PREDICTORS OF NONADHERENCE TO ANTIRETROVIRAL THERAPIES IN HIV-INFECTED OLDER ADULTS

A thesis presented to
the faculty of
the College of Arts and Sciences
of Ohio University

In partial fulfillment
of the requirements for the degree
Master of Science

Andrea H. Waltje
August 2003
This thesis entitled

PREDICTORS OF NONADHERENCE TO ANTIRETROVIRAL THERAPIES IN HIV-INFECTED OLDER ADULTS

BY

ANDREA H. WALTJE

has been approved for

the Department of Psychology

and the College of Arts and Sciences by

Timothy G. Heckman

Associate Professor of Psychology

Leslie A. Flemming

Dean, College of Arts and Sciences
This secondary data analytic effort identified psychosocial predictors of adherence to antiretroviral therapies in middle-aged and older adults living with HIV/AIDS. The current study is needed because rates and predictors of adherence identified in research with younger samples of HIV-infected persons may not generalize to older populations. In particular, this study examined relationships between depression, pain, and self-reported cognitive functioning with intentional and unintentional nonadherence to medications in middle-aged and older adults with HIV disease. Depression significantly predicted adherence in this group in logistic multiple regression analyses; however, this association was less clear when escape-avoidant coping was included in the model. Pain and cognitive functioning showed no correlational relationship with medication adherence. Findings from this research can delineate rates of adherence in HIV-infected older adults and inform the conceptualization of interventions intended to optimize rates of adherence in this understudied population.

Approved: Timothy G. Heckman

Associate Professor of Psychology
Acknowledgments

This thesis is dedicated with love to my husband for his spirit, humor, and support, to my daughters Laura and Fiona, to my parents, and to my siblings. I should also like to thank Dr. Timothy G. Heckman for his support and mentoring with this effort, and my committee members Dr. Julie A. Suhr and Dr. John P. Garske.
# Table of Contents

**Review of the Literature** .......................................................................................................................... 11

- Epidemiological Data Regarding HIV/AIDS and Middle-Aged and Older Adults .................. 11
- The Role of HAART in Lives of People Living with HIV/AIDS .................................................. 17
- Social Action Theory ......................................................................................................................... 18
- General Rates of Adherence in People Living with HIV/AIDS .................................................... 21
- General Rates of Adherence in HIV-Negative Older Adults .................................................... 24
- Rates and Predictors of Adherence to HAART in HIV-Infected Older Adults ....................... 25
- The Current Study .......................................................................................................................... 42

**Method** ............................................................................................................................................... 48

- Participant Characteristics .............................................................................................................. 49
- Assessment Instrument .................................................................................................................. 52

**Results** ............................................................................................................................................... 62

- Data Screening and Preparation .................................................................................................. 62
- Descriptive Statistics and Frequencies ......................................................................................... 65
- Medication Adherence .................................................................................................................. 70
- Intentional Medication Nonadherence ......................................................................................... 79
- Unintentional Medication Nonadherence .................................................................................... 81

**Discussion** ......................................................................................................................................... 84

- Summary of Findings ...................................................................................................................... 85
- Limitations ....................................................................................................................................... 90

**References** .......................................................................................................................................... 93

**Appendix** ........................................................................................................................................... 115
Tables

Table 1.   Selected Empirical Studies on Adherence to HAART ........................................39
Table 2.   Sociodemographic characteristics of total sample (N = 100) and participants
taking HIV medication (N = 85) ..................................................................................51
Table 3.   Factor Loadings for Intentional and Unintentional Medication Nonadherence
Nonadherence ..................................................................................................................54
Table 4.   Reliability Coefficients for all Scales and Subscales ........................................63
Table 5.   Intercorrelations Among Selected Dependent and Independent Variables ......66
Table 6.   Descriptive Statistics for Continuous Variables .............................................67
Table 7.   Sample Sociodemographics and Demographic Correlates of Medication Adherence
Adherence .......................................................................................................................69
Table 8.   Overview of Predictors in Regression Analyses ..............................................74
Table 9.   Hierarchical Logistic Regression of Medication Adherence on Depression ....77
Table 10.  Hierarchical Multiple Regression of Intentional Medication Nonadherence
on Pain .............................................................................................................................82
Figures

Figure 1. Model of Risk Behavior Self-management derived from Ewart's Social Action Theory ............................................................21

Figure 2. Interaction of depression and escape-avoidant coping on medication adherence .................................................................78

Figure 3: Interaction of pain and escape-avoidant coping difficulties on medication adherence ..............................................................79
Predictors of Nonadherence to Antiretroviral Therapies in HIV-Infected Older Adults

Overview of Current Study

This research related patterns of medication adherence in middle-aged and older adults living with HIV disease to psychosocial factors, such as psychological distress, pain, and self-perceived cognitive functioning. Adherence to antiretroviral medication is crucial, because even occasional nonadherence greatly reduces the immunological and clinical benefits of these treatments (Bangsberg, 2001; Hecht, Colfax, Swanson, & Chesney, 1998; Montaner et al., 1998; Paterson et al., 2000). In addition, if individuals do not adhere consistently to antiretroviral medication, HIV may become resistant to these medications (Deeks, 1997; Mellors, 1997).

The basis for this study was that previous research has identified a positive relationship between higher depression and lack of medication adherence (Carney, Freedland, Eisen, Rich, & Jaffe, 1995; Catz, Kelly, Bogart, Benotsch, & McAuliffe, 2000; Coons, Sheahan, Martin, Hendricks, Robbins, & Johnson, 1994; Gordillo, del Amo, Soriano, & Gonzalez-Lahoz, 1999; Murphy, Wilson, Durako, Muenz, Belzer, & The Adolescent Medicine HIV/AIDS Research Network, 2001; Paterson et al., 2000; Singh et al., 1996; etc.). The unique contribution of this project to the scientific literature was the integration of physical pain and self-perceived cognitive functioning as predictors of medication adherence above-and-beyond depression observed in participants. Furthermore, the focus of this secondary data analytic effort...
was on middle-aged and older persons living with HIV/AIDS. To date, most medication adherence research has focused on relatively young samples of people living with HIV/AIDS.

Ewart’s social action theory (1991) provided the theoretical framework for this study. Ewart (1991) suggests that internal and affective states, self-regulatory processes, and interactions with one’s environment are related to the enactment of health supportive behavior. In this study, the internal and affective states under investigation were depression, pain, and self-perceived cognitive functioning, while coping strategies were considered a major self-regulatory process for health behavior. Finally, social support and barriers to care, such as long distances to medical facilities and personnel, represented interactions with one’s environment. The health-related behavior investigated in this project was adherence to antiretroviral therapies during the previous week. The examination of relationships among the above-mentioned factors and intentional and unintentional medication nonadherence may facilitate the efforts of practitioners to develop culturally contextualized interventions to improve adherence to antiretroviral medications in older persons living with HIV/AIDS.

This research analyzed data collected in “Project Enhancement,” a NIH-funded study undertaken at Ohio University. Self-administered questionnaires were completed by 100 individuals 45-plus years of age who were living with HIV/AIDS. Logistic and multiple regression analyses evaluated relationships between medication adherence and depression, pain, and self-perceived cognitive functioning. These analyses were expected to find significant and negative relationships among: (1)
depression and medication adherence; (2) physical pain and medication adherence; and (3) self-perceived cognitive compromise and medication adherence. In addition, coping and social support were included in the analyses. It was expected to find (4) significant and positive relationships between perceived social support and medication adherence, and (5) greater medication adherence among people with fewer avoidant coping strategies, such as turning to work or substitute activities. Furthermore, it was proposed to find significant and positive associations among (6) physical pain and intentional medication nonadherence, and (7) among self-perceived cognitive difficulties and unintentional medication nonadherence.
Review of the Literature

*Epidemiological Data Regarding HIV/AIDS and Middle-Aged and Older Adults*

AIDS (Acquired Immunodeficiency Syndrome) is a relatively new disease first identified in the United States in the early 1980s (Centers for Disease Control and Prevention, CDC, 1981). AIDS is caused by the human immunodeficiency virus (HIV). A person can contract HIV in several ways: from person to person during unprotected sex, from mother to child during pregnancy or birth (i.e., vertical transmission), and from direct contact with tainted blood or blood products (e.g., plasma; Glasner & Kaslow, 1990). The highest percentage of all infected people in the United States (50%) are men who have sex with men (MSM), followed by injection drug users (25%; CDC, 2002). Stall and Catania (1994) report that nearly 60% of all persons with AIDS in the elderly population were infected by way of male-male unprotected sex with an infected partner. Fifteen percent of this population was infected by sharing contaminated drug use equipment, and approximately ten percent by unprotected heterosexual transmission. The number of HIV/AIDS cases resulting from blood transfusions has decreased substantially, because blood screening technology improved and was implemented more rigorously in the mid-1980s (Kalichman, 1998).

The presence of certain symptoms—typically fever, sore throat, skin rash, headache, and other mild symptoms that cannot easily be distinguished from other diseases (except that they last much longer, usually more than 10 – 12 weeks; McCutchan, 1990)—may lead an individual to seek the help of a physician. At this
point, it can be determined by serologic testing that the person has contracted HIV and therefore is HIV-infected, or HIV-seropositive. Many people live in this condition (i.e., HIV-seropositive but asymptomatic) for several years before they develop more advanced symptoms and progress to AIDS.

The first AIDS diagnostic criteria were established in 1982 and have been updated several times since then. In 1993, the CDC instituted a definition that includes all HIV-infected individuals who have clinical conditions such as opportunistic infections, seizures, mental symptoms, vision loss, weight loss, etc., and also less than 200 CD4 cells per cubic millimeter of blood (Centers for Disease Control, 1992; Kalichman, 1998). CD4 cells are an essential part of the immune system. They are known as T-helper-cells, T-cells, or T-lymphocytes. CD4 cells represent the primary target of HIV and, therefore, their numbers tend to diminish as the disease progresses.

Since 1981, 790,000 cases of AIDS have been diagnosed in the United States (CDC, 2002). Overall, AIDS is the fourth leading cause of death in the world (Chaisson, 1999) although in the United States, AIDS is no longer among the ten leading causes of death (CDC, 1999). Due to enhanced medical treatment, most notably highly active antiretroviral therapy (HAART), the disease progresses more slowly and the life expectancies of persons living with the virus have increased (Palella et al., 1998). Decreased mortality and the aging of the "baby boomers" have caused an increase in the number of middle-aged and older adults with HIV/AIDS (Avis, 1998; Avis & Smith, 1998, Catz, Heckman, Kochman, & DiMarco, 2001;
Heckman et al., 2001; Heckman et al., 2002; Ory & Mack, 1998). In addition, a growing number of middle-aged and older adults are contracting new HIV infections (Grossman, 1999; Levy, 1998; Stall & Catania, 1994; Whipple & Scura, 1996). Lack of knowledge may be the main reason for this trend. Middle-aged and older people have been targeted less intensely in HIV primary prevention intervention efforts (Grossman, 1999; Schoenborn, Marsch, & Hardy, 1994).

This lack of knowledge may lead to continued high HIV transmission risk behaviors in this age group. For example, some MSM continue to engage in many of the same unsafe sexual practices they used before the appearance of HIV/AIDS. They may also be more hesitant to talk about sensitive subjects, such as sexually transmitted diseases, perhaps partly due to the stigma that they confronted for much of their lives (Anderson, 1996; Grossman, 1997; Nokes, 1996). In addition, clinicians are less likely to consider their older clients to be at risk for HIV infection. They may not view older adults as being sexually active, or they may confuse HIV-related symptoms in older adults with other medical conditions that are more common in this group (Whipple & Scura, 1996). Middle-aged and older HIV-positive individuals may have lived for a long period of time without any symptoms of HIV disease, and therefore are unaware of their HIV-seropositive status (Nokes, 1996), leading to the continued spread of HIV among their sexual partners. Furthermore, due to lack of education, middle-aged and older adults may falsely perceive themselves as healthy, especially when their viral loads are undetectable or as long as they are free of AIDS-related symptoms. Moreover, loneliness and the use of alcohol or drugs generally
lead to cognitive distortions that justify unsafe sexual behavior (Parish, 1997).

Finally, and fortunately, middle-aged and older people are living longer due to HAART (Justice & Weissman, 1998), but this benefit allows more time for the disease to spread.

Heckman and colleagues (1995) found several differences in factors related to HIV transmission between HIV-seropositive women of three age groups, young adult (ages 18-25 years), adult (ages 26-39 years), and older adult (ages 40 and older). Older adult women evidenced the poorest knowledge related to HIV risk transmission (e.g., not knowing that latex was the most effective material with which to make condoms). They were also more likely than their younger counterparts to report being in a relationship with a high-risk HIV male partner. In addition, older adult women were more likely to endorse statements such as "Using condoms means you don't trust your partner" or "I do not have a need to use condoms". In fact, older adult women reported lower proportions of condom-protected intercourse than all younger women. Finally, Heckman and colleagues found that older adult women were less likely to be tested for HIV and other sexually transmitted diseases than younger women.

The continued increase in HIV-infected middle-aged and older people has prompted several researchers to examine the life circumstances of late middle-aged and older individuals with HIV/AIDS (Catz et al., 2001; Goodkin et al., 2001; Heckman et al., 2002; etc.). These studies generally include participants as young as 45 years of age. The mean age of research participants varies between 53 and 55
According to Goodkin and colleagues (2001), 11% (86,875) of all people diagnosed with AIDS in the United States were 50 years of age or older at the time of their AIDS diagnosis. Until June 2002, circa 11,065 HIV/AIDS-infected people in the USA were 65 years of age or older at the time of their AIDS identification. The age group of 45 to 49 years alone contains 77,152 people with HIV/AIDS (CDC, 2002). People aged 45 to 55 have a 2.6% likelihood of dying of AIDS, ranked eighth on the list of common causes of death for this age group (CDC, 1999).

Members of the middle-aged and older group of HIV-infected people differ from their younger counterparts in important ways. In general, older adults evidence more severely compromised immune responses compared to younger individuals (Franceschi et al., 1996). Older persons with HIV disease also have relatively higher HIV viral loads in relation to the amount of time that had passed since the diagnosis (Blaxhult, Granath, Lidman, Giesecke, 1990; Eyster, Gail, Ballard, Al-Mondhiry, Goedert, 1987; Operskalski et al., 1995; Whipple & Scura, 1996). Higher viral loads in HIV-infected older adults may be due to a variety of reasons. For example, older people show a potential for a more rapid progression of the disease (Chaisson, Keruly, Moore, 1995; Emlet, 1993; Whipple & Scura, 1996). Effros and colleagues (1994, 1996) found that older adults living with AIDS had less reserve immune functioning. Moreover, late middle-aged or older persons may wait until their symptoms are more severe than those of younger people before they seek medication
from a physician. They may perceive their symptoms as age-related and not consider HIV infection (McCormick & Wood, 1992).

Several symptoms reported by HIV-infected older adults may indeed be related to normal aging. These include a decline of sensory perceptions (Learning to See, 2000; Tun, 1998), hearing loss, and changes in neurological functioning, such as cognitive decline (Bäckman, Small, & Wahlin, 2001; Cowart, Yokomukai, & Beauchamp, 1994; Kemper & Mitzner, 2001). Other physical or neurological symptoms may be caused by co-morbid disorders, such as orthopedic or vascular diseases. Generally, age-related increases in symptom severity are common for high blood pressure, which can result in cardiovascular disease, heart attack, or osteoporosis (Brannon & Feist, 2000; Howe, 1997). Also, some disorders may be set off by the presence of HIV/AIDS (Avis, 1998). Furthermore, Goodkin and colleagues (2001) reported age-related increases in the risk for neurological conditions such as cognitive-motor impairment and disorder, peripheral neuropathy, progressive multifocal leukoencephalopathy (PML), primary central nervous system (CNS) lymphoma, and cerebrovascular accident (CVA). Other opportunistic infections that may be worse in older individuals include oropharyngeal candidiasis, herpes simplex infections, or cytomegalovirus (Connolly et al., 1989; Cook, 1990).

