No

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

3. Current medications and dosages:

(a) Medication	(b) Doses/day	(c) # of Pills/dose
(1.) _____ (for office use only)		
(2.) _____ (for office use only)		
(3.) _____ (for office use only)		
(4.) _____ (for office use only)		
(5.) _____ (for office use only)		
(6.) _____ (for office use only)		
(7.) _____ (for office use only)		
(8.) _____ (for office use only)		
(9.) _____ (for office use only)		
(10.) _____ (for office use only)		

(continued on next page)

ID Number: __ __ __ __ __ __ __ __ __ __ (for internal use only) Date: _ _ / _ _ / _ _ (for internal use only)

3. Current medications and dosages: *(continued)*

	(a)	(b)	(c)
Medication		**Doses/day**	**# of Pills/dose**
(11.) _____	(for office use only)		
(12.) _____	(for office use only)		
(13.) _____	(for office use only)		
(14.) _____	(for office use only)		
(15.) _____	(for office use only)		

Please complete the following questions. We are interested in obtaining information since _____ .

4. Hospitalizations?

○ 1 Yes ------> a. Reason(s):

(1.) _____

(2.) _____

(3.) _____

(4.) _____

(for office use only)

5. Emergency room visits?

○ 1 Yes ------> a. Reason(s):

(1.) _____

(2.) _____

(3.) _____

(4.) _____

(for office use only)

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

6. Missed medical appointments?

○ 1 Yes ------> a. How many? ☐☐

○ 2 No

b. Reason(s):

(1.) _____

(2.) _____

(3.) _____

(for office use only) ☐☐☐ ☐☐☐ ☐☐☐

7. Do you have any current infections related to HIV?

○ 1 Yes ------> a. Please list:

○ 2 No

(1.) _____

(2.) _____

(3.) _____

(for office use only) ☐☐☐ ☐☐☐ ☐☐☐

8. Are you currently involved in a clinical trial or research study, <u>other than this one</u>?

○ 1 Yes ------> a. Please list:

○ 2 No

(1.) _____

(2.) _____

(for office use only) ☐☐☐ ☐☐☐

9. Do you currently use any alternative therapies or treatments for HIV infection?

○ 1 Yes ------> a. Are you currently using any of these:

○ 2 No

Yes		Yes	
1 ○	1. Yoga	1 ○	5. Vitamins
○	2. Meditation	○	6. Acupuncture
○	3. Herbal therapy	○	7. Aromatherapy
○	4. Exercise	○	8. Other

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

10. Are you currently involved in <u>one-on-one</u> counseling?

○ 1 Yes
○ 2 No

11. Are you currently involved in <u>group counseling</u> or support groups?

○ 1 Yes ------> a. Please list:
(1.) _____
(2.) _____

(for office use only)

○ 2 No

12. Do you currently receive assistance from a community-based organization?

○ 1 Yes ------> a. Please list:
(1.) _____
(2.) _____

(for office use only)

○ 2 No

13. How satisfied are you with your relationship with your health care provider?

1	2	3	4	5	6	7	8	9	10
○	○	○	○	○	○	○	○	○	○
Not Satisfied									***Very Satisfied***

Instrument Number: 8 2 4
(For internal use only)

Study ID: 0 7 1

MEDICAL RECORD REVIEW

Center for Research in Chronic Disorders

ID Number: | | | | | | | | | | |

Administration Date: | | / | | / | | | | |
(month) (day) (year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

(FOR STAFF USE ONLY)

Please keep these rules in mind when responding to the questions....

Shade circles like this: ●
Not like this: ⊗ ✓

1. CD4 T-Cell Count: | | | | | |

2. Date: | | / | | / | | | | |
(month) (day) (year)

3. Viral load detectable?

○ 1 Yes ------> Viral load/HIV RNA:

(a.) | | | | | | | |

(b.) Date: | | / | | / | | | | |
(month) (day) (year)

○ 2 No

(c.) Sensitivity: < | | |

(d.) Date: | | / | | / | | | | |
(month) (day) (year)

