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Kenneth D. Phillips

*University of Tennessee - Knoxville*, [kphill22@utk.edu](mailto:kphill22@utk.edu)

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# Social Support, Coping, and Medication Adherence Among HIV-Positive Women with Depression Living in Rural Areas of the Southeastern United States

MEDHA VYAVAHARKAR, M.D., D.N.B., D.G.O., D.F.P., M.P.H.,<sup>1</sup>  
LINDA MONEYHAM, D.N.S., R.N.,<sup>2</sup> ABBAS TAVAKOLI, Dr.P.H., M.P.H., M.E.,<sup>2</sup>  
KENNETH D. PHILLIPS, Ph.D., R.N.,<sup>2</sup> CAROLYN MURDAUGH, Ph.D., R.N.,<sup>4</sup>  
KIRBY JACKSON, M.S., Ph.D.,<sup>2</sup> and GENE MEDING, B.S.<sup>3</sup>

## ABSTRACT

This study examined the relationships among sociodemographic factors, social support, coping, and adherence to antiretroviral therapy (ART) among HIV-positive women with depression. The analyses reported here were limited to the 224 women receiving ART of 280 women recruited from community-based HIV/AIDS organizations serving rural areas of three states in the southeastern United States. Two indicators of medication adherence were measured; self-report of missed medications and reasons for missed medications in the past month. Descriptive statistics, correlation, and regression analyses were performed to systematically identify sociodemographic, coping, and social support variables that predicted medication adherence. In regression analysis, three variables were determined to be significant predictors accounting for approximately 30% of the variability in the self-report of reasons for missed medications. Coping focused on managing HIV disease was negatively associated, while coping focused on avoidance/denial and number of children were positively associated with reasons for missed medications. Coping by spiritual activities and focusing on the present mediated the effect of social support on self-reported missed medications. The relationship of predictor variables to self-report of missed medications was assessed using *t* test statistics and logistic regression analysis to determine the odds of self-reported medication adherence. Satisfaction with social support ( $p = 0.04$ ), and coping focused on managing HIV disease ( $p = 0.002$ ) were the best positive predictors, whereas number of children ( $p = 0.02$ ) was the lone significant negative predictor of medication adherence. The study findings have implications for designing, implementing, and testing interventions based on social support and coping theories for achieving better adherence to HIV medications.

## INTRODUCTION

**W**ITH THE ADVENT of antiretroviral medications, improvements in treatment op-

tions, and introduction of highly active antiretroviral therapy (HAART), HIV disease has undergone a transition from an acute terminal illness to a chronic illness. Treatment with

<sup>1</sup>Arnold School of Public Health, <sup>2</sup>College of Nursing, <sup>3</sup>Rural Women's Health Project, University of South Carolina, Columbia, South Carolina.

<sup>4</sup>School of Nursing, the University of Arizona, Tucson, Arizona.

HAART has been shown to suppress viral loads to undetectable levels in many patients.<sup>1</sup> Continuous viral suppression, which is a primary goal of medical management of HIV infection, results in longer and healthier lives for HIV-positive individuals.<sup>2</sup> Viral replication dramatically increases within days after withdrawing or missing antiretroviral doses.<sup>3</sup> Failure to adhere to HAART not only results in treatment failure but also in the development of drug-resistant strains of HIV.<sup>4</sup> It is estimated that in the United States, as many as 50% of persons with HIV disease who have been treated with HAART now have strains of HIV that are resistant to at least one of the available antiretroviral drugs.<sup>5</sup> Persons who do not maintain a 95% adherence rate to HAART are at risk for treatment failure and adverse clinical outcomes.<sup>4</sup> Once established, resistance may become irreversible through a process of evolution and diversification.<sup>5</sup> Therefore, strict adherence to the prescribed drug regimen is a critical factor in controlling progression of the disease, thereby reducing morbidity and mortality in individuals with HIV disease.

Achieving a nearly perfect adherence to a complex regimen of medications is a remarkably difficult and challenging task.<sup>2,6,7</sup> Despite the efforts of health care professionals to encourage adherence, many individuals with HIV disease continue to miss doses, take lower doses than prescribed or fail to take their medications as directed.<sup>8</sup>

Numerous studies have focused on identifying factors influencing medication adherence. Many of these studies have focused on barriers to adherence such as depression and substance abuse. Both social support and coping are known factors influencing the outcomes of chronic illness, and many studies have focused on the roles social support and coping may play in medication adherence within the context of HIV disease.<sup>9</sup> However, very little is known about the population of rural women living with HIV disease, including factors that may influence their adherence to ART medication regimens. Given the geographical and social barriers to needed support and services faced by individuals with HIV disease living in rural areas, an examination of factors influenc-

ing the medication adherence of rural women is warranted.