In summary, older HIV-positive people experience greater severity in co-morbid medical conditions (Skiest et al., 1996). Moreover, middle-aged and older adults with HIV/AIDS experience more medication side effects than their younger counterparts.
(Ickowics & Meisler, 1997). The topic of antiretroviral therapy and issues related to medication adherence will be discussed further.

*The Role of HAART in Lives of People Living with HIV/AIDS*

Antiretroviral medical management has improved periods of survival in people living with HIV disease over the last two decades (Kalichman, 1998). HIV medications can slow or halt HIV reproduction process at various stages. Nucleoside Analogues (e.g., Zidovudine (AZT), Dideoxycytidine (ddC), Dideoxyinosine (ddI), Lamivudine (3TC) and 3’-Deoxycytidine) incorporate themselves into the deoxyribonucleic acid (DNA) of the virus. AZT was the first anti-HIV drug and was approved for use in 1987. Non-nucleoside reverse transcriptase inhibitors (e.g., Viramune, Sustiva, and Delavirdine) prevent the production of virus DNA in the CD4 cell. Protease inhibitors (e.g., Amprenavir, Crixivan, Norvir, Viracept, and Inviase) prevent the assembly of new viruses in the CD4 cell (Kalichman, 1998).

Antiretroviral medications are often administered in combinations called "AIDS cocktails" (Kalichman, 1998) or "highly active antiretroviral therapies (HAART)," most of which produce many undesirable side effects. People on antiretroviral medications frequently report severe and disabling physical symptoms, such as headache, insomnia, nausea, vomiting, abdominal pain, diarrhea, anemia, fatigue, rash, changes in taste, oral ulcerations, abdominal cramps, muscle pain, fever, pancreatitis, hyperglycemia, and peripheral neuropathy (i.e., numbness, tingling, or pain in hands and feet), confusion, lightheadedness, depression, and kidney and liver problems (Gerschenson et al., 2001; Physician's Desk Reference, 2002). Thus, while
HIV medications have improved life quantity, the extent to which they have improved life quality is still largely uncertain.

In addition, when side effects are combined with the challenging dosing schedules, it is very difficult for many individuals to adhere consistently to prescribed medication regimens. It is not uncommon for HIV-infected persons to take 20 or more antiretroviral medication pills per day (Catz et al., 2000). Some of these medications must be taken with food, some must be taken on an empty stomach, and still others must be taken every few hours (day and night). Often, there is a specific sequence in which HIV medication needs to be taken in relation to other drugs. In short, the use of antiretroviral medication poses great challenges for every HIV-seropositive patient.

Despite these challenges, HAART has been shown to successfully decrease viral loads, increase CD4 cell counts or both. Mortality and morbidity are often reduced in people on HAART. However, these results depend largely on the extent to which the individual adheres to prescribed treatments (Bangsberg, 2000; Catz et al., 2001; Deeks, Smith, Halodnly, Kahn, 1997; Hecht, 1998; Mellors, 1997; Morse, 1991; Samet et al., 1992; Singh et al., 1996). Past behavioral research has found that, a large number of biopsychosocial factors can influence the degree to which one adheres successfully to complex and rigid medication adherence regimens.

Social Action Theory

Social action theory (Ewart, 1991) provides a structure for identifying factors that may hinder or facilitate adherence to medical treatment in middle-aged and older
HIV-seropositive individuals. According to social action theory, adaptive behavior (such as medication adherence) is influenced by social factors such as environmental interactions. Furthermore, adaptive behavior is influenced by individual factors, such as self-regulatory processes, internal physiological, and affective states (Ewart, 1991). “Self-regulation is a condition of self-sustaining, dynamic equilibrium between self-protective activities and their experienced biologic, emotional, and social consequences” (Ewart, 1991, p. 932). This is to say that actions are guided by their outcome, which in turn is related to physical, affective, and environmental information. The process of self-change is dependent on the negative control loops of action and outcome (Ewart, 1991).

Motivation and problem-solving skills influence the ability to self-change from an established harmful behavior to a new self-protective behavior, such as taking prescribed medication at the appropriate time. Immediately related to motivation are internal affective states (e.g., psychological distress, such as depression or anxiety). Ewart (1991) postulates that people actively motivate themselves by envisioning possible outcomes, evaluating their capabilities, and generating goals that guide and energize problem solving. These necessary components to motivation are almost certain to be influenced by internal affective states. For instance, negative affect is related to low expectations of success or to conflicts among one’s various goals (Emmons & King, 1988, Ruehlman, 1985).

Social action theory also addresses generative capabilities for changes in risk behavior self-management. Ewart (1991) postulates that people use schemas to guide
the encoding of experiences and procedural routines. Schemas in this context are defined as “organized knowledge sets that direct one’s attention to specific aspects of situation and environments, guide the encoding of experiences in long-term memory, and provide procedural routines for performing familiar tasks” (Ewart, 1991, p.937). Individuals also use these schemas as a means to visualize alternative goals and strategies. The ability to change schemas as a mechanism to deal with obstacles to appropriate risk behavior self-management requires the skill to bring the schemas into consciousness and to change them, and the confidence in one's ability to do so. Cognitive functioning may be crucial for the adequate adaptation of health behavior or in the context of risk behavior management.

Furthermore, successful interactions with the environment can contribute to risk behavior management, such as medication adherence. From this point of view, the availability of support in the healthcare field as well as informal social relationships are among the environmental characteristics likely to influence success in the facilitation of medication adherence. The person-environment interactions provide feedback for the individual regarding personal goals, expectations, skills, and strategies. The individual might seek out environments that are conforming to consistent risk behavior, for example, spending time at bars in which drug consumption is the norm. However, he or she may also respond to normative behavior within a new and unusual social setting, like a support group.
Internal Factors
- Depression
- Pain
- Cognitive Functioning

Environmental Factors
- Barriers to Care
- Social Support

Risk behavior Self-management
- Medication adherence

Generative Capabilities
- Coping

FIGURE 1: Model of Risk Behavior Self-management derived from Ewart's Social Action Theory

*General Rates of Adherence in People Living with HIV/AIDS*

This section will begin by defining the term “adherence” as opposed to “compliance”. Then, a description of the operationalization and measurement of medication adherence as used in other studies will follow. Finally, the relevance of medication adherence to HAART will be addressed and research findings will be introduced.

More than 10 years ago, the term “compliance” was used almost interchangeably with the term "adherence." Recently, the term “adherence” has
replaced the term "compliance." This occurred, because both terms describe the same behavior, yet different motivations for it. “Noncompliance” implied "deviant behavior" and was linked to forgetfulness and ignorance. The term "adherence" was thought to imply that individuals make deliberate decisions regarding their medication regimen (Donovan & Blake, 1992). Medication adherence is the extent to which a person follows physician-prescribed medication regimen. Typical reasons for nonadherence with antiretroviral medication have been found to be related to perceptions about its efficacy (Mehta, Moore, & Graham, 1997) in addition to forgetfulness, or unpleasant side effects (Hecht et al., 1998).

In the context of HIV-research, medication adherence has been operationalized differently in various studies. Bangsberg and colleagues (2000) reported on the percentage of prescribed doses taken over a specified period, using a continuous measure of medication adherence. Catz and colleagues (2000) categorized their sample of HIV-infected individuals into four groups. Their categories were perfect adherence (19% of the participants in this study), missing doses daily (4%), weekly (18%), monthly (49%). Another way to operationalize medication adherence is to dichotomize medication adherence into satisfactory or good adherence (> 90% of the pills prescribed) and less than excellent adherence (Gordillo, et al., 1999). Gordillo and colleagues reported good adherence in 57.6% of their sample of 366 HIV-infected participants. Others used the terms consistent adherence (no skipped doses) and inconsistent adherence (at least one skipped dose;
Catz et al., 2001). Thirty-one percent of the 84 participants of this study were taking their medications as prescribed.

Medication adherence has been measured in various ways. The most common approach is to elicit the information by *self-report*, in which participants describe their adherence over a specified time interval. This can be assessed as part of an interview or by use of self-report questionnaires. Bangsberg et al. (2000) compared the self-report method with similar approaches, which measure medication adherence among homeless people. They included the following three measures in the longitudinal design of their study: adjusted electronically monitored doses, pill count, and percentage of days doses taken. Adjusted electronically monitored doses is the calculated mean of three measures: (1) doses taken from an electronically monitored container, (2) self-reported doses taken from another source (pocket), and (3) 0% adherence for unopened container in a 24 hour period. Pill count is the difference between subsequent pill counts divided by the number of prescribed tablets. Finally, percentage of days doses taken is the percentage of days that the subject opened the electronic medication monitor at least once during the entire study period. They found the following median percentages of adherence: 89%, 67%, 73%, and 100% respectively. It appears that the self-report method may lead to an overestimation of medication adherence. However, adherence was a strong predictor of viral load (Bangsberg et al., 2000). Self-report, electronically monitored doses, and pill count led to similar estimates of the relationship between adherence and viral suppression. Catz et al. (2000) used the interview technique and found that almost one third of
their sample of persons living with HIV disease had missed at least one dose in the previous five days. Another study found that up to one-third of people taking HIV medications discontinued the use altogether (Samet et al., 1992).

Adherence to antiretroviral medication is critical in order to gain optimal viral suppression (Bangsberg, Hecht, Charlebois, Chesney, & Moss, 2001; Gordillo et al., 1999; Ickowics & Meisler, 1997), to increase the CD4 lymphocyte count (Bangsberg et al., 2000, 2001; Murphy et al., 2001; Paterson et al., 2000) and to avoid the development of medication-resistent strains of HIV (Deeks et al., 1997; Mellors, 1997). Furthermore, support for medication adherence resides in the finding that among all HIV-infected individuals, medication adherence is associated with fewer days of hospitalization (Paterson et al., 2000). Moreover, in the course of their study, Paterson and colleagues (2000) found no opportunistic infections or deaths in people of all ages who showed 95% or greater adherence to a group of HIV medications called "protease inhibitors."

**General Rates of Adherence in HIV-Negative Older Adults**

Adherence rates among middle-aged and older people range from 26% to 79% (Carney et al., 1995; Col, Fanale, & Kronholm, 1991; Coons et al., 1994; Cooper, Love, & Raffoul, 1982; German, Klein, McPhee, & Smith, 1982; Wroe, 2002). Coons et al. (1994) found that 21% of their sample of 55 independently living older adults with various diseases had not followed through with their prescribed medication regimen. In other words, these individuals have taken their medication more or less often as prescribed. They found relationships between better adherence
and higher socioeconomic status, and greater number of prescribed medications and higher psychological stress. They did not find a relationship between better adherence and health, life satisfaction, age, or sex. Carney et al. (1995) found that older patients with coronary artery disease adhered to the prescribed medical regimen on average 45% of the time if they were diagnosed as depressed and 69% of the time if they were non-depressed.

Middle aged and older persons often experience progressive physical decline due to aging. This decline, in addition to various age related diseases, often calls for the use of medication. It might be argued that older people who are accustomed to taking medications have established a routine due to habit and practice. This routine might make medication adherence to antiretroviral medication easier for older adults as opposed to individuals who are not experienced with medication regimen. Greater history of taking pills or other medications might be one reason why older individuals in some studies evidenced better medication adherence than their younger counterparts (Goodkin et al., 2001; Paterson et al., 2000).

Rates and Predictors of Adherence to HAART in HIV-Infected Older Adults

Considering the negative side effects of HAART and its complex scheduling, it is not surprising that some people are challenged with the task of medication adherence (Hecht et al., 1998). In middle-aged and older adults, medication adherence is associated with fewer physical complaints (Catz et al., 2001), a relationship that can be interpreted either way. That is to say, adherence may lead to less somatization (i.e., physical discomfort). At the same time, diminished physical
discomfort may be the reason for better medication adherence. Unfortunately, several researchers found that older adults living with AIDS experience more medication side effects than their younger counterparts (Catz et al., 2001; Ickowics & Meisler, 1997). In spite of an increased likelihood of experiencing negative side effects from AIDS medication, some survey studies found that older HIV-infected individuals demonstrate better-than-average adherence to medical treatment (Goodkin et al., 2001; Paterson et al., 2000). This finding is not in accord with most findings in the general population. For instance, Coons et al. (1994) did not find an association between adherence and age.

The rates of adherence have been reported as follows: Catz and colleagues (2001) found that 31% of their middle-aged and older participants missed medication doses during a seven day retrospective recall period. For people living with HIV disease across all ages, Catz et al. (2000) reported that an equivalent amount of participants, almost one third, had missed a dose in the previous five days. In comparison, Murphy et al. (2001) reported a full medication adherence rate of only 41% among their adolescent sample. Almost two-thirds of their participants skipped medication occasionally.

Other findings do not support the above hypothesis of greater medication adherence in older people with HIV disease. Ickowics and Meisler (1997) found that older HIV-infected adults have greater difficulty complying with a medical treatment regimen. Furthermore, Singh and colleagues (1996) did not detect a relationship
between medication adherence and age in their sample of HIV-infected people of all ages.

The benefits of medication adherence outweigh the adverse effects, and benefits are not only related to better health and reduced disease progression. Better medication adherence may be economic in nature in the sense that less hospital days and fewer visits to physicians may save insurances and tax-payers great amounts of money. Medication adherence is related to a number of factors, such as depression, pain, and self-perceived cognitive functioning. Psychosocial factors, like social support, coping, and sociodemographic factors may also be related to medication adherence and will be further discussed.

*Psychological Distress.* This section will address relationships between distress, particularly depression, and medication adherence in persons living with HIV/AIDS, with special emphasis on middle-aged and older adults. It will attend to issues such as prevalence, associations, and implications, especially regarding medication adherence.

Estimates of prevalence rates of major depression in the general population range from six percent (Weissman & Klerman, 1991) to seventeen percent (Kessler et al., 1993; Blazer, Kessler, McGonagle, & Swartz, 1994). The rates of this mental disorder seem to be negatively related to age (Weissman & Klerman, 1991), although 1 to 4% of all individuals aged 45 years and older are diagnosed as clinically depressed (Jefferson & Greist, 1993; Weissman & Klerman, 1991) while 10% of older Americans have some symptoms of depression (Jefferson & Greist, 1993).
The prevalence of depression in HIV-infected people has not been definitively determined (Heckman, Kochman, Sikkema, & Kalichman, 1999). Between 20% and 69% of all individuals with HIV/AIDS experience depression. Lower rates of depression are found in populations of affluent Caucasian male homosexuals, while higher rates are found in more diverse socioeconomic and ethnic backgrounds (Savetsky, Sullivan, Clarke, Stein, & Samet, 2001). Heckman and colleagues (1999, 2002) observed that 25% of older adults with HIV disease report “moderate” or “severe” levels of depressive symptoms (Heckman et al., 1999, 2002). These findings exceed levels of depression assessed in younger samples of people with HIV/AIDS (Cochran & Mays, 1994; Kalichman, Sikkema, Somlai, 1995; Katz et al., 1996). In summary, more HIV-infected individuals than other people report symptoms of depression (Debring et al., 1994). It is unclear if middle-aged and older HIV-infected individuals experience higher symptoms of depression compared to younger HIV-infected individuals. However, it is undisputed that the disease brings with it challenges causing great distress for infected people.

It is interesting to note that other factors may influence symptoms of depression in people with HIV/AIDS. For example, antiretroviral medication brings with it side effects that mimic characteristics of depression (Heckman et al., 1999). Further symptom overlap may be caused by physical HIV-related symptoms, like pain or cognitive problems. Depression has been related to increased somatization among individuals with HIV/AIDS of all ages (Harker et al., 1995; Heckman et al.,
1999, 2000; Savetsky et al., 2001). Consideration of these issues is important in the diagnostic process of depression.