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

4. Any missed appointments?

○ 1 Yes -----> a. How many? ☐☐

b. Resolution to these missed appointments: _____

_____

○ 2 No

5. Number of hospitalizations: ☐☐ Reason(s): _____

_____

6. Number of emergency room visits: ☐☐ Reason(s): _____

_____

7. Number of outpatient surgical visits: ☐☐ Reason(s): _____

_____

8. Current illicit drug use?

○ 1 Yes

○ 2 No

9. Current alcohol abuse?

○ 1 Yes

○ 2 No

10. Current opportunistic infections:

a. _____

b. _____

c. _____

d. _____

e. _____

(for office use only)

☐☐☐

☐☐☐

☐☐☐

☐☐☐

☐☐☐

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

11. Current medications and dosages:

	(a)	(b)	(c)
Medication		**Doses/day**	**# of Pills/dose**
(1.) _____	(for office use only)		
(2.) _____	(for office use only)		
(3.) _____	(for office use only)		
(4.) _____	(for office use only)		
(5.) _____	(for office use only)		
(6.) _____	(for office use only)		
(7.) _____	(for office use only)		
(8.) _____	(for office use only)		
(9.) _____	(for office use only)		
(10.) _____	(for office use only)		

(continued on next page)

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

11. Current medications and dosages: ***(continued)***

(a) Medication	(b) Doses/day	(c) # of Pills/dose
(11.) _____ (for office use only)		
(12.) _____ (for office use only)		
(13.) _____ (for office use only)		
(14.) _____ (for office use only)		
(15.) _____ (for office use only)		

Instrument Number: 826
(For internal use only)

Study ID: 071

MEDICAL RECORD REVIEW

Addendum A

Center for Research in Chronic Disorders

ID Number: | | | | | | | | | | |

Administration Date: ___ (month) / ___ (day) / ____ (year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○

(FOR STAFF USE ONLY)

Please use the following example to answer all questions:

Shade circles like this: ●
Not like this: ⊗ ✓

1. New medical record information available since last data collection?

○ 1 Yes
○ 2 No

2. Evidence of assessment of adherence since last data collection?

○ 1 Yes ----> Evidence of adherence intervention?
○ 2 No

  ○ 1 Yes ----> Answer the following:
  ○ 2 No

	(1)
a. Evidence of referral to in-house adherence program?	○ Yes
b. Evidence of referral to outside adherence program?	○ Yes
c. Evidence of tools/devices recommended for adherence (pill box, beeper, diary)?	○ Yes

ID Number: _ _ _ _ _ _ _ _ _ _ (for internal use only) Date: _ _ / _ _ / _ _ (for internal use only)

3. Diagnosed with Hepatitis C+?

○ 1 Yes ----> a. Quantitative HCV Viral Load available?

○ 2 No

○ 1 Yes ----> 1. Quantitative HCV Viral Load date:

○ 2 No

(month) / (day) / (year)

2. Viral Load detectable?

○ 1 Yes ----> a. Copies/ML:

○ 2 No

b. IU/ML:

c. Log IU/ML: .

b. HCV Genotype available?

○ 1 Yes ----> 1. HCV Genotype date:

○ 2 No

(month) / (day) / (year)

2. HCV Genotype:

	(#)	(letter)
a.		
b.		
c.		
d.		

Instrument Number: 729
(For internal use only)

Study ID: 031

CO-MORBIDITY CONDITIONS

Center for Research in Chronic Disorders

ID Number: | | | | | | | | | | |

Administration Date: | | / | | / | | | | |
(month) (day) (year)

Source: | |

Visit Number: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

Problem List:

1. _____ | | |
2. _____ | | |
3. _____ | | |
4. _____ | | |
5. _____ | | |
6. _____ | | |
7. _____ | | |
8. _____ | | |
9. _____ | | |
10. _____ | | |

Instrument Number: 8 1 4
(For internal use only)

Study ID: 0 7 1

CO-MORBIDITY QUESTIONNAIRE
ADDENDUM

Center for Research in Chronic Disorders

ID Number: | | | | | | | | | | | Administration Date: | | / | | / | | | | |
(month) (day) (year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

(FOR STAFF USE ONLY)

77. Do you have pain in your arms or legs?

○ 2 No ----> Go to question 78.