Instruments that measure depression often assess somatic (e.g., sleep, energy, appetite, and sexual performance) and affective (e.g., sadness, dissatisfaction, and disappointment) symptoms of depression. Kalichman and colleagues (1995) performed a principal component analysis on depression in HIV-positive individuals. Using the Beck Depression Inventory (BDI), Kalichman and colleagues were able to divide the depressive symptoms into "physical" and "cognitive-affective" signs. They found that the physical signs of depression (i.e., tiredness, changes in appetite, and low energy) were more closely related to symptoms of HIV/AIDS (i.e., persistent fatigue, diarrhea, night sweats, and muscle aches), whereas the cognitive-affective symptoms were associated with anxiety, hypochondriasis, and the number of months since HIV-diagnosis. This result has been confirmed by Harker and colleagues (1995). Hence, depressive symptoms in HIV-positive people may be due in part to the common physical characteristics of both disorders. This finding provides reason for careful evaluation of depression among middle-aged and older individuals, as this age group also evidences more physiological symptomatology related to HIV/AIDS.

Symptoms of psychological distress among middle-aged and older adults with HIV/AIDS may be caused by physiological symptoms related to medication side effects or the disease itself. Actual psychological distress, however, may be related to these and other physiological challenges and it may be due in part to more severe circumstantial challenges. Middle-aged and older individuals experience higher rates
of bereavement (Folkman, Chesney, Collette, Boccellari, & Cooke, 1996; Sikkema, Kalichman, Hoffman, Koob, Kelly, & Heckman, 2000), barriers to care due to illness-related stigma, and barriers to care due to insufficient personal resources (Heckman et al., 2002).

Psychological distress decreases the quality of life. In addition, it has been found to be related to a number of adverse circumstances, such as HIV disease progression, by way of a more rapid decline in CD4 counts and faster symptomatic progression to AIDS (Burack, Barrett, Stall, Chesney, Ekstrand, & Coates, 1993; Katz et al., 1996; Savetsky et al., 2001), less social support (Katz et al., 1996), altered coping responses (Folkman et al., 1996; Heckman et al., 1999), and lack of medication adherence (Gordillo et al., 1999). To underscore the last point, Carney et al. (1995) found that older non-depressed patients with coronary artery disease adhered to the prescribed medical regimen significantly better than depressed patients. Among HIV-infected adolescents, higher levels of depression are strongly associated with lack of adherence to medical treatments (Murphy et al., 2001). In addition, in samples with greater age ranges, this relationship has been confirmed (Catz et al., 2000; Gordillo et al., 1999; Ohmit et al., 1998; Paterson et al., 1999; Singh et al., 1996).

Paterson et al. (2000) explored a possible relationship between psychological history and medication adherence in his sample of HIV-infected people of a greater age range, and his results were inconclusive. However, they were able to determine an association between current psychological symptomatology and medication
adherence. They acknowledged the vast amount of literature that addresses the association between medication adherence and psychological illnesses (Carney et al., 1995; Coons et al., 1994; Draine & Solomon, 1994; Pugh, 1983; Young, Zonana, & Shepler, 1986) and advised to include the diagnosis of depression in any efforts aimed at the improvement of medication adherence. This advice is inherently sensible as none of the above-listed associations are proven to be one-directional. Most likely, all of the relationships discussed in the literature are reciprocal. Therefore, it makes sense to intervene at the one common factor of these vicious circles, namely depression. One aspect of the study was to investigate the relationship between symptoms of depression and medication adherence among middle-aged and older individuals.

*Pain.* Between 50 and 97% of people living with HIV disease experience elevated levels of physical pain. These numbers are dependent on certain circumstances: the highest number represents the pain occurrence among people close to death (Singh, Ferie & Taters, 1992). The types of pain common to persons living with HIV/AIDS include headaches, lower back pain, gastrointestinal pain, chest pain, and pain related to neuropathies and musculoskeletal pain in arms and legs (Heckman et al., 1992; O'Neill & Sherrard, 1993; Penfold & Clark, 1991; Singer, Zorilla, Fahy-Chandon, Chi, Syndulko, & Tourtellotte, 1993).

Symptoms of pain can be related to the disease itself and to illness-related opportunistic infections, such as oropharyngeal candidiasis, herpes simplex infections, or cytomegalovirus (Connolly et al. 1989; Cook, 1990). In addition, pain
is common in people who have developed cancers (e.g., CNS lymphoma and Kaposi's sarcoma) and central nervous system involvement (Goodkin et al., 2001; O'Neil & Sherrard, 1993; Penfold & Clark, 1992). Pain is often caused by side-effects of HIV/AIDS medication (Kalichman, 1998; Sikkema & Kelly, 1996). Naturally, these circumstances can challenge one's motivation to adhere to antiretroviral medication regimens. To date, there are no studies investigating the relationship between pain and adherence to antiretroviral medication. However, Catz et al. (2001) established that individuals who endorsed more symptoms of somatization were most likely to report inconsistent use of antiretroviral medication. It was one of the goals of this research to examine if pain in HIV-positive people is related to medication adherence and--even more specific--to intentional nonadherence.

**Self-Perceived Cognitive Functioning.** Cognitive functioning, such as working memory and episodic memory, appears to decline as people age in the general population (Bäckman et al., 2001; Kemper & Mitzner, 2001). As discussed above, middle-aged and older people with HIV/AIDS may be more likely to experience disease-related cognitive decline due to their comparably poorer immunological resistance to HIV. Ellis and colleagues (1997) found that 38% of HIV-positive individuals had neurocognitive impairments to various degrees. It can be speculated that this number might be even higher in older populations. Some neuro-AIDS conditions are HIV-1-associated dementia (HAD) or minor cognitive-motor disorder (MCMD), and are highly associated with age (Goodkin et al., 2001). The above-mentioned neurocognitive disorders can only be found among HIV-
positive people. Other conditions common in middle-aged and older HIV-positive individuals are progressive multifocal leukoencephalopathy (PML), primary central nervous system (CNS) lymphoma, and cerebrovascular accident (CVA) (Goodkin et al., 2001), as well as reversible encephalitis, lymphocytic meningitis, radiculitis, and peripheral mononeuritis (Ellis et al., 1997). People whose central nervous systems are affected by HIV progress more rapidly to AIDS (Boufassa, Bachmeyer, & Carre 1995). Consequently, neuro-AIDS conditions contribute to a higher risk of death (Casabona, Danchez, Graus, Abos, & Segura, 1991; Ellis et al., 1997; Karlsen, Reinvang, & Froland, 1995).

It is possible that, when cognitive functioning declines, medication adherence may also decline (Ickovics & Meisler, 1997). In fact, a circular relationship may exist between cognitive functioning and medication adherence, where lack of adherence may result in higher viral loads. The progressing disease, in turn, affects the central nervous system in a manner that may increase poor unintentional medication adherence (Goodkin et al., 2001) in the form of misunderstanding the regimen or forgetfulness.

Many authors have questioned the predictive ability of self-report measures on objective cognitive deficits (Barker, Prior, & Jones, 1995; Blazer, Hays, Fillenbaum, & Gold, 1997; Erber, Szuchman, & Rothberg, 1992; Levi-Cushman & Abeles, 1998; McNair & Kahn, 1983; Ponds, van Boxtel, & Jolles, 2000; etc.). To date no self-report measures have been developed that reliably measure the construct of cognitive difficulties. Self-report measures have been found to correlate more highly with
measures of depression (Barker, Prior, & Jones, 1995; Blazer, Hays, Fillenbaum, & Gold, 1997; Erber, Szuchman, & Rothberg, 1992; Levi-Cushman & Abeles, 1998; McNair & Kahn, 1983; Ponds, van Boxtel, & Jolles, 2000), and in one longitudinal study with neuroticism (Poitrenaud, Malbezin, & Guez, 1989) than with actual performance on tests that measure domains such as memory, attention, mental speed, planning, and decision making. Hence, the most reliable approach to detecting actual cognitive difficulties is to administer neuropsychological tests. This study relied with caution on the use of a self-report measure, the Cognitive Difficulties Scale (McNair & Kahn, 1983), because the study hypotheses were developed post hoc after data collection.

Sociodemographic Factors. In this section, sociodemographic variables such as gender, ethnicity, education, employment status, income, duration of illness, health status, and risk factors for HIV will be discussed. Their relationships with medication adherence will be addressed because they were proposed to explain some of the variance independent of the main predictors of this study (depression, pain, and self-perceived cognitive functioning).

Findings regarding the association between gender and medication adherence are mixed. In adolescents, males have been reported to be less compliant with their medication regimen than females (Murphy et al., 2001). This trend may continue throughout the lifespan, because Heckman and colleagues (2001) found that middle-aged and older men report more difficulties adhering to complex medical treatments and negative side-effects from HIV medications than middle-aged and older women.
However, other researchers did not find an association between medication adherence and gender among their sample of adults above the age of 45 (Catz et al., 2001; Coons et al., 1994; Paterson et al., 2000). A closer look at ethnicity reveals ambivalent findings regarding ethnicity. In a study performed by Singh and colleagues (1996), being African-American was associated with nonadherence. However, in a recent study, Heckman, Catz, Heckman, Miller, & Kalichman (in press) did not find adherence to antiretroviral regimens associated with ethnicity.

Education has often been found to be associated with better medication adherence. For example, Catz et al. (2001) found a significant and positive relationship between education and consistent medication adherence. Kalichman, Benotsch, Suarez, Catz, Miller, and Rompa (2000) found that illiterate HIV-seropositive individuals had greater rates of nonadherence than literate people, even after controlling for education. However, Singh et al. (1996) did not confirm any relationship between medication adherence and education. In addition, Paterson and colleagues (2000) as well as Singh et al. (1996) did not confirm a relationship between employment status and medication adherence. Yet, in their study with HIV-positive people of all ages, Paterson et al. (2000) established relationships between greater medication adherence and higher income. The same relationship was significant in the study by Coons et al. (1994) of older HIV-infected adults.

Paterson et al. (2000) established that medication adherence was positively related to longer duration of illness. Catz and colleagues (2001) did not confirm this
relationship in their sample of late middle-aged and older adults. Instead, they found that people in better physical shape showed greater adherence.

Social Support. Social support is perhaps one of the most interesting aspects in the context of health promoting behavior. Findings in this area are not unequivocal, not only because of the various ways in which social support is assessed, but because of the various ways in which social support is perceived. In general, however, social support is regarded as positive (Cohen & Wills, 1985; Thoits, 1984, 1986; Thoits, Hohman, Harvey, & Fletcher, 2000; Wills, 1991). Draine and Solomon (1994) established in their study involving mentally ill participants that a greater social network produced more positive attitudes toward medication adherence. They argue that "The benefits of increased social activity are not limited to an expanded social network. Other benefits, including improved social skills, communication capabilities, and confidence in social situations may contribute to more positive attitudes toward medication compliance." (p.53)

Self-perceived social support has been found to be positively related to medication adherence in HIV-infected individuals of all ages (Catz et al. 2000; Gordillo et al., 1999; Morse et al., 1991). Ickovics and Meisler (1997) reported that a good relationship with one's physician, where the provider provides clear explanations, encouragement, reassurance, and systematic follow-up, enhances medication adherence. Furthermore, social support in the form of individual therapy and group interventions can enhance coping efforts and positive attitude change (Heckman et al., 1999; Picciano, Roffman, Kalichman, Rutledge, & Berghuis, 2001).
This in turn may lead to better health behavior as in increased adherence to antiretroviral medication. From a social action theory point of view, environmental structures have an influence on health supportive behavior (Ewart, 1991) such as medication adherence. This study explored the contribution of perceived social support to adherence to HAART.

*Coping.* HIV disease often creates significant physiological, social, and emotional challenges to middle-aged and older adults. Most symptoms of HIV/AIDS, such as diminished energy, fatigue (Avis, 1998), and pain are physiological in nature. Pain may be related to opportunistic infections, other medical conditions, or to side effects of medication. Older people with HIV/AIDS often show increased symptoms of pain compared with younger individuals with HIV/AIDS (Piette, Wachtel, Mor & Mayer, 1995) or with the general population (Ware, Kosinski, & Keller, 1994).

Besides pain, older HIV-positive individuals may experience very different social environments than their younger counterparts. An older individual's social situation may be less supportive than that of a younger person. There may be stigma attached to senescence HIV/AIDS (Heckman et al. 2002; Piette et al., 1995), and older HIV-infected people may experience increased levels of homophobia. Most older adults with HIV/AIDS are men who have sex with men (MSM; Flaskerud & Ungvarski, 1999). This cohort was raised in a time of great resentment towards homosexuality (Anderson, 1996; Grossman, 1997; Nokes, 1996), which is certainly often reason for great distress. Furthermore, older adults are more likely to be in
relationships with other older individuals. Hence, they may be involved with the challenges of caregiving responsibilities themselves (Ungvarski & Falskerud, 1999). They may even have experienced multiple bereavements (Heckman et al., 1999; Sikkema et al., 2000). Surely, good coping strategies are needed in order to deal with a variety of stressors effectively.

Singh and colleagues (1996) found coping strategies related to medication adherence, and detected an association between medication adherence and better adaptive coping as well as lower depression scores. Consequently, avoidant coping strategies may lead to a decline in medication adherence. Considering the unique life circumstances of the middle-aged and older HIV-seropositive population, it is possible that coping capabilities and health promoting behavior, like medication adherence, may be compromised as a result of the burden associated with age and HIV/AIDS. The current study examined avoidant coping strategies, and sought to delineate whether an increased use of avoidant coping strategies lead to a decrease in health promoting behavior. Please view Table 1 for an overview of selected empirical studies of adherence to HAART.
Table 1

*Selected Empirical Studies on Adherence to HAART*

<table>
<thead>
<tr>
<th>Authors, publication date</th>
<th>Study participants’ age range, mean, and standard deviation (if available)</th>
<th>Predictors of medication adherence relevant to the current study</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catz, S. L., Heckman, T. G., Kochman, T. &amp; DiMarco, M. (2001)</td>
<td>47 – 69</td>
<td>Education, Physical Well-Being</td>
<td>Education was positively related with consistent medication adherence. Individuals, who endorsed more symptoms of somatization were most likely to report inconsistent use of antiretroviral medication.</td>
</tr>
<tr>
<td>Catz, S. L., Kelly, J. A., Bogart, L. M., Benotsch, E. G., &amp; McAuliffe, T. L. (2000)</td>
<td>24 – 61</td>
<td>Depression, Social Support</td>
<td>Nonadherent individuals had higher levels of depression and lower levels of social support.</td>
</tr>
</tbody>
</table>
Table 1 (continued)

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Study Population (n)</th>
<th>Variable(s) Described</th>
<th>Findings</th>
</tr>
</thead>
</table>
Table 1 (continued)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Variables</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singh, N., Squier, C., Sivek, C., Wagener, M., Hong Nguyen, M., &amp; Yu, V. L. (1996).</td>
<td>Ethnicity, Education, Employment, Adaptive Coping, Depression</td>
<td>Education and employment status were unrelated with medication adherence. Black race was significantly associated with medication adherence, as were better adaptive coping skills and less depression.</td>
</tr>
</tbody>
</table>
The Current Study

Medication adherence in middle-aged and older HIV-seropositive individuals was in the focus of this study. As mentioned above, during the past 10 years, the term "adherence" has replaced the term "compliance", which was used to describe a patient's "failure" to take prescribed medications. In addition, researchers added a more specific viewpoint to the discussion: that of intentional and unintentional nonadherence (Cooper, J. K., Love, D. W., Raffoul, P. R., 1982; Wroe, 2002). Wroe (2002) describes intentional nonadherence as "missing or altering doses to suit one's needs" and unintentional nonadherence as "forgetting", and claims that they are separate entities. She established in her study on the use of inhaled corticosteroids in the management of respiratory conditions that intentional nonadherence is associated with decision balance, whereas, unintentional nonadherence is less strongly associated with decision balance and is more strongly associated with demographics, in particular, age. No studies involving HIV-infected individuals on antiretroviral medication regimens have distinguished between intentional and unintentional medication nonadherence.

Medication adherence in older populations is more consistent relative to adherence in the general population (Draine & Solomon, 1994; Gordillo et al., 1999; Paterson et al., 2000). Medication adherence may be diminished by challenges, such as psychological distress, pain, or cognitive functioning. Fifty percent of all HIV-infected people who present with neurological symptoms exhibit purely cognitive dysfunction (Moss & Miles, 1987). In older HIV-infected individuals, the relative
greater symptom severity and higher viral loads might create an additional challenge to the central nervous system (CNS; Operskalski, Mosley, Busch, & Stram, 1997). Indeed, several studies have established a relationship between severity of symptoms and central nervous system disease in HIV/AIDS-infected people (Brew, Pemberton, & Law, 1996; Conrad et al., 1995; Ellis et al., 1997; Hegge, Brockmeyer, Esser, Maschke, & Goos, 1998; McArthur et al., 1997; Pratt et al., 1996). Goodkin and colleagues (2001) suggest that medication adherence of individuals with cognitive challenges might be decreased compared to the general older population. People with cognitive difficulties might not understand their medication regimen. They might also be more likely to forget to take their medication at the appropriate times.

Additional factors that may decrease medication adherence include psychological distress, particularly depression (Harker et al., 1995; Heckman et al., 1999, 2000; Savetsky et al., 2001), and pain. Most side effects of antiretroviral medication (e.g., headache, abdominal pain, rash, oral ulcerations, abdominal cramps, muscle pain, pancreatitis, peripheral neuropathy, and kidney and liver problems involve symptoms of pain (Gerschenson et al, 2001; Physician's Desk Reference, 2002). It is plausible that pain challenges people's adherence efforts, when they must assume that some of the pain they feel stems from the medication they are prescribed. In this situation, it might appear to the individual person that the termination of medical treatment outweighs its long-term benefits, for example longevity and remaining in better health for longer periods of time and with fewer HIV-related symptoms.
As mentioned earlier, highly active antiretroviral therapies (HAART) will be less efficacious in individuals who are unable to adhere consistently to their medication regimen. In fact, intermittent use of medication enhances the risk of resistance and progression to AIDS (Deeks et al., 1997). Medication regimens must be followed more than 90% of the time in order to achieve substantial positive outcome (Paterson et al., 2000). People on HAART need to be educated about the role of HAART in HIV/AIDS and supported in medication adherent behavior.

According to social action theory (Ewart, 1991), psychological distress, pain, and cognitive compromise present significant obstacles to behavior-change efforts (e.g., efforts to adhere more consistently to HAART). This theory proposes that individuals take personal action in order to change their own health promoting (or injurious) behavior. Social factors, such as perceived social support or the quality of the physician-patient relationship, might influence problem-solving activities that promote better health behavior. Project Enhancement, a study conducted at Ohio University and described in greater detail below, assessed a number of constructs that may be related to medication adherence in older adults living with HIV/AIDS (e.g., depression, pain, self-perceived cognitive functioning, barriers to care, perceived social support, coping, etc.).

In summary, the current study undertook five major objectives, each of which includes its own testable hypothesis and specific rationale. Each study objective and hypothesis is summarized below.
Objective 1:

To determine if depressive symptoms, physical pain, and self-reported cognitive dysfunction are related to adherence to HAART in people with HIV/AIDS 45-plus years of age.

Hypothesis 1:

HIV-infected older adults who report less consistent adherence to HAART will also report elevated levels of depressive symptoms, physical pain, and greater self-perceived cognitive compromise.

Rationale for Hypothesis 1:

Depression has been linked to medication adherence many times in individuals with HIV/AIDS (Harker et al., 1995; Heckman et al., 1999, 2000; Savetsky et al., 2001). However, only one study addressed the relationship of depression and medication adherence in middle-aged and older adults (Catz et al., 2001). Catz and colleagues found no significant association between depressive symptomatology and medication adherence. Given the results of studies with other samples, it seemed appropriate to follow up on this question. Physical pain and cognitive difficulties might also present significant challenges to an individual on antiretroviral medication as pain may cause the person to question the benefits of the medication and cognitive difficulties may make it hard to understand the regimen and remember to take medication at the proper times.
Objective 2:
To establish if perceived social support is associated with medication adherence.

Hypothesis 2:
HIV-infected older adults who report higher perceptions of social support will also report more consistent adherence to HAART.

Rationale for Hypothesis 2:
Perceived support might increase medication adherence by way of increasing a sense of empowerment and control. This in turn might lead to better health behavior, which includes medication adherence. In addition, as Draine and Solomon (1994) argue, social support may contribute to more positive attitudes toward medication compliance.

Objective 3:
To explore if escape-avoidant coping strategies are related to medication adherence.

Hypothesis 3:
Increased avoidant coping is associated with poorer medication adherence.

Rationale for Hypothesis 3:
Singh et al. (1996) found that better coping skills were positively related to medication adherence. Avoidant coping might actually lead to a lack of medication adherence, because the medications might be associated with the disease, which the individual may seek to avoid.
Objective 4:

To determine if physical pain is related to intentional nonadherence in people with HIV/AIDS age 45 and older.

Hypothesis 4:

HIV-infected older adults who report elevated levels of physical pain will also report greater intentional nonadherence to HAART.

Rationale for Hypothesis 4:

Participants, who experience elevated levels of physical pain, might be doubtful that the benefits of the drugs outweigh sensations of pain and the side effect of some antiretroviral medication (Mehta et al., 1997; Hecht et al., 1998).

Objective 5:

To determine if self-perceived cognitive dysfunction is related to unintentional nonadherence in people with HIV/AIDS age 45 and older.

Hypothesis 5:

HIV-infected older adults who report greater self-perceived cognitive compromise will also report greater levels of unintentional nonadherence to HAART.

Rationale for Hypothesis 5:

Individuals who are experiencing cognitive difficulties might not be able to comprehend instructions related to antiretroviral medication or they might be more likely to forget to take their pill on time.
Method

Data analyzed in the current study were collected as part of Project Enhancement. Project Enhancement was a study conducted at Ohio University in 2001 and 2002. After receiving approval from the university’s Institutional Review Board (IRB), the study team at Ohio University sent recruitment packages to AIDS-service organizations (ASOs) in Minneapolis, Minnesota, and Columbus, Ohio; the majority of participants was from the Greater Columbus, OH area. These packages included a flyer, a cover letter from the primary investigator, which described the project, and stamped envelopes that ASOs could address and forward to their clients. The brochures informed middle-aged and older clients about the study, inclusion criteria needed to enroll, and a toll free number to access the study institution. Interested clients telephoned Project Enhancement research staff that screened them for possible enrollment into the project. Inclusion criteria were literacy, 45 years of age and older, and self-reported HIV-seropositivity. Clients were also verbally given an explanation of Project Enhancement and its procedures including the issue of confidentiality.

The study institution then sent a survey packet to 105 eligible clients. Each packet contained a cover letter thanking clients and explaining the procedure for completing the program, a 50-page survey to be filled out by the participant, the informed consent which was to be mailed back, and stamped, self-addressed envelopes in which the survey and the informed consent were to be returned to the study institution. Participants completed the self-administered instrument in the
privacy of their own homes. Completion required approximately 90 minutes.
Participants were compensated $50 for completing the survey. One hundred surveys
were completed and returned to the study institution, which represents a response rate
of 95%.

Participant Characteristics

Eighty-two (82%) of the participants were male, and eighteen (18%) were
female. Ages ranged from 45 years to 75 years with a mean of 54 years. Most
participants (32%) had completed 14 years of education, 26% had completed 12 years
of education, and 15% had completed 17 years of education. Sixteen percent of the
participants reported that they were employed full-time, 13% part-time, and 11%
were unemployed. Clients also received social security disability money (59%) and
7% were applying for social security disability. The sample was 21% African
American, 73% Caucasian, and 6% other. Thirty-eight percent of all participants
earned less than 10,000 dollar annually, followed by 34% earning between $10,001
and $20,000 dollars annually. Most people (41%) were single. Eleven percent were
legally married, 1% separated, 20% divorced, 18% were partnered, and 7% were
widowed. The average participant had been living with the HIV infection for
approximately 11 years (range 2 – 20). All participants resided in urban areas.
Eighty-five percent (N=85) of the middle-aged and older adults that participated in
Project Enhancement were taking antiretroviral medications. Thirty-seven percent of
the participants on medication had missed medication at least once during the seven
days prior to filling out the questionnaire. Sixty-one percent reported to have not
skipped medication during the previous week. The current sample was comparable to samples in other studies reviewed for this project (Catz et al., 2001; Chesney et al., 2000; Coons et al., 1994; Justice & Weissman, 1998; etc.). The sociodemographic characteristics are in agreement with those from similar studies. For a summary of sociodemographic characteristics of this sample, please view Table 2.
Table 2

*Sociodemographic characteristics of total sample (N = 100) and participants taking HIV medication (N = 85)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Only Those Participants Taking HAART</th>
<th>All Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>84%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>76%</td>
</tr>
<tr>
<td></td>
<td>African American</td>
<td>24%</td>
</tr>
<tr>
<td></td>
<td>Employment Status</td>
<td></td>
</tr>
<tr>
<td></td>
<td>working/Student</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>unemployed</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>other</td>
<td>61%</td>
</tr>
<tr>
<td></td>
<td>Income</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$ 0 - $ 10,000</td>
<td>35%</td>
</tr>
<tr>
<td></td>
<td>$ 10,001 - $ 20,000</td>
<td>38%</td>
</tr>
<tr>
<td></td>
<td>$ 20,001 - $ 30,000</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>$ 30,001 - $ 40,000</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>over 40,000</td>
<td>6%</td>
</tr>
</tbody>
</table>
Assessment Instrument

This study’s 50-page assessment instrument took about 90 minutes to complete and assessed each construct discussed below. All data were collected via self-report recall methods.

Adherence to Antiretroviral Medications Questionnaire. Project Enhancement employed modified versions of adherence instruments used by the AIDS Clinical Trials Group (ACTG; Chesney et al., 2000). Two questions inquire about the frequency with which participants skipped or were late for their doses of antiretroviral medication during the last seven days. The answer choices are "More than once a day", "About once every day", "More than two times this week", "About twice this week", "About once this week", and "Never during the last week". While self-reported adherence might lead to an overestimation of adherence (Bangsberg et al., 2000; Matsui, Hermann, Klein, Berkovitch, Oliviery, & Koren, 1994; Straka, Fish, Benson, & Suh, 1997), Bangsberg and colleagues (2000) found that self-report, electronically monitored doses, and pill count led to similar estimates of the relationship between adherence and viral suppression. In addition, the difference between self-report measures and objective, clinical measures of adherence, such as plasma levels of protease inhibitors and biological parameters associated with the use of some antiretroviral medications, has been found to be non-significant (Bangsberg et al., 2000; Duong et al., 2001). Because medication adherence is crucial in order to benefit from HAART, participants were be categorized into a consistent adherence
group ("never skipped during the past seven days") and a nonadherence group ("skipped about once this week" or more).

In addition, 10 questions were extracted on a conceptual basis to reveal information about intentional or unintentional nonadherence. Five questions imply unintentional medication nonadherence. They cover reasons such as being away from home, were busy with other things, simply forgot, has a change in daily routine, and fell asleep/slept during dose time. Subjects, who report missing their medications because they wanted to avoid side effects, did not want others to notice the taking of the medication, felt like the drug was toxic/harmful, felt sick from side effects, or they had problems taking pills at specified times (with meals, on empty stomach, etc.) endorse intentional medication nonadherence. A principal components factor analysis with Varimax transformation was performed in order to examine the factor structure of the 10 questions in this group of HIV-infected middle-aged and older individuals. This analysis resulted in 2 factors with eigenvalues greater than 1.0, accounting for 61% of the variance. The factors were interpreted as intentional and unintentional medication nonadherence and, except for items 9 and 12, the items matched those described above, which were picked in advance based on theoretical reasoning. Please view Table 3 for a summary of the factor loadings. Participants rated on a 4-point likert scale how often they have missed taking their medication (0=never, 1=rarely, 2=sometimes, 3=often). Scores range from 0 to 20 with higher scores representing greater nonadherence in each category (intentional and
### Table 3

*Factor Loadings for Intentional and Unintentional Medication Nonadherence*

<table>
<thead>
<tr>
<th></th>
<th>Intentional Medication Nonadherence</th>
<th>Unintentional Medication Nonadherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were away from home.</td>
<td>.83</td>
<td></td>
</tr>
<tr>
<td>Were busy with other things.</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Simply forgot.</td>
<td>.77</td>
<td></td>
</tr>
<tr>
<td>Wanted to avoid side effects.</td>
<td>.87</td>
<td></td>
</tr>
<tr>
<td>Did not want others to notice you taking medication.</td>
<td>.56</td>
<td></td>
</tr>
<tr>
<td>Had a change in daily routine.</td>
<td></td>
<td>.63</td>
</tr>
<tr>
<td>Felt like the drug was toxic/harmful.</td>
<td>.82</td>
<td></td>
</tr>
<tr>
<td>Fell asleep/slept during dose time.</td>
<td></td>
<td>.27</td>
</tr>
<tr>
<td>Felt sick/ill from side effects.</td>
<td></td>
<td>.82</td>
</tr>
<tr>
<td>Had problems taking pills at specified times (with meals, on empty stomach, etc.)</td>
<td>.53</td>
<td></td>
</tr>
</tbody>
</table>
unintentional nonadherence). Cronbach's alpha for intentional medication nonadherence equaled .80 and for unintentional medication nonadherence .81.

The AACTG Adherence Instruments have been widely used in several studies. Their questions were rationally derived by the Recruitment, Adherence and Retention (RAR) Subcommittee of the Adult Outcomes Committee, and the Patient Care Committee of the AACTG (Chesney et al., 2000). To investigate construct validity, adherence (or, conversely, nonadherence) was correlated with items from the Baseline Correlates of Adherence Questionnaire of the same study. These items were “reasons for enrolling and for possible early withdrawal from the trial,” “adherence self-efficacy and beliefs about medication effectiveness,” “psychological distress and social support,” “alcohol and drug use,” and “sociodemographic characteristics and health care coverage.” Comparisons of nonadherent (skipping in the last two weeks) versus adherent participants in this study revealed that nonadherent participants were more likely to work for pay outside the home, consumed more alcoholic beverages in the month prior to assessment, were more likely to have enrolled in the trial to obtain access to a particular drug, were less sure that they would be able to take all or most of the medications as directed, were less knowledgeable about the consequences of medication nonadherence, were more likely to have used cocaine in the past, reported greater perceived stress, and were less sure that they would keep all appointments as scheduled. While they acknowledge the exploratory nature of their study, Chesney et
al. (2000) conclude that it provides evidence for the feasibility of the AACTG Adherence Instruments for self-administration.

*The Geriatric Depression Scale (GDS; Yesavage, Brink, Rose, & Leirer, 1983).* The GDS consists of 30 items. The answers to each item are either “1” (yes) or “2” (no). Examples are "Are you basically satisfied with your life?" "Do you think it is wonderful to be alive now?" and "Do you often feel downhearted and blue?"