○ 1 Yes ---> Please complete the following questions:

a. Was this diagnosed by a healthcare provider as neuropathy?	**b. was present in the last 5 years:**	**c. is currently treated with the following:**	**d. required hospital admission:**	**e. has decreased your quality of life:**
○ 1 Yes ---> Please identify the location of the pain: _____ _____ _____ ○ 2 No *(for office use only)*	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

f.	**Does the pain worsen with movement or exercise?**	○ 1 Yes	○ 2 No
g.	**Is the pain constant?**	○ 1 Yes	○ 2 No
h.	**Does pain restrict your mobility?**	○ 1 Yes	○ 2 No
i.	**Does pain affect your sleep?**	○ 1 Yes	○ 2 No

ID Number: _ _ _ _ _ _ _ _ _ _ (for internal use only) Date: _ _ / _ _ / _ _ (for internal use only)

78. Have you ever had hepatitis?

○ 2 No ----> Go to question 79.

○ 1 Yes ---> Please choose all that apply:

Yes	
1	
○	**a. Hepatitis A**
○	**b. Hepatitis B**
○	**c. Hepatitis C**
○	**d. Hepatitis Unknown or Other**

Please complete the following questions:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

79. Do you have fat redistribution syndrome (lipodystrophy)?

○ 2 No ----> Go to question 80.

○ 1 Yes ---> Please complete the following questions:

a. was diagnosed by a healthcare provider:	b. was present in the last 5 years:	c. is currently treated with the following:	d. required hospital admission:	e. has decreased your quality of life:
○ 1 Yes ○ 2 No	○ 1 Yes ○ 2 No	1. Drugs ○ 1 Yes 2. Diet ○ 1 Yes 3. Exercise ○ 1 Yes 4. Other ○ 1 Yes 5. None ○ 1 Yes	○ 1 Yes ○ 2 No	○ 0 Not at all ○ 1 Slightly ○ 2 Moderately ○ 3 Greatly ○ 4 Extremely

f. Do you have fat redistribution on the back of your neck?	○ 1 Yes	○ 2 No
g. Do you have central weight gain (weight gain in abdomen, breast enlargement)?	○ 1 Yes	○ 2 No
h. Do you have peripheral fat wasting (fat loss in face, arms, legs, or buttocks)?	○ 1 Yes	○ 2 No

ID Number: __ __ __ __ __ __ __ __ __ __ (for internal use only) Date: _ _ / _ _ / _ _ (for internal use only)

80. Do you *currently* have any of the following:

	Symptom	a. Do you have this symptom?		b. Has this symptom decreased your quality of life?				
		Yes	No	Not at all	Slightly	Moderately	Greatly	Extremely
		1	2	0	1	2	3	4
1.	Genital Warts	○	○	○	○	○	○	○
2.	Gonorrhea	○	○	○	○	○	○	○
3.	Chlamydia	○	○	○	○	○	○	○
4.	Genital Herpes	○	○	○	○	○	○	○
5.	Oral Herpes	○	○	○	○	○	○	○
6.	PID (Pelvic Inflammatory Disease)	○	○	○	○	○	○	○
7.	HPV (Human Papillomavirus)	○	○	○	○	○	○	○
8.	Trichomoniasis	○	○	○	○	○	○	○
9.	CMV (Cytomegalovirus)	○	○	○	○	○	○	○
10.	Bacterial Vaginosa	○	○	○	○	○	○	○

Instrument Number: 1 0 4
(For internal use only)

Study ID: 0 7 1

MOS-HIV HEALTH SURVEY

Center for Research in Chronic Disorders

ID Number: | | | | | | | | | | |

Administration Date: (month) / (day) / (year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

(FOR STAFF USE ONLY)

Please use the following example to answer all questions:

Shade circles like this: ●
Not like this: ⊗ ✓

INSTRUCTIONS TO PATIENT: Please answer the following questions by filling in ONE circle for each question that corresponds best to your response.

1. In general, would you say your health is: *(Choose ONE response only.)*

   ○ 1 Excellent
   ○ 2 Very good
   ○ 3 Good
   ○ 4 Fair
   ○ 5 Poor

2. How much bodily pain have you generally had during the past 4 weeks?
   (Choose ONE response only.)

   ○ 1 None
   ○ 2 Very mild
   ○ 3 Mild
   ○ 4 Moderate
   ○ 5 Severe
   ○ 6 Very severe

ID Number: __ __ __ __ __ __ __ __ __ __ (for internal use only) Date: _ _ / _ _ / _ _ (for internal use only)

3. During the past 4 weeks, how much did pain interfere with your normal work (or your normal activities, including work outside the home and housework)? *(Choose ONE response only.)*