This instrument might be especially fit for the population of this study, because no somatic items are included. Consequently, overlap between depression, HIV-infection, age-related co-morbidity, and medication side effects will not exist. After reverse scoring 10 items, scores range from 30 to 60. Depression-scores place the subject into one of three categories. The categories are "no depression" (30-40), "mild depression" (41-50), and "moderate-to-severe depression" (51-60). The GDS possesses strong psychometric properties. Internal consistency is high. Items correlate with each other with a median of .36, which is similar to other measures of depression (e.g., Hamilton Rating Scale for Depression [HRS-D], Hamilton, 1960; Zung Self-Rating Depression Scale [SDS], Zung, 1965). Correlations with the total score (corrected-item total score, i.e., after subtracting the particular item) showed a median of .56. Cronbach's (1951) alpha coefficient equals .94. The split-half reliability coefficient also equals .94. All these indices are equal or exceed the corresponding values of the HRS-D and the SDS. Test-retest reliability was calculated by having 20 individuals complete the questionnaire twice, one week apart. The correlation was .85. Correlations between the GDS and the SDS as well as the
HRS-D were .84 and .83 respectively. Individual subjects fell in the same categories of depression (normal, mild, and severely depressed) in all three instruments (Brink et al., 2000; Yesavage et al., 1983). Cronbach's (1951) alpha in Project Enhancement also equaled .94.

West Haven-Yale Multidimensional Pain Inventory (WHYMPI; Kerns, Turk, & Rudy, 2000). This instrument measures chronic pain. Its three part design assesses (1) the impact of pain in people's lives, (2) the responses of others to the individual's communication of pain, and (3) the extent to which pain sufferers participate in daily activities. For Project Enhancement, the first part - a 20 item scale that focuses especially on the evaluation of perceived pain - was used. Participants are responding to the questions on a 7-point scale, with "0" representing no problem or no change and "6" expressing extreme change or extreme problem. Items sum up to a possible total of 120 points for the highest rating of impact of pain. The 20 items represent five scales: interference (e.g., "In general, how much does your pain problem interfere with you day-to-day activities?"), support (e.g., "How supportive or helpful is your spouse (significant other) to you in relation to your pain?"), pain severity (e.g., "Rate the level of your pain at the present moment."), self-control (e.g., "During the past week how much control do you feel that you have had over your life?"), and negative mood (e.g., "Rate your overall mood during the past week."). Kerns and colleagues (1985) studied the WHYMPI with 120 chronic pain patients, whose mean age was 50.8 years. The scales of Part I of the WHYMPI demonstrated small to moderate correlations. Within the scales, all items correlated significantly with each
of their scale. Subscale alphas for Part I range from .72 to .90. Test-retest correlations range from .68 to .86. All correlations with instruments such as the Present PainIntensity and the total Pain Rating Index scales from the McGill Pain Questionnaire (MPQ), the Beck Depression Inventory (BDI), the State-Trait Anxiety Inventory form (STAI), the Depression Adjective Checklist (DACL), and the Multidimensional health Locus of control Scale that is comprised of Internal Powerful Others, and Chance subscales (MHLC) are significant and in the predicted directions (Kerns et al., 1985). Cronbach's (1951) alpha in Project Enhancement equaled .91.

Cognitive Difficulties Scale (CDS; McNair & Kahn, 1983). The CDS consists of 39 statements regarding various aspects of self-reported cognitive difficulty. The level of agreement is determined with a 5-point scale. Participants answer to questions such as "I have trouble describing a program I just watched on television." or "I need to check or double-check whether I locked the door, turned off the stove etc." with either "0" (No at all), "1" (Rarely), "2" (Sometimes), "3" (Often), or "4" (Very often). No reverse scoring is required for this scale. Scores range from 0 to 156. Test-retest reliability is satisfactory with a correlation of .77 in a healthy sample of 16 volunteers in a study of tricyclic antidepressant side effects. Cronbach's (1951) alpha in Project Enhancement equals .96.

Previous research indicating that depression and self-reported cognitive difficulties are highly correlated led to a closer examination of this possibility in data collected in the current study. Correlational analyses indicated that depression was
significantly and positively correlated with self reported cognitive difficulties, \( r(83) = .68, p < .01 \). This problem was addressed by correlating each individual variable of the CDS with the summed score of the Geriatric Depression Scale. Correlation analyses determined that individual items of the CDS correlated with summated GDS scale between \( r = .14 \) and \( r = .65 \). Nine items from the Cognitive Difficulties Scale that evidenced correlations of .35 and less (i.e., less than 10% shared variance) were summed and used to create a “Revised Cognitive Difficulties Scale.” The Revised Cognitive Difficulties Scale consists of questions such as “I need a written list when I do errands to avoid forgetting things” and “I forget to button or zip my clothing.” Items sum up to a possible total of 36 points with higher numbers representing greater cognitive difficulties. This new scale was used in all subsequent analyses to avoid overlap between depression and cognitive compromise due to depression. Cronbach's (1951) alpha for the Revised Cognitive Difficulties Scale used in this study equaled .75.

*The Provision of Social Relations Scale (PSR; Turner, Frankl, & Levin, 1983).* This 15-item instrument measures two dimensions of social support, i.e., family support and support from friends. Participants choose their answers to questions such as "When I'm with my friends, I feel completely able to relax and be myself", and "Sometimes I'm not sure if I can completely rely on my family" from a 5-point scale. Answers range from "Very much like me" to "Not at all like me". After reverse scoring two items, scores sum up to a total of 75 points with higher numbers representing lower perceptions of social support. The PSR has good internal
consistency with alphas ranging from .75 to .87. No reports regarding test-retest correlations were found. This instrument correlates significantly with the Kaplan Scale of Social Support (Kaplan, 1977). Correlations between this scale and indices of social support resources (i.e., availability of confidants, participation in social activities, and availability of family, friends, or neighbors) ranged from .19 to .49. These findings support the expectations of an association between the experience of social support and the availability of use of social resources. The PSR was used as a continuous measure of perceived social support. Cronbach's (1951) alpha in Project Enhancement equaled .84.

*The Barriers to Care Scale (BACS; Heckman et al., 1998).* The 13-item BACS enables people living with HIV disease to rate the problem severity of various geographic, economic, and structural barriers that prevented them from accessing health care and social services (sample items: "Lack of transportation to access services I need" and "Lack of psychological support groups"). The 12 items are summed and averaged to create a single index of barriers to care (α=.93, Heckman et al., 1998). Higher scores indicate more barriers to health care and social services. Cronbach's (1951) alpha in Project Enhancement equaled .89.

*The Ways of Coping Checklist (WOCC; Folkman & Lazarus, 1988).* The 66 items on the Ways of Coping Checklist assess thoughts and behaviors employed to deal with stressors of daily living. This scale has been employed in previous HIV research (Heckman et al., 2001; Singh et al, 1996). The Project Enhancement survey instructed participants to identify their most prominent stressor in the HIV-Related
Life Stressor Burden Scale. They then indicated how often they used each coping strategy to cope with the identified stressor. Examples for coping strategies are "I apologized and did something to make up", "I tried to analyze the problem in order to understand it better", "I refused to believe that it had happened", "I turned to work or substitute activity to take my mind off things", "I made a plan of action and followed it", "I came out of the experience better than when I went in", "I got professional help", and "I maintained my pride and kept a stiff upper lip". Answers are made along four levels from "1" (Not Used), "2" (Used Somewhat), "3" (Used Quite a Bit), to "4" (Used A Great Deal). The WOCC consists of eight subscales: Accepting Responsibility ($\alpha=.73$), Confrontive Coping ($\alpha=.70$), Distancing ($\alpha=.72$), Escape-Avoidance ($\alpha=.78$), Planful Problem Solving ($\alpha=.71$), Positive Reappraisal ($\alpha=.77$), Seeking Social Support ($\alpha=.72$), and Self-Controlling ($\alpha=.78$). Coefficient $\alpha$-s are based on Heckman et al. (1999) work with HIV-infected older adults. In this research project, escape-avoidance coping is addressed separately. Seven questions assess this concept (sample items: "Refused to believe that it had happened." and "Wished that the situation would go away or somehow be over with."). Scores range from 7 to 28 with higher scores representing increased escape-avoidant coping behavior. Reversed scoring is not necessary for these items. This scale was used as a continuous variable in this study. Cronbach's (1951) alpha for the Escape-Avoidance scale in Project Enhancement equaled .80.
Results

Data Screening and Preparation

Study data was analyzed using the Statistical Package for the Social Sciences for Windows Version 10.0 (SPSS Inc.). The accuracy of the raw data file was verified by confirming and correcting every case after initial entering. All variables of interest (sociodemographics, duration of illness, health status, escape-avoidant coping strategies, perceived social support, barriers to care, depression, pain, self-perceived cognitive functioning, medication adherence, intentional, and unintentional medication nonadherence) were examined for missing values and the fit between their distributions and the assumptions of relevant multivariate analyses. Within the variables of interest, ten missing values were found among the predictor variables and replaced by the variable’s mean. One case with a missing value on medication adherence was deleted from all analyses in which medication adherence was the dependent or criterion variable. This procedure left 85 cases for all analyses involving intentional and unintentional medication nonadherence and 84 cases for all analyses involving medication adherence as the criterion. Reliability coefficients were computed for all scales and subscales (see Table 4). Coefficient alphas are reported as an index of the internal consistency of the used psychological measures. They ranged from .80 to .96.

Several steps were employed to ensure that the assumption of multivariate normality was met. Distributions were checked for univariate outliers and 2 scores
were found to be more than 3 standard deviations from their respective means (i.e., barriers to care and intentional nonadherence). The affected variables were retained.

Table 4

*Reliability Coefficients for all Scales and Subscales*

<table>
<thead>
<tr>
<th>Scale</th>
<th># Items</th>
<th>(\alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Geriatric Depression Scale (GDS; Yesavage, Brink, Rose, &amp; Leirer, 1983)</td>
<td>30</td>
<td>.94</td>
</tr>
<tr>
<td>West Haven-Yale Multidimensional Pain Inventory (WHYMPI; Kerns, Turk, &amp; Rudy, 2000)</td>
<td>20</td>
<td>.91</td>
</tr>
<tr>
<td>Cognitive Difficulties Scale (CDS; McNair &amp; Kahn, 1983)</td>
<td>39</td>
<td>.96</td>
</tr>
<tr>
<td>Revised Cognitive Difficulties Scale</td>
<td>9</td>
<td>.75</td>
</tr>
<tr>
<td>The Ways of Coping Checklist (WOCC; Folkman &amp; Lazarus, 1988) Escape-Avoidance scale</td>
<td>7</td>
<td>.80</td>
</tr>
<tr>
<td>The Provision of Social Relations Scale (PSR; Turner, Frankl, &amp; Levin, 1983)</td>
<td>15</td>
<td>.84</td>
</tr>
<tr>
<td>The Barriers to Care Scale (BACS; Heckman et al., 1998)</td>
<td>13</td>
<td>.89</td>
</tr>
<tr>
<td>Intentional Medication Nonadherence</td>
<td>5</td>
<td>.80</td>
</tr>
<tr>
<td>Unintentional Medication Nonadherence</td>
<td>5</td>
<td>.81</td>
</tr>
</tbody>
</table>
However, recoding the raw scores to within 3 standard deviations of the scale mean reduced the influence of the outliers. A check of Mahalanobis distances revealed no multivariate outliers.

Examination of normal probability plots and scores for skewness and kurtosis revealed that the assumption of normality was not met by the following variables: age, avoidant coping strategies, barriers to care, and intentional medication nonadherence (all of which were positively skewed). All variables were transformed using a Log10 transformation. After transforming these variables, the assumption of normality was met by all variables of interest. The assumptions of linearity and homoscedasticity appeared to be met following the examination of bivariate scatterplots and residual scatterplots for variables following each multiple regression analysis.

Gender and ethnicity were dichotomous variables and were not split equally among participants taking antiretroviral medications. Of all participants, who were taking antiretroviral medication, 71 were male and 14 were female. Sixty-three were White and 22 were non-White participants. In spite of these uneven splits, both variables were retained for study analyses.

Concerns regarding multicollinearity among predictor variables, particularly depression and self-perceived cognitive difficulties, were addressed by examining intercorrelations between criterion and predictor variables and conditioning indices and variance proportions in regression analyses. Intercorrelations revealed that, consistent with Tabachnick and Fidell’s (1996) suggestion to delete one of two
variables that show a correlation of .70 or more, no predictors needed to be excluded from the analyses, although depression correlated highly with self-reported cognitive difficulties, \( r(84) = .68, p < .01 \). This problem was addressed by the creation of the Reduced Cognitive Difficulties Scale, which was described earlier in this document. This scale replaced the Cognitive Difficulties Scale and was used in all analyses. Intercorrelations among selected variables are presented in Table 5.

While 100 individuals participated in Project Enhancement, only 85 were taking antiretroviral therapy at the time of the survey. Only this subset of the Project Enhancement sample will be described below. This is a small sample size, but large enough to fulfill minimum requirement for an acceptable ratio of cases to IV-s in multiple regression according to Tabachnick and Fidell (1989). The cases to variable ratio for the logistic regression analysis was 21 to 1 (i.e., 21 participants for each variable included in most regression analyses).

**Descriptive Statistics and Frequencies**

The means and standard deviations for continuous variables are presented in Table 6. Sociodemographics and demographic correlates of all categorical predictors are summarized in Table 7.

**Sociodemographic Variables.** The mean age of participants enrolled in Project Enhancement who were taking HIV medication was 54.48 years (Range= 46 to 76 years). Most participants (n=71) were men while 14 were women. There were 63 White participants and 22 Non-White participants. Non-White participants included 19 African-American, 1 Hispanic, and 2 Native American persons.
Table 5

Intercorrelations Among Selected Dependent and Independent Variables

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Ethnicity</td>
<td></td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Income</td>
<td>-.05</td>
<td></td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Duration of Illness</td>
<td>-.20</td>
<td>-.16</td>
<td>-.10</td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Avoidant Coping Strategies</td>
<td>-.28***</td>
<td>.8</td>
<td>-.19</td>
<td>-.05</td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Perceived Social Support</td>
<td>-.12</td>
<td>.02</td>
<td>-.04</td>
<td>.03</td>
<td>.23**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Barriers to Care</td>
<td>-.14</td>
<td>-.07</td>
<td>-.11</td>
<td>.04</td>
<td>.37***</td>
<td>.35***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Depression</td>
<td>-.32***</td>
<td>.00</td>
<td>-.03</td>
<td>-.07</td>
<td>.58***</td>
<td>.41***</td>
<td>.28***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Pain</td>
<td>-.31**</td>
<td>.08</td>
<td>-.05</td>
<td>-.02</td>
<td>.46***</td>
<td>.14</td>
<td>.42***</td>
<td>.46***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Self-reported Cognitive Functioning</td>
<td>-.27**</td>
<td>.03</td>
<td>-.05</td>
<td>-.00</td>
<td>.50***</td>
<td>.38***</td>
<td>.30***</td>
<td>.69***</td>
<td>.51***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Self-reported Cognitive Functioning (reduced scale)</td>
<td>-.19</td>
<td>.01</td>
<td>.11</td>
<td>.03</td>
<td>.23**</td>
<td>.35***</td>
<td>.20</td>
<td>.44***</td>
<td>.27**</td>
<td>.85***</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Intentional Medication nonadherence</td>
<td>-.23**</td>
<td>.28***</td>
<td>-.30***</td>
<td>.03</td>
<td>.36***</td>
<td>.18</td>
<td>.25**</td>
<td>.20</td>
<td>.22**</td>
<td>.19</td>
<td>.12</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>13. Unintentional Medication nonadherence</td>
<td>-.23**</td>
<td>.02</td>
<td>-.16</td>
<td>.20</td>
<td>.48***</td>
<td>.21</td>
<td>.25**</td>
<td>.29***</td>
<td>.23**</td>
<td>.30***</td>
<td>.16</td>
<td>.60***</td>
<td>1.00</td>
</tr>
<tr>
<td>14. Medication adherence</td>
<td>.24**</td>
<td>-.20</td>
<td>.09</td>
<td>-.09</td>
<td>-.34***</td>
<td>-.09</td>
<td>.03</td>
<td>-.29***</td>
<td>-.11</td>
<td>-.21</td>
<td>-.16</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

*p < .10

**p < .05

***p < .01
Table 6

*Descriptive Statistics for Continuous Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Possible range</th>
<th>Actual range</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sociodemographic Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>54.48</td>
<td>45+</td>
<td>46-76</td>
<td>5.50</td>
</tr>
<tr>
<td>Education</td>
<td>14</td>
<td>9-17+</td>
<td></td>
<td>1.95</td>
</tr>
<tr>
<td><strong>Health Related Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of Illness</td>
<td>10.91</td>
<td>0+</td>
<td>2-20</td>
<td>5.03</td>
</tr>
<tr>
<td>Health Status</td>
<td>2.70</td>
<td>1-5</td>
<td>1-5</td>
<td>1.36</td>
</tr>
<tr>
<td><strong>Additional Predictors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoidant Coping Strategies</td>
<td>14.99</td>
<td>7-28</td>
<td>7-27</td>
<td>5.07</td>
</tr>
<tr>
<td>Perceived Social Support</td>
<td>35.08</td>
<td>0-75</td>
<td>15-60</td>
<td>10.81</td>
</tr>
<tr>
<td>Barriers to Care</td>
<td>23.27</td>
<td>13-52</td>
<td>13-47.97*</td>
<td>8.19</td>
</tr>
<tr>
<td>Variable</td>
<td>Mean</td>
<td>Possible range</td>
<td>Actual range</td>
<td>SD</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------</td>
<td>----------------</td>
<td>--------------</td>
<td>-----</td>
</tr>
<tr>
<td><strong>Main Predictors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>47.92</td>
<td>30-60</td>
<td>31-60</td>
<td>8.54</td>
</tr>
<tr>
<td>Pain</td>
<td>46.33</td>
<td>0-120</td>
<td>0-98</td>
<td>23.18</td>
</tr>
<tr>
<td>Cognitive Functioning</td>
<td>46.09</td>
<td>0-156</td>
<td>0-121</td>
<td>26.66</td>
</tr>
<tr>
<td>Cognitive Functioning (reduced scale)</td>
<td>9.67</td>
<td>0-36</td>
<td>0-22</td>
<td>4.90</td>
</tr>
<tr>
<td><strong>Criteria</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intentional Medication nonadherence</td>
<td>2.61</td>
<td>0-20</td>
<td>0-12.60*</td>
<td>3.22</td>
</tr>
<tr>
<td>Unintentional Medication nonadherence</td>
<td>4.46</td>
<td>0-20</td>
<td>0-15</td>
<td>3.68</td>
</tr>
</tbody>
</table>

*Decimals are due to outlier score transformation
Table 7

*Sample Sociodemographics and Demographic Correlates of Medication Adherence*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percent of Sample</th>
<th>Medication adherence</th>
<th>Intentional Medication nonadherence</th>
<th>Unintentional Medication nonadherence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>p=NS</td>
<td>p=NS</td>
</tr>
<tr>
<td>Male</td>
<td>84%</td>
<td>58%</td>
<td>2.56</td>
<td>4.46</td>
</tr>
<tr>
<td>Female</td>
<td>16%</td>
<td>78%</td>
<td>2.86</td>
<td>4.43</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td>p=.01</td>
<td>p=.NS</td>
</tr>
<tr>
<td>White</td>
<td>76%</td>
<td>68%</td>
<td>2.19</td>
<td>4.42</td>
</tr>
<tr>
<td>Non-White</td>
<td>24%</td>
<td>45%</td>
<td>4.05</td>
<td>4.58</td>
</tr>
<tr>
<td>Employment Status</td>
<td></td>
<td></td>
<td>p=NS</td>
<td>p=NS</td>
</tr>
<tr>
<td>working/Student</td>
<td>30%</td>
<td>60%</td>
<td>2.88</td>
<td>4.56</td>
</tr>
<tr>
<td>unemployed</td>
<td>9%</td>
<td>75%</td>
<td>2.50</td>
<td>2.88</td>
</tr>
<tr>
<td>other</td>
<td>61%</td>
<td>61%</td>
<td>2.49</td>
<td>4.65</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td>p=.05</td>
<td>p=NS</td>
</tr>
<tr>
<td>$ 0 - $ 10,000</td>
<td>35%</td>
<td>70%</td>
<td>3.62</td>
<td>4.87</td>
</tr>
<tr>
<td>$ 10,001 - $ 20,000</td>
<td>38%</td>
<td>42%</td>
<td>2.81</td>
<td>4.91</td>
</tr>
<tr>
<td>$ 20,001 - $ 30,000</td>
<td>15%</td>
<td>77%</td>
<td>.92</td>
<td>3.31</td>
</tr>
<tr>
<td>$ 30,001 - $ 40,000</td>
<td>6%</td>
<td>80%</td>
<td>1.60</td>
<td>3.00</td>
</tr>
<tr>
<td>over $ 40,000</td>
<td>6%</td>
<td>80%</td>
<td>.60</td>
<td>3.60</td>
</tr>
<tr>
<td>Medication Adherence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>never skipped during the last week</td>
<td>61%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>skipped once this week or more</td>
<td>38%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>missing</td>
<td>1%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Participants had an average of 14 years of education. Range of education varied from 9 to more than 17 years (17+). Employment was categorized in the following way; if participants did not endorse the options "working", "unemployed", or "student", they were grouped in a category called "other" which included 61% participants. These individuals were either seeking social security services or applying for disability services. Also, participants who listed other sources of financial support were included in this group. Thirty percent of the participants were working or students, 9% were unemployed, but did not report any sources of financial support. Five categories described participant's income. Thirty-five percent of all participants were earning between $0 and $10,000, 38% between $10,001 and $20,000, 15% between $20,001 and $30,000, 6% between $30,001 and $40,000, 6% were earning more than $40,000.

Medication Adherence

Three hypotheses involved medication adherence as the criterion variable. Hypothesis 1 stated that HIV-infected older adults who report less consistent adherence to HAART would also report elevated levels of depression, physical pain, and greater self-reported cognitive compromise. Hypotheses 2 proposed that HIV-infected older adults who report higher perceptions of social support would also report more consistent adherence to HAART. Finally, Hypothesis 3 stated that increased escape-avoidant coping would be associated with poorer treatment adherence.
Preliminary analyses were undertaken in order to identify significant relationships between predictor variables and criterion measures for inclusion into regression analyses. A significance level of $p < .10$ was required for the variable to be considered for inclusion in the main logistic regression analyses. Point-biserial correlations were computed for all pairwise relationships that involved one continuous variable and the medication adherence criterion (full adherence as opposed to missing one or more medication doses). Chi-square tests were performed to identify significant associations between categorical variables and medication adherence.

**Sociodemographic Predictors of Medication Adherence.** Education, income, duration of illness, and current health status were not significantly associated with medication adherence in correlation analyses. In addition, chi-square tests of association identified no significant relationships between medication adherence and gender, ethnicity, employment status, and income. Significant relationships were found between age and medication adherence, $r(83) = .24, p = .03$, and between ethnicity and medication adherence, $\chi^2(1, N = 84) = 3.42, p = .06$. Older individuals evidenced better medication adherence than younger participants. Non-White participants exceeded Whites in their ability to adhere to their HIV-medication regimen. Both predictors were therefore used as covariates in the multiple logistic regression analysis modeling medication adherence.

**Psychosocial Predictors of Medication Adherence.** Perceived social support, barriers to care, pain, and self-reported cognitive difficulties (using the reduced scale)
were not significantly associated with the medication adherence criterion measure and, as such, were excluded from the subsequent logistic regression analysis. Significant associations were found between, escape-avoidant coping strategies and medication adherence, \( r(83) = -.34, p < .01 \), and depression and medication adherence, \( r(83) = -.29, p = .01 \). Again, the results of the correlation analyses revealed that physical pain and self-reported cognitive compromise were not associated with medication adherence in this sample: physical pain: \( r(83) = -.11, p = .34 \); self-perceived cognitive functioning: \( r(83) = -.16, p = .16 \). Hence, Hypotheses 1 was not confirmed. Physical pain was not associated with medication adherence and self-reported cognitive functioning was also not associated with medication adherence. In addition, Hypothesis 2 was not supported regarding the proposed association between social support and medication adherence, \( r(83) = -.09, p = .44 \).

Hierarchical Logistic Regression Analysis of Medication Adherence. Logistic hierarchical regression analyses were conducted to test Hypotheses 1, 2, and 3 of this study (1: HIV-infected older adults who report less consistent adherence to HAART will also report elevated levels of depression, physical pain, and greater cognitive compromise; 2: HIV-infected older adults who report higher perceptions of social support will also report more consistent adherence to HAART; and 3: Increased avoidant coping is associated with poorer medication adherence). A logistic hierarchical regression analysis was performed on medication adherence and four additional predictors: age, ethnicity, escape-avoidant coping, and depression. All
excluded covariates are reported in the above section. Please view Table 8 for an overview of included variables into regression analyses.

From a theoretical point of view, it was important to control for the effects of sociodemographic predictors and the escape-avoidant coping variable prior to evaluating the predictive ability of depression. That is, in the attempt to answer the research question “Do HIV-infected older adults, who report less consistent adherence to HAART, also report elevated levels of depression?” it was important to determine if depression added any information in the explanation of medication adherence above-and-beyond the predictive ability of age, ethnicity, and escape-avoidant coping. Age and ethnicity were therefore entered into the regression first. Block 2 added escape-avoidant coping strategies to the model and Block 3 added depression.

A test of the full model with all predictors against the constant-only model was statistically reliable, $\chi^2 (4, N = 84) = 16.14, p = .01$, indicating that the set of predictors reliably distinguished between persons who missed zero medication doses during the past week and those who missed one or more medication doses. Prediction accuracy was 44% of the nonadherent participants and 79% of the adherent participants correctly predicted and an overall success rate of 66%.
### Table 8

*Overview of Predictors in Regression Analyses*

<table>
<thead>
<tr>
<th>Logistic Hierarchical Regression Analysis  (Criterion: Medication Adherence)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Block 1:</strong> Sociodemographic Variables:</td>
</tr>
<tr>
<td>• Age</td>
</tr>
<tr>
<td>• Ethnicity</td>
</tr>
<tr>
<td><strong>Block 2:</strong> Care and Coping Variables:</td>
</tr>
<tr>
<td>• Escape-Avoidant Coping Strategies</td>
</tr>
<tr>
<td><strong>Block 3:</strong> Main Predictors:</td>
</tr>
<tr>
<td>• Depression</td>
</tr>
</tbody>
</table>
Table 8 (continued)

Hierarchical Multiple Regression Analyses (Criterion: Intentional Medication Nonadherence)

<table>
<thead>
<tr>
<th>Block 1:</th>
<th>Sociodemographic Variables:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Age</td>
</tr>
<tr>
<td></td>
<td>• Ethnicity</td>
</tr>
<tr>
<td></td>
<td>• Income</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Block 2</th>
<th>Care and Coping Variables:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Escape-Avoidant Coping</td>
</tr>
<tr>
<td></td>
<td>Strategies</td>
</tr>
<tr>
<td></td>
<td>• Barriers to Care</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Block 3:</th>
<th>Main Predictors:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Pain</td>
</tr>
</tbody>
</table>

Hierarchical Multiple Regression Analyses (Criterion: Unintentional Medication Nonadherence)

Not performed due to non-significant relationship between self-reported cognitive functioning and medication adherence in preliminary correlation analysis.
Table 9 shows the regression coefficients, Wald statistics, and odds ratios for each of the five predictors (age, ethnicity, escape-avoidant coping, and depression). According to the Wald criterion, none of the four predictor variables in the full model predicted medication adherence successfully. Escape-avoidant coping was significantly related with medication adherence when depression was not in the model, $z = 5.12, p = .02$. The second block, which did not include depression, was reliably different from the constant-only model, $\chi^2 (1, N = 84) = 14.94, p < .01$. In addition, prediction success was greater without depression in the model with an overall success rate of 69%. Hence, escape-avoidant coping appears to be the only reliable predictor of medication adherence among the four predictors. A closer look at the odds ratio for escape-avoidant medication adherence reveals that the probability of being nonadherent to medication increases significantly with an increase in escape-avoidant coping.\(^1\)

Further logistic hierarchical regression analyses were conducted in order to explore if there exist two-way interactions of the predictor variables depression, pain, self-perceived cognitive difficulties, and escape-avoidant coping on medication adherence. These analyses contained age and ethnicity as covariates in their first step. Additional analyses in which depression was entered prior to escape-avoidant coping revealed a similar result: depression was significantly related with medication adherence when escape-avoidant coping was omitted from the model, $B = -.06, p = .04$. Analyses were reconducted adding the Revised Cognitive Difficulties Scale in a separated step to a model that already contained age, ethnicity, depression, and escape-avoidant coping. The addition of cognitive difficulties to the model did not explain any additional variance above and beyond depression and escape-avoidant coping, $B = 0.01, p = .81$.\(^1\)
Table 9

Hierarchical Logistic Regression of Medication Adherence on Depression

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>Wald</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sociodemographic Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>9.56</td>
<td>1.95</td>
<td>.16</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-1.02</td>
<td>3.05</td>
<td>.08</td>
</tr>
<tr>
<td><strong>Care and Coping Variables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Esape-Avoidant Coping Strategies</td>
<td>-3.10</td>
<td>2.14</td>
<td>.14</td>
</tr>
<tr>
<td>Depression</td>
<td>-.04</td>
<td>1.20</td>
<td>.27</td>
</tr>
</tbody>
</table>
steps. The next two steps contained the two interaction variables individually.

Finally, the fourth step contained the interaction variable. The following two interactions significantly predicted medication adherence: Escape-avoidant coping and depression, $B = .01, p < .01$, and escape-avoidant coping and pain, $B = .23, p < .02$.

Please view Figures 2 and 3 for a visual presentation of these interactions on medication adherence.

![Figure 2: Interaction of depression and escape-avoidant coping on medication adherence.](image)
Intentional Medication Nonadherence

Intentional Medication Nonadherence was the criterion variable of Hypothesis 4: HIV-infected older adults who report elevated levels of physical pain will also report greater intentional nonadherence to HAART. In preliminary analyses conducted prior to testing this hypothesis, Pearson Product Moment Correlations were computed for all continuous variables and Point-biserial correlations were computed for all pairwise relationships that involved one continuous and one dichotomous variable.
Sociodemographic Predictors of Intentional Medication Nonadherence.

Gender, education, employment status, duration of illness, and current health status were excluded from hierarchical multiple regression analyses because they were not significantly correlated with intentional medication nonadherence (all $p$s > .10). Age, ethnicity, and income correlated significantly with intentional medication nonadherence and were therefore retained in subsequent analyses. Please view Table 5 for a report of correlations.

Psychosocial Predictors of Intentional Medication Nonadherence. Perceived social support and self-reported cognitive difficulties were excluded from hierarchical multiple regression analysis due to their nonsignificant relationships with intentional medication nonadherence. However, escape-avoidant coping, barriers to care, and pain were correlated with intentional medication nonadherence (escape-avoidant coping, $r(84) = .36, p < .01$; barriers to care, $r(84) = .25, p = .02$; pain, $r(84) = .22, p = .45$) and were subsequently retained in the main analysis.

Hierarchical Multiple Regression Analysis Modeling the Relationship Between Significant Bivariate Predictors and Intentional Medication Nonadherence.

Hierarchical multiple regression analyses were used to test Hypothesis 4 (HIV-infected older adults who report elevated levels of physical pain will also report greater intentional nonadherence to HAART). Based on preliminary analyses, the following predictors were entered into the respective multivariate analyses. The first block of predictors contained age, ethnicity, and income, Block 2 contained escape-
avoidant coping strategies, and barriers to care, and Block 3 contained the main predictor (physical pain). Please view Table 8 for an overview of included predictors.