   ○ 1 Not at all
   ○ 2 A little bit
   ○ 3 Moderately
   ○ 4 Quite a bit
   ○ 5 Extremely

4. The following questions are about activities you might do during a typical day. Does your health **now** limit you in these activities? If so, how much? *(Choose ONE response on each line.)*

	YES, limited a lot 1	**YES, limited a little** 2	**NO, not limited** 3
a. The kinds or amounts of vigorous activities you can do, like lifting heavy objects, running, or participating in strenuous sports	○	○	○
b. The kinds or amounts of moderate activities you can do, like moving a table, carrying groceries, or bowling	○	○	○
c. Walking uphill or climbing (a few flights of stairs)	○	○	○
d. Bending, lifting, or stooping	○	○	○
e. Walking one block	○	○	○
f. Eating, dressing, bathing, or using the toilet	○	○	○

5. Does your health keep you from working at a job, doing work around the house, or going to school? *(Choose ONE response only.)*

   ○ 1 Yes
   ○ 2 No

6. Have you been unable to do certain kinds or amounts of work, housework, or schoolwork because of your health? *(Choose ONE response only.)*

   ○ 1 Yes
   ○ 2 No

ID Number: __ __ __ __ __ __ __ __ __ __ (for internal use only)

Date: _ _ / _ _ / _ _ (for internal use only)

For <u>each</u> of the following questions, choose the <u>ONE</u> answer that comes <u>closest</u> to the way you have been feeling <u>during the past 4 weeks</u>.

7. How much of the time <u>during the past 4 weeks</u> has your health limited your social activities (like visiting with friends or close relatives)?

All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
1	2	3	4	5	6
○	○	○	○	○	○

8. How much of the time <u>during the past 4 weeks</u>:

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
	1	2	3	4	5	6
a. have you been a very nervous person?	○	○	○	○	○	○
b. have you felt calm and peaceful?	○	○	○	○	○	○
c. have you felt downhearted and blue?	○	○	○	○	○	○
d. have you been a happy person?	○	○	○	○	○	○
e. have you felt so down in the dumps that nothing could cheer you up?	○	○	○	○	○	○

ID Number: _ _ _ _ _ _ _ _ _ _ _ _ (for internal use only)

Date: _ _ / _ _ / _ _ (for internal use only)

For <u>each</u> of the following questions, choose the <u>ONE</u> answer that comes <u>closest</u> to the way you have been feeling <u>during the past 4 weeks</u>.

9. How often <u>during the past 4 weeks</u>:

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
	1	2	3	4	5	6
a. did you feel full of pep?	○	○	○	○	○	○
b. did you feel worn out?	○	○	○	○	○	○
c. did you feel tired?	○	○	○	○	○	○
d. did you have enough energy to do the things you wanted to do?	○	○	○	○	○	○
e. did you feel weighed down by your health problems?	○	○	○	○	○	○
f. were you discouraged by your health problems?	○	○	○	○	○	○
g. did you feel despair over your health problems?	○	○	○	○	○	○
h. were you afraid because of your health?	○	○	○	○	○	○

ID Number: __ __ __ __ __ __ __ __ __ __ (for internal use only) Date: _ _ / _ _ / _ _ (for internal use only)

10. How much of the time during the past 4 weeks:

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
	1	2	3	4	5	6
a. did you have difficulty reasoning and solving problems (for example, making plans, making decisions, learning new things)?	○	○	○	○	○	○
b. did you forget things that happened recently (for example, where you put things and when you had appointments)?	○	○	○	○	○	○
c. did you have trouble keeping your attention on any activity for long?	○	○	○	○	○	○
d. did you have difficulty doing activities involving concentration and thinking?	○	○	○	○	○	○

11. Please respond to the following statements by choosing how "True" or "False" each statement is for you. *(Choose ONE response only per statement.)*

	Definitely True	Mostly True	Not Sure	Mostly False	Definitely False
	1	2	3	4	5
a. I am somewhat ill.	○	○	○	○	○
b. I am as healthy as anybody I know.	○	○	○	○	○
c. My health is excellent.	○	○	○	○	○
d. I have been feeling bad lately.	○	○	○	○	○

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

12. How has the quality of your life been during the past 4 weeks? That is, how have things been going for you? *(Choose ONE response only.)*