Sociodemographic predictors alone accounted for 19% of the variance in intentional medication nonadherence. Addition of escape-avoidant coping strategies and barriers to care in the second block of predictors accounted for an contributed 8% of the variance in intentional medication nonadherence. In both steps, $R^2$ was significantly different from zero. The addition of physical pain to the regression model did not reliably improve $R^2$, $F(1,78) = .10, p = .75$ (see Table 10). In the full model containing all predictor variables, the only significant predictors of intentional medication nonadherence were income, $B = - .07, t(84) = -2.15, p = .03$, and ethnicity, $B = .20, t(84) = 2.18, p = .03$. Barriers to care were marginally significant, $B = .56, t(84) = 1.90, p = .06$. Taken as a whole, these results suggest that intentional medication adherence was greater when participants were earning less money, non-White, and when experiencing more barriers to care.

**Unintentional Medication Nonadherence**

Hypothesis 5 stated that HIV-infected older adults who reported greater cognitive compromise would also report greater levels of unintentional nonadherence to HAART. To identify significant associations between predictors and unintentional medication nonadherence, Pearson Product Moment Correlations were computed for all continuous variables and Point-biserial correlations were computed for all pairwise relationships that involved one continuous and one dichotomous variable. No associations were detected among gender, ethnicity, education, income, employment
Table 10

*Hierarchical Multiple Regression of Intentional Medication Nonadherence on Pain*

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>R</th>
<th>R squared</th>
<th>Adj R squared</th>
<th>F change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sociodemographic Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-1.67</td>
<td>.19</td>
<td>.16</td>
<td></td>
<td>6.30*</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>- .07</td>
<td></td>
<td></td>
<td></td>
<td>2.18***</td>
</tr>
<tr>
<td><strong>Care and Coping Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barriers to Care</td>
<td>.56</td>
<td></td>
<td></td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>Escape-Avoidant Coping</td>
<td>.46</td>
<td></td>
<td></td>
<td></td>
<td>1.90</td>
</tr>
<tr>
<td><strong>Main Predictor</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>.52</td>
<td>.27</td>
<td>.22</td>
<td>.10</td>
<td></td>
</tr>
</tbody>
</table>

*p < .001*

**p < .01*

***p < .05*
status, current health status, and self-reported cognitive difficulties with unintentional medication nonadherence. After conducting these analyses, it was determined that Hypothesis 5 was not supported due to the non-significant correlation between self-reported cognitive functioning and unintentional medication nonadherence. No further analyses were conducted regarding this research question.

Hierarchical Multiple Regression Analyses Modeling the Relationship Between Predictors and Unintentional Medication Nonadherence. The Reduced Cognitive Difficulties Scale did not correlate significantly with unintentional medication nonadherence, \( r(84) = .16, p = .14 \). Hence, Hypothesis 5 of this study (HIV-infected older adults who report greater cognitive compromise will also report greater levels of unintentional nonadherence to HAART) was not tested by multiple regression analysis.
Discussion

The advent of HAART has significantly improved the clinical treatment and outcomes of HIV-infected persons in many areas, such as patient immunological and clinical health and reduced death rates due to AIDS (Bangsberg et al., 2000, 2001; Catz et al., 2001; Murphy et al., 2001; Paterson et al., 2000). Adherence to HAART is challenging because of complex regimens and many common side effects (Catz et al., 2000). At the same time, consistent adherence is crucial, because even occasional lapses in adherence have been related to viral load rebound (Bangsberg et al., 2000, 2001; Murphy et al., 2000, Paterson et al., 2000) and the development of drug resistance (Deeks et al., 1997; Mellors, 1997).

In the current sample of HIV-infected older persons on HAART regimens, 38% reported missing one or more medication doses in the past week. This is troubling because nonadherence has been shown to predict poor treatment outcomes (Catz et al. 2000; Hecht et al., 1998; Montaner et al., 1998; Paterson et al., 1999). For improved health outcomes it is necessary to better understand factors related to medication adherence and in turn to develop appropriate intervention approaches.

The main aim of this study was to examine relationships between depressive symptoms, physical pain, and self-reported cognitive difficulties with medication adherence. In addition, the study investigated the association among social support and escape-avoidant coping strategies with medication adherence. Finally, more specific hypotheses were formulated regarding the relationship of physical pain with intentional medication nonadherence and the relationship of self-reported cognitive
difficulties with unintentional medication nonadherence. The association of the above predictors with medication adherence will be discussed below. First, findings will be introduced. Then, the findings will be discussed with consideration of study limitations and possible treatment implications.

Summary of Findings

Findings of this study revealed that HIV-infected older adults who reported inconsistent adherence to HAART also reported elevated levels of depression, but neither increased physical pain nor greater self-reported symptoms of cognitive compromise. However, HIV-infected older adults who reported less consistent adherence to HAART did not report elevated levels of depression when other related predictors (i.e., age, ethnicity, income, and escape-avoidant coping strategies) were considered in the same model. Increased avoidant coping was associated with poorer medication adherence above-and-beyond predictions made by age, and ethnicity, but not when depression was included in the model. In addition, HIV-infected older adults who reported higher perceptions of social support did not report more consistent adherence to HAART.

Potential interactions between predictors were also explored. Non-depressed participants who reported using more escape-avoidant coping skills were adherent to their medication regimen than non-depressed participants who reported using less escape-avoidant coping skills. However, in participants with high depression scores, escape-avoidant coping was not related to treatment adherence. Participants who reported low pain and using more escape-avoidant coping skills were more adherent
to they medication regimen than participants who reported low pain and using less escape-avoidant coping skills. Again, in participants who reported high pain scores, escape-avoidant coping was not related to treatment adherence.

HIV-infected older adults who reported elevated levels of physical pain also reported greater intentional nonadherence to HAART. Yet, considered in a model together with age, ethnicity, income, barriers to care, and escape-avoidant coping, the predictive ability of pain became nonsignificant. Finally, HIV-infected older adults who reported greater self-reported cognitive compromise did not report greater levels of unintentional nonadherence to HAART.

Medication Adherence. While depression and medication adherence were significantly and negatively associated with each other in point-biserial correlation analyses, hierarchical logistic regression analyses revealed no additional predictive value of depression when other variables such as age, ethnicity, income, and escape-avoidant coping strategies were considered in the same model. The same was true for escape-avoidant coping, which was significantly related with medication adherence in point-biserial correlation analysis, but failed to add predictive value to a model that also contains the other named covariates and depression. Both predictors (depression and escape-avoidant coping strategies) were significant when the other one was omitted in the logistic regression analyses.

Given the strong correlation between depression and escape-avoidant coping strategies, it was not surprising that either escape-avoidant coping or depression were significant predictors without the other one in the same model. Hence, behavioral
treatment approaches should focus on addressing both concepts as they overlap in their appearance among HIV-infected individuals. Escape-avoidant coping strategies may be appropriate at times depending on individual coping-challenges. In the context of medication adherence and in order to receive the promised improved health outcomes of HAART, however, infected individuals must not shy away from problem-focused coping strategies. Conceivably, the presence of depression decreases a person’s ability to problem-solve. It is therefore recommended to aim psychological treatments at the decrease of depressive symptoms with the goal in mind to increase appropriate coping strategies in relation to medication adherence.

Contrary to the prediction of Hypotheses 1 and 2, this study also did not find significant relationships in correlation analyses between medication adherence and physical pain, self-reported cognitive difficulties, as well as social support. Regarding the nonsignificant association between pain and medication adherence, previous research has established that the severity of side-effects of HAART was related to medication adherence in a general sample of HIV-infected persons (Catz et al., 2000). Side-effects vary from headaches, insomnia, nausea, vomiting, abdominal pain, diarrhea, anemia, fatigue, rash, changes in taste, oral ulcerations, muscle pain, fever, pancreatitis, hyperglycemia, peripheral neuropathy, confusion, lightheadedness, depression, and kidney and liver problems. Most of these side effects are painful. However, this sample of patients on HAART showed relatively low scores of physical pain with a mean of 46.33 (SD = 23.18) on a scale from 0 to 120. Evidently, physical pain was not a major stressor in participants. However, it may also not be
the aspect of physical pain itself that causes an individual to skip medication, but the
general malaise that often comes with HIV-medication.

No studies have assessed the relationship of self-reported cognitive
functioning and medication adherence. It appeared that self-reported cognitive
difficulties are related to medication adherence. However, self-reported cognitive
difficulties are highly correlated with depression. Therefore, it was difficult to assess
the relationship between cognitive difficulties and medication adherence. A reduced
scale of cognitive difficulties was constructed, which, in this sample, showed a lower
correlation with depression than the full Cognitive Difficulties Scale. It remains to be
seen if actual cognitive difficulties are related to medication adherence.

Earlier findings in connection with social support are mixed. This study failed
to find a relationship between social support and medication adherence. This finding
is in agreement with Catz et al. (2001) who also failed to find an association between
social support and medication adherence in their middle-aged and older sample of
persons living with HIV disease. However, it is worthwhile to examine the concept
of social support more closely.

It appears to be important to relate the amount of perceived social support to
the kind of provided support (e.g., instrumental versus emotional, aimed at fostering
self-sufficiency versus unconditional assistance). The supportive environment may
welcome a behavioral change towards increased independence or improved health
behavior, but improved health behavior may also, at times, represent a threat to the
interpersonal relationship. A closer look at the quality of relevant reported supportive
relationships may reveal which kinds of relationships best represent the supportive network of a particular client.

*Intentional Medication Nonadherence.* Preliminary analyses revealed a significant relationship between pain and intentional medication nonadherence in this sample. In multivariate analysis, pain failed to predict intentional medication nonadherence. The only significant predictors were income and ethnicity. That is, when controlling for age, escape-avoidant coping strategies, barriers to care, depression and pain, higher income as well as being non-White were associated with intentional nonadherence. As mentioned above, this sample of patients on HAART evidenced relatively low scores of physical pain. It is possible that this finding underestimates the prevalence of pain in HIV-infected middle-aged individuals. All study participants were served by ASOs and were living independently at the time of the study. With further disease progression, HIV-infected persons may be unable or unmotivated to participate in a survey study from their own home. It should be interesting to assess medication adherence of HIV-infected individuals in other settings such as outpatient clinics and physicians’ offices. Such an approach may increase the range of reported physical pain and in doing so increase the likelihood of understanding the influence of pain on intentional medication nonadherence or medication adherence in general.

Interestingly, pain was not only significantly associated with intentional medication nonadherence in bivariate correlation analysis, but also with unintentional medication nonadherence. Both associations were statistically significant. However,
the correlation between pain and unintentional medication nonadherence was slightly higher than the one with intentional medication nonadherence. Hence, hypothesis 4 (HIV-infected older adults who report elevated levels of physical pain will also report greater intentional nonadherence to HAART) was disconfirmed.

**Unintentional Medication Nonadherence.** Preliminary analyses revealed a significant relationship between self-perceived cognitive difficulties and unintentional medication nonadherence in this sample. However, once again, using the reduced scale of cognitive difficulties this study failed to repeat this finding. There was no association among self-reported cognitive difficulties and unintentional medication nonadherence. Future studies should readdress this issue and assess cognitive functioning by use of neuropsychological tests.

**Limitations**

The following section addresses the limitations of this study. Limitations are related to the sample as well as to the operationalization of study variables. Regarding the sample, HIV-infected older adults who self-enrolled into Project Enhancement may differ from older persons with HIV/AIDS who were not enrolled in the study in areas such as depression, physical pain, and self-perceived cognitive functioning, as well as escape-avoidant coping skills and perceived social support. All study participants received services from participating ASOs. This fact may have lead to differences in this sample compared to people with HIV/AIDS who are not connected to service organizations. The sample was also geographically limited. It is likely that study findings underestimated the prevalence of the three main predictors,
hence, their relationship with medication adherence. Furthermore, our operationalization of middle-aged and older adult is open to interpretation. Different age cutoffs are likely to yield different findings.

Previous research has shown that side effects of HAART may have an influence on medication adherence. Future research should include questions that directly assess a participant’s perception of physical and emotional side effects of medication as they are more diverse than just physical pain. In addition, looking back at the previous seven days of medication adherence may not be sufficient in detecting a tendency of nonadherence. Future research should include an additional question inquiring about a pattern of nonadherence to antiretroviral medications.

The operationalization of medication adherence may have lead to an over-reporting of adherence. However, Bangsberg et al. (2000) found that adherence was a strong predictor of viral load (Bangsberg et al., 2000). In addition, the operationalization of self-reported cognitive difficulties led to high correlations with depression. As a way of addressing this overlap, a reduced scale was created based on items from the Cognitive Difficulties Scale. This new scale can only be interpreted with caution. For the purpose of understanding the relationship of cognitive functioning and medication adherence, future research should include neuropsychological tests, rather than a self-report measure.

In addition, it might be worthwhile to examine the concept of social support and its implication in the change of health behavior. The constructive value of social support may be dependent on the kind of social support an individual is generally
receiving. Future research should aim to determine the influence of social support in an individual’s personal circumstance. Similarly, coping strategies are related to the problems that persons are coping with. Future studies should include the examination of relevant stressors.

Furthermore, sociodemographic variables such as ethnicity and income may reveal their association with medication adherence when they are considered under special circumstances. For example, it is possible that escape-avoidant coping strategies function as a moderator in the relationship between ethnicity and medication adherence. Further research is needed to better understand the relationship of these factors with medication adherence.

There is little doubt that HIV treatment advances have produced dramatic improvements in physiological symptomatology in HIV-infected persons. In order to take full advantage of the benefits of HAART, it is necessary to continue efforts to better understand the factors related to medication nonadherence.
References


http://biostat.hitchcock.org


Heckman, T. G., Kochman, A., Sikkema, K. J., Kalichman, S. C. (1999). Depressive symptomatology, daily stressors, and ways of coping among middle-age and


"Learning to see the inevitable signs of aging." (2000). *Better Vision Institute.* Retrieved September 08, 2002 from


Stevens, C. E. et al. (1995). Human immunodeficiency virus type 1 infection:
Relationship of risk group and age to rate of progression to AIDS. *Journal of
Infectious Diseases, 172*, 648 – 655.

of age, viral load and CD4+ count on the rate of progression of HIV-1
infection to AIDS. *Journal of Acquired Immune Deficit Syndromes and
Human Retrovirology, 15*, 243 – 244.


Palella, F. J. Jr., Delaney, K. M., Moorman, A. C., Loveless, M. O., Fuhrer, J., Satten,
G. et al. (1998). Declining morbidity and mortality among patients with
advanced human immunodeficiency virus infection. HIV outpatient study

transmission to others. In Winiarsky, M. G. (Ed.): HIV mental health for the

How much adherence is enough? A prospective study of adherence to
protease inhibitor therapy using MEMs caps. Paper presented at the
Retrovirus Conference, Chicago.

Adherence to protease inhibitor therapy and outcomes in patients with HIV
infection. *Annals of Internal Medicine, 133,* 21 – 30.


Piccaiano, J. F., Roffman, R. A., Kalichman, S. C., Rutledge, S. E., & Berghuis, J. P.
(2001). A telephone based brief intervention using motivational enhancement
to facilitate HIV risk reduction among MSM: A pilot study. *AIDS and
Behavior, 5 (3),* 251 – 262.

quality of life in persons with HIV infections. *Journal of Aging and Health, 7
(2),* 162 – 178.


Pratt, R. D., Nichols, S., McKinney, N., Kwok, S., Dankner, W. M., Spector, S. A.
(1996). Virologic markers of human immunodeficiency virus type 1 in
cerebrospinal fluid of children. *Journal of Infectious Diseases, 174 (2),* 288 –
293.


Appendix

Assessments instruments

What year were you born?  ____________

What is your gender?

[] Male

[] Female

[] Transgendered

What ethnic background or race do you consider yourself?