- ○ 1 Very well; could hardly be better
- ○ 2 Pretty good
- ○ 3 Good and bad parts about equal
- ○ 4 Pretty bad
- ○ 5 Very bad; could hardly be worse

13. How would you rate your physical health and emotional condition **now** compared to 4 weeks ago? *(Choose ONE response only.)*

- ○ 1 Much better
- ○ 2 A little better
- ○ 3 About the same
- ○ 4 A little worse
- ○ 5 Much worse

Instrument Number: 8 2 8
(For internal use only)

Study ID: 0 7 1

Perception of Illness

Visual Analog Scale

Scoring Sheet

Center for Research in Chronic Disorders

ID Number: | | | | | | | | | | |

Administration Date: | | / | | / | | | | |
(month) (day) (year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

(FOR STAFF USE ONLY)

DIRECTIONS: Place a vertical line on the lines below that best describe your perception of the statements.

1. Living with HIV has had _____ on my life.

no effect ——— **a major effect**

| | . | | | |

2. Living with HIV has become _____.

easier ——— **more difficult**

| | . | | | |

3. There is _____ I can do to control my HIV.

little ——— **much**

| | . | | | |

4. My state of mind plays a _____ part in managing my illness.

minor ——— **major**

| | . | | | |

5. There is _____ that can be done to control my illness.

nothing ——— **a lot**

| | . | | | |

Instrument Number: 2 4 5
(For internal use only)

Study ID: 0 7 1

THE SATISFACTION WITH LIFE SCALE

Center for Research in Chronic Disorders

ID Number: | | | | | | | | | | |

Administration Date: ( ) ( ) / ( ) ( ) / ( ) ( ) ( ) ( )
(month) (day) (year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

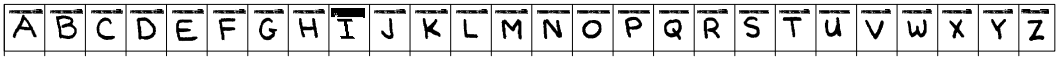
Administration Time: ( ) ( ) : ( ) ( )
(hr) (min)

(FOR STAFF USE ONLY)

Please keep these rules in mind when responding to the questions....

Shade circles like this: ●
Not like this: ⊗ ✓

For optimum accuracy, it is recommended that characters be written block style without touching the sides of the blocks, such as in the following examples. Place only one letter or one number in each box as shown....



Instructions: Please fill in the circle that corresponds to how much you agree or disagree with each statement below. Please fill in only one circle for each statement. Use the following scale as a basis for your answers:

[1] = Strongly Disagree
[2] = Disagree
[3] = Slightly Disagree
[4] = Neither Agree nor Disagree
[5] = Slightly Agree
[6] = Agree
[7] = Strongly Agree

	STRONGLY DISAGREE 1	*DISAGREE* 2	*SLIGHTLY DISAGREE* 3	*NEITHER AGREE NOR DISAGREE* 4	*SLIGHTLY AGREE* 5	*AGREE* 6	*STRONGLY AGREE* 7
1. In most ways, my life is close to my ideal.	○	○	○	○	○	○	○
2. The conditions of my life are excellent.	○	○	○	○	○	○	○
3. I am satisfied with my life.	○	○	○	○	○	○	○
4. So far I have gotten the important things I want in life.	○	○	○	○	○	○	○
5. If I could live my life over, I would change almost nothing.	○	○	○	○	○	○	○

Instrument Number: 259
(For internal use only)

Study ID: 071

ISEL

Center for Research in Chronic Disorders

ID Number: | | | | | | | | | | |

Administration Date: ___ / ___ / ____ (month / day / year)

Time: 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○

Administration Time: ___ : ___ (hr : min)

(FOR STAFF USE ONLY)

Please keep these rules in mind when responding to the questions....

Shade circles like this: ●
Not like this: ⊗ ✓

***Instructions*: This scale is made up of a list of statements each of which may or may not be true about you. For each statement, fill in the circle that corresponds to the response which best describes you. For example, choose "definitely true" if you are sure it is true about you; choose "probably true" if you think it is true but are not absolutely certain. Similarly, choose "definitely false" if you are sure the statement is false; choose "probably false" if you think it is false but you are not absolutely certain. Please fill in only one circle for each statement.**

	DEFINITELY FALSE 0	*PROBABLY FALSE* 1	*PROBABLY TRUE* 2	*DEFINITELY TRUE* 3
1. There are several people that I trust to help solve my problems.	○	○	○	○
2. If I needed help fixing an appliance or repairing my car, there is someone who would help me.	○	○	○	○
3. Most of my friends are more interesting than I am.	○	○	○	○
4. There is someone who takes pride in my accomplishments.	○	○	○	○
5. When I feel lonely, there are several people I can talk to.	○	○	○	○
6. There is no one that I feel comfortable talking to about intimate personal problems.	○	○	○	○

(continued on next page)

ID Number: _ _ _ _ _ _ _ _ _ _ _ _ (for internal use only)

Date: _ _ / _ _ / _ _ (for internal use only)

	DEFINITELY FALSE 0	PROBABLY FALSE 1	PROBABLY TRUE 2	DEFINITELY TRUE 3
7. I often meet or talk with family or friends.	○	○	○	○
8. Most people I know think highly of me.	○	○	○	○
9. If I needed a ride to the airport very early in the morning, I would have a hard time finding someone to take me.	○	○	○	○
10. I feel like I'm not always included by my circle of friends.	○	○	○	○
11. There really is no one who can give me an objective view of how I'm handling my problems.	○	○	○	○
12. There are several different people I enjoy spending time with.	○	○	○	○
13. I think that my friends feel that I'm not very good at helping them solve their problems.	○	○	○	○
14. If I were sick and needed someone (friend, family member, or acquaintance) to take me to the doctor, I would have trouble finding someone.	○	○	○	○
15. If I wanted to go on a trip for a day (example: to the mountains, beach, or country), I would have a hard time finding someone to go with me.	○	○	○	○
16. If I needed a place to stay for a week because of an emergency (for example: water or electricity out in my apartment or house), I could easily find someone who would put me up.	○	○	○	○
17. I feel that there is no one I can share my most private worries and fears with.	○	○	○	○
18. If I were sick, I could easily find someone to help me with my daily chores.	○	○	○	○
19. There is someone I can turn to for advice about handling problems with my family.	○	○	○	○
20. I am as good at doing things as most other people are.	○	○	○	○

(continued on next page)

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

	DEFINITELY FALSE 0	*PROBABLY FALSE* 1	*PROBABLY TRUE* 2	*DEFINITELY TRUE* 3
21. If I decide one afternoon that I would like to go to a movie that evening, I could easily find someone to go with me.	○	○	○	○
22. When I need suggestions on how to deal with a personal problem, I know someone I can turn to.	○	○	○	○
23. If I needed an emergency loan of $100, there is someone (friend, relative, or acquaintance) I could get it from.	○	○	○	○
24. In general, people do not have much confidence in me.	○	○	○	○
25. Most people I know do not enjoy the same things that I do.	○	○	○	○
26. There is someone I could turn to for advice about making career plans or about changing my job.	○	○	○	○
27. I often don't get invited to do things with others.	○	○	○	○
28. Most of my friends are more successful at making changes in their lives than I am.	○	○	○	○
29. If I had to go out of town for a few weeks, it would be difficult to find someone who would look after my house or apartment (the plants, pets, garden, etc.).	○	○	○	○
30. There is really no one I can trust to give me good financial advice.	○	○	○	○
31. If I wanted to have lunch with someone, I could easily find someone to join me.	○	○	○	○
32. I am more satisfied with my life than most people are with theirs.	○	○	○	○
33. If I was stranded 10 miles from home, there is someone I could call who would come and get me.	○	○	○	○
34. No one I know would throw a birthday party for me.	○	○	○	○
35. It would be difficult to find someone who would lend me their car for a few hours.	○	○	○	○

(continued on next page)

ID Number: __ __ __ __ __ __ __ __ __ __
(for internal use only)

Date: _ _ / _ _ / _ _
(for internal use only)

	DEFINITELY FALSE 0	*PROBABLY FALSE* 1	*PROBABLY TRUE* 2	*DEFINITELY TRUE* 3
36. If a family crisis arose, it would be difficult to find someone who could give me good advice about how to handle it.	○	○	○	○
37. I am closer to my friends than most other people are to theirs.	○	○	○	○
38. There is at least one person I know whose advice I really trust.	○	○	○	○
39. If I needed some help in moving to a new house or apartment, I would have a hard time finding someone to help me.	○	○	○	○
40. I have a hard time keeping pace with my friends.	○	○	○	○

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