[] White/Non-Hispanic

[] Hispanic/Latino

[] African-American/Non-Hispanic

[] African-American/Hispanic

[] Asian or Pacific Islander

[] Native American

[] other:  _________________
What is the highest grade or year of school that you have completed?

[] 6  [] 7  [] 8  [] 9  [] 10  [] 11  [] 12  [] 1  [] 2  [] 3  [] 4  [] 5+

College

What is your current employment status? (Mark all that apply)

[] Working full-time (35 or more hours per week)

[] Working part-time (fewer than 35 hours per week)

[] Unemployed

[] Student (either full- or part-time)

[] Social Security Disability

[] Applying for Social Security Disability

[] Other (Please explain: ____________________________)

What figure is closest to your current annual income?

[] $ 0 - $ 10,000

[] $ 10,001 - $ 20,000

[] $ 20,001 - $ 30,000

[] $ 30,001 - $ 40,000

[] over $ 40,000
When did you first learn that you were HIV+? __________

Which statement best describes your current health status:

[] HIV positive, with no symptoms.

[] I have symptoms, but have not had to change my normal daily routines.

[] I have symptoms that have required me to change parts of my normal routine of daily activities; Extra rest is not required during a normal day.

[] Because of my symptoms, I am in bed, or resting, less than half of the waking hours.

[] Because of my symptoms, I am in bed, or resting, more than half of my waking hours.

Please read each item below and indicate, by checking the appropriate box, to what extent you used it in the past month to cope with the problem you identified as being the greatest stressor you confront.

1  Not Used

2  Used Somewhat

3  Used Quite A Bit

4  Used A Great Deal
1. Just concentrated on what I had to do next--the next step.

2. I tried to analyze the problem in order to understand it better.

3. Turned to work or substitute activity to take my mind off things.

4. I felt that time would make a difference--the only thing to do was to wait.

5. Bargained or compromised to get something positive from the situation.

6. I did something, which I didn’t think would work, but at least I was doing something.

7. Tried to get the person responsible to change his or her mind.
8. Talked to someone to find out more about the situation.

9. Criticized or lectured myself.

10. Tried not to burn my bridges, but to leave things open somewhat.

11. Hoped a miracle would happen.

12. Went along with fate; sometimes I just had bad luck.

13. Went on as if nothing had happened.

14. I tried to keep my feelings to myself.

15. Looked for the silver lining, so to speak; tried to look on the bright side of things.
16. Slept more than usual.

17. I expressed anger to the person(s) who caused the problem.

18. Accepted sympathy and understanding from someone.

19. I told myself things that helped me to feel better.

20. I was inspired to do something creative.

21. Tried to forget the whole thing.

22. I got professional help.

23. Changed or grew as a person in a good way.

24. I waited to see what would happen before doing anything.
25. I apologized or did something to make up
26. I made a plan of action and followed it.
27. I accepted the next best thing to what I wanted.
28. I let my feelings out somehow.
29. Realized I brought the problem on myself.
30. I came out of the experience better than when I went in.
31. Talked to someone who could do something concrete about the problem.
32. Got away from it for a while; tried to rest or take a vacation.
33. Tried to make myself feel better by eating, drinking, smoking, using drugs or medication, etc.
34. Took a big chance or did something very risky.  
35. I tried not to act too hastily or follow my first hunch.  
36. Found new faith.  
37. Maintained my pride and kept a stiff upper lip.  
38. Rediscovered what is important in life.  
39. Changed something so things would turn out all right.  
40. Avoided being with people in general.  
41. Didn’t let it get to me; refused to think too much about it.  
42. I asked a relative or friend I respected for advice.
43. Kept others from knowing how bad things were.  

44. Made light of the situation; refused to get too serious about it.  

45. Talked to someone about how I was feeling.  

46. Stood my ground and fought for what I wanted.  

47. Took it out on other people.  

48. Drew on my past experiences; I was in a similar situation before.  

49. I knew what had to be done, so I doubled my efforts to make things work.  

50. Refused to believe that it had happened.  

51. I made a promise to myself that things would be different next time.
52. Came up with a couple of different solutions to the problem.

53. Accepted it, since nothing could be done.

54. I tried to keep my feelings from interfering with other things too much.

55. Wished that I could change what had happened or how I felt.

56. I changed something about myself.

57. I daydreamed or imagined a better time or place than the one I was in.

58. Wished that the situation would go away or somehow be over with.

59. Had fantasies or wishes about how things might turn out.
60. I prayed.

61. I prepared myself for the worst.

62. I went over in my mind what I would say or do.

63. I thought about how a person I admire would handle this situation and used that as a model.

64. I tried to see things from the other person’s point of view.

65. I reminded myself how much worse things could be.

66. I jogged or exercised.
We would like to know something about your relationships with other people. Please read each statement below and decide how well the statement describes you. For each statement, circle the number which best describes your feelings.

1 Very much like me
2 Much like me
3 Somewhat like me
4 Not very much like me
5 Not at all like me

1. When I’m with my friends, I feel completely able to relax and be myself. [ ] 1 [ ] 2 [ ] 3 [ ] 4
2. I share the same approach to life that many of my friends do. [ ] 1 [ ] 2 [ ] 3 [ ] 4
3. People who know me, trust me and respect me. [ ] 1 [ ] 2 [ ] 3 [ ] 4
4. No matter what happens, I know that my family will always be there for me, should I need them. [ ] 1 [ ] 2 [ ] 3 [ ] 4
5. When I want to go out to do things, I know that many of my friends would enjoy doing these things with me. [ ] 1 [ ] 2 [ ] 3 [ ] 4
6. I have at least one friend I could tell anything to. [1 2 3 4]

7. Sometimes I’m not sure if I can completely rely on my family. [1 2 3 4]

8. People who know me think I am good at what I do. [1 2 3 4]

9. I feel very close to some of my friends. [1 2 3 4]

10. People in my family have confidence in me. [1 2 3 4]

11. My family lets me know they think I am a worthwhile person. [1 2 3 4]

12. People in my family provide me with help in finding solutions to my problems. [1 2 3 4]

13. My friends would take the time to talk over my problems, should I ever want to. [1 2 3 4]

14. I know my family will always stand by me. [1 2 3 4]

15. Even when I am with my friends, I feel alone. [1 2 3 4]
Please indicate to what extent each of the following circumstances makes it difficult for you to receive the care, services, or opportunities you wish to obtain by checking the appropriate box.

[ ] 1 No Problem At All
[ ] 2 Very Slight Problem
[ ] 3 Somewhat of a Problem
[ ] 4 Major Problem

1. Long distances to medical facilities and personnel.
   [ ] 1  [ ] 2  [ ] 3  [ ] 4

2. Medical personnel (e.g., physicians, nurses) who decline to provide direct care to persons with HIV/AIDS.
   [ ] 1  [ ] 2  [ ] 3  [ ] 4

3. The lack of health care professionals who are adequately trained and competent in HIV/AIDS care.
   [ ] 1  [ ] 2  [ ] 3  [ ] 4

4. The lack of transportation to access services I need.
   [ ] 1  [ ] 2  [ ] 3  [ ] 4
5. The shortage of psychologists, social workers, and mental health counselors who can help me address mental health issues.

6. The lack of psychological support groups for persons living with HIV/AIDS.

7. The level of knowledge about HIV/AIDS among citizens in the community.

8. Community residents’ stigma against persons living with HIV/AIDS.

9. The lack of employment opportunities for people living with HIV/AIDS.

10. The lack of supportive and understanding work environments for people living with HIV/AIDS.

12. My personal financial resources.

13. Lack of adequate and affordable housing.
We’d like to ask you one a set of questions to assess your mood. Please place an “X” or a “✔” in front of “yes” or “no” (whichever best describes your mood in the past week, including today).

_____ (1) Yes 1. Are you basically satisfied with your life?
_____ (2) No

_____ (1) Yes 2. Have you dropped many of your activities and interests?
_____ (2) No

_____ (1) Yes 3. Do you feel that your life is empty?
_____ (2) No

_____ (1) Yes 4. Do you often get bored?
_____ (2) No

_____ (1) Yes 5. Are you hopeful about the future?
_____ (2) No

_____ (1) Yes 6. Are you bothered by thoughts that you can’t get out of your head?
_____ (2) No
_____ (1) Yes 7. Are you in good spirits most of the time?
_____ (2) No

_____ (1) Yes 8. Are you afraid that something bad is going to happen to you?
_____ (2) No

_____ (1) Yes 9. Do you feel happy most of the time?
_____ (2) No

_____ (1) Yes 10. Do you often feel helpless?
_____ (2) No

_____ (1) Yes 11. Do you often get restless and fidgety?
_____ (2) No

_____ (1) Yes 12. Do you prefer to stay at home, rather than going out and doing things?
_____ (2) No

_____ (1) Yes 13. Do you frequently worry about the future?
_____ (2) No
_____ (1) Yes 14. Do you feel that you have more problems with memory than most?
_____ (2) No

_____ (1) Yes 15. Do you think it is wonderful to be alive now?
_____ (2) No

_____ (1) Yes 16. Do you often feel downhearted and blue?
_____ (2) No

_____ (1) Yes 17. Do you feel pretty worthless the way you are now?
_____ (2) No

_____ (1) Yes 18. Do you worry a lot about the past?
_____ (2) No

_____ (1) Yes 19. Do you find life very exciting?
_____ (2) No

_____ (1) Yes 20. Is it hard for you to get started on new projects?
_____ (2) No
_____ (1) Yes 21. Do you feel full of energy?
_____ (2) No

_____ (1) Yes 22. Do you feel that your situation is hopeless?
_____ (2) No

_____ (1) Yes 23. Do you think that most people are better off than you are?
_____ (2) No

_____ (1) Yes 24. Do you frequently get upset about little things?
_____ (2) No

_____ (1) Yes 25. Do you frequently feel like crying?
_____ (2) No

_____ (1) Yes 26. Do you have trouble concentrating?
_____ (2) No

_____ (1) Yes 27. Do you enjoy getting up in the morning?
_____ (2) No
135

_____ (1) Yes 28. Do you prefer to avoid social gatherings?
_____ (2) No

_____ (1) Yes 29. Is it easy for you to make decisions?
_____ (2) No

_____ (1) Yes 30. Is your mind as clear as it use to be?
_____ (2) No

The following 20 questions ask you to describe your pain and how it affects your life. Under each question is a scale to record your answer. Read each question carefully and then circle a number on the scale under that question to indicate how that specific question applies to you.

1. Rate the level of your pain at the present moment.

\[
\begin{align*}
1 & \quad 2 & \quad 3 & \quad 4 & \quad 5 & \quad 6 \\
\text{No pain} & & & & & \text{Very intense pain}
\end{align*}
\]
2. In general, how much does your pain problem interfere with your day-to-day activities?

1  2  3  4  5  6
No interference                             Extreme interference

3. Since the time you developed a pain problem, how much has your pain changed your ability to work?

1  2  3  4  5  6
No change                             Extreme change

_____ Check here if you have retired for reasons other than your pain problem.

4. How much has your pain changed the amount of satisfaction or enjoyment you get from participating in social and recreational activities?

1  2  3  4  5  6
No change                             Extreme change
5. How supportive or helpful is your spouse (significant other) to you in relation to your pain?

1  2  3  4  5  6
Not at all supportive  Extremely supportive

6. Rate your overall mood during the past week.

1  2  3  4  5  6
Extremely low mood  Extremely high mood

7. On the average, how severe has your pain been during the last week?

1  2  3  4  5  6
Not at all severe  Extremely severe

8. How much has your pain changed your ability to participate in recreational and other social activities?

1  2  3  4  5  6
No change  Extreme change
9. How much as your pain changed the amount of satisfaction you get from family-related activities?

1 2 3 4 5 6
No change Extreme change

10. How worried is your spouse (significant other) about you in relation to your pain problem?

1 2 3 4 5 6
Not at all worried Extremely worried

11. During the *past week* how much control do you feel that you have had over your life?

1 2 3 4 5 6
Not at all in control Extremely in control

12. How much *suffering* do you experience because of your pain?

1 2 3 4 5 6
No suffering Extreme suffering
13. How much has your pain changed your marriage and other family relationships?

1  2  3  4  5  6
No change     Extreme change

14. How much has your pain changed the amount of satisfaction or enjoyment you get from work?

1  2  3  4  5  6
No change     Extreme change

_____ Check here if you are not presently working.

15. How attentive is your spouse (significant other) to your pain problem?

1  2  3  4  5  6
Not at all attentive     Extremely attentive
16. During the *past week* how much do you feel that you’ve been able to deal with your problems?

1 2 3 4 5 6

No change  Extreme change

17. How much has your pain changed your ability to do household chores?

1 2 3 4 5 6

No change  Extreme change

18. During the past week how irritable have you been?

1 2 3 4 5 6

Not at all irritable  Extremely irritable

19. How much has your pain changed your friendships with people other than your family?

1 2 3 4 5 6

No change  Extreme change
20. During the past week how tense or anxious have you been?

1 2 3 4 5 6
Not at all tense or anxious   Extremely tense or anxious

Below are statements describing everyday inefficiencies, lapses of attention or memory, and related functions that people often notice about themselves. Please rate the degree to which each statement describes your typical or usual behavior during the past week. Please use the following scale and record your answers in the blanks provided:

4 = Very often
3 = Often
2 = Sometimes
1 = Rarely
0 = Not at all
1. I have trouble recalling frequently used phone numbers.
2. I put down things (glasses, keys, wallet, purse, papers) and have trouble finding them.
3. When interrupted while reading, I have trouble finding my place again.
4. I need a written list when I do errands to avoid forgetting things.
5. I forget appointments, dates, or classes.
6. I forget to return phone calls.
7. I have trouble getting my keys into a lock.
8. I forget errands I plan to do on my way home.
9. I have trouble recalling names of people I know.
10. I find it hard to keep my mind on a task or job.
11. I have trouble describing a program I just watched on television.
12. I don’t quite say what I mean to say.
13. I fail to recognize people I know.
14. I have trouble getting out information that’s at the tip of my tongue.
15. I have trouble thinking of the names of objects.
16. I find it hard to understand what I read.
17. I miss the point of what other people are saying.
18. I forget names of people soon after being introduced.
19. I lose my train of thought as I listen to somebody else.
20. I forget steps in recipes I know well and have to look them up.
21. I forget what day of the week it is.
22. I forget to button or zip my clothing.

23. I need to check or double-check whether I locked the door, turned off the stove, etc.

24. I make mistakes in writing, typing, or operating a calculator.

25. I cannot keep my mind on one thing.

26. I need to have instructions repeated several times.

27. I leave out ingredients when I cook.

28. I have trouble manipulating buttons, fasteners, scissors, or bottle caps.

29. I misplace my clothing.

30. I have trouble sewing or mending.

31. I find it hard to keep my mind on what I’m reading.

32. I forget right away what people say to me.

33. When walking or riding, I forget how I’ve gotten from one point to another.

34. I have trouble deciding if I’ve received the correct change.

35. I forget to pay bills, record checks, or mail letters.

36. I have to do things very slowly to be sure I’m doing them right.

37. My mind just goes blank at times.

38. I forget the date of the month.

39. I have trouble using tools (hammers, pliers) for minor household repairs.
People may miss taking their medications for many reasons. Here is a list of possible reasons why you may miss taking your medications. How often have you missed taking your medications because you: (PLEASE CIRCLE YOUR RESPONSE)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Were away from home</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Were busy with other things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Simply forgot</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Had too many pills to take</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Wanted to avoid side effects</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Did not want others to notice you taking medications</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Had a change in daily routine</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Felt like the drug was toxic/harmful</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Fell asleep/slept through dose time</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10. Felt sick/ill from side effects</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11. Felt depressed/overwhelmed</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
12. Had problems taking pills at specified times (with meals, on empty stomach, etc.) empty stomach, etc.)