This study examined the relationships among perceived social support, coping strategies and antiretroviral medication adherence in a sample of 224 rural women with HIV disease, a subset of participants enrolled in a longitudinal clinical trial designed to test the efficacy of a peer-based social support intervention. The cross-sectional data used in the analyses were obtained during baseline interviews with study participants. Based on theory of psychological stress, coping, and adaptation, analyses were conducted to examine the predictive value of both social support and coping for adherence, and also to examine the role of coping as a mediator of the relationship between social support and medication adherence.

## BACKGROUND

The theoretical perspective guiding this analysis is Lazarus and colleagues' cognitive-phenomenological model of psychological stress and coping, which identifies the antecedents and processes that account for individual differences in adaptational outcomes of stressful life situations such as chronic illness.<sup>10-12</sup> Important to the present study are the roles of social support and coping in accounting for individual differences in medication adherence within the context of HIV disease among rural women.

Social support is conceptualized as one of a number of antecedent stress resistance resources that contribute to positive adaptational outcomes.<sup>10-12</sup> Having people in one's life during a stressful episode from whom one receives emotional, informational, and/or tangible support is a major factor mediating such outcomes. It is postulated that individuals who have access to resources such as social support are more likely to be effective in managing stressful situations and less likely to experience poor outcomes. Conversely, those who are deficient in resources such as social support are less able to manage the situation effectively, and thus are more likely to experience negative outcomes.<sup>12</sup> Extensive evidence suggests that social support contributes to positive adaptational outcomes, even in the most difficult of

situations, and its absence contributes to poor outcomes. For example, social support has been found to mitigate depressive symptoms of HIV-positive individuals.<sup>13</sup>

Social support is a complex construct that is difficult to define and measure. The general consensus is that social support is a multidimensional construct that includes the sources of support, i.e., who in the social network provides support, the types of support (e.g., emotional, informational, or tangible), and one's satisfaction with the support received.<sup>14</sup> There is less agreement concerning what constitutes social support, how it works, and what types of support are most effective in a particular context. Although the emphasis of research has been on the positive dimensions of social support, it is acknowledged that some attempts at support are actually perceived by the recipient to be unhelpful or negative and undesirable.<sup>15</sup> The desirability and potential effectiveness of different types of support depend to a great extent on the context of the situation and the type of support needed, and support may be perceived negatively when the support provided does not match the needs of the situation.<sup>12</sup>

In stress theory, coping is conceptualized as a process that mediates the relationship between the antecedents and outcomes of psychological stress. Coping responses include all cognitive and behavioral strategies used by individuals to manage a stressful situation. There are two major functions of coping: (1) management of emotional distress and (2) management of those problems causing psychological stress.<sup>12</sup> A number of coping strategies, primarily cognitive in nature, focus on managing one's emotional distress; such strategies are called emotion-focused coping strategies. In contrast, coping strategies that focus on managing the situation causing distress are called problem-focused coping strategies. It is postulated that the effectiveness of any one coping strategy is dependent upon the match between the strategy and what is needed in the situation.<sup>12</sup> In situations of chronic illness, there is extensive evidence that problem-focused coping strategies are more effective in producing positive adaptational outcomes over the long-term than emotion-focused strategies.<sup>13,16,17</sup> Similar findings have been reported in studies

of coping with HIV disease.<sup>18</sup> Similar to social support, coping strategies must match the demands of the situation to be effective.<sup>12</sup>

Medication adherence is an important adaptational outcome for HIV disease. As noted previously, HIV patients must show a high level of adherence to HAART to suppress viral loads and avoid development of resistant strains of the virus. It is estimated that adherence rates greater than 95% are necessary to achieve maximum HIV suppression.<sup>19</sup> Failure to adhere to a medication regimen results in virologic failure, which is defined as an increase in the rates of viral replication and mutation following initiation of the regimen.<sup>20</sup> It is estimated that average rates of nonadherence to antiretroviral therapy range from 50% to 70%.<sup>21</sup> Understanding of those factors contributing to adherence as well as nonadherence is essential to the development of interventions that are predictably effective in promoting adherence. Recent efforts to test interventions tailored to address such factors have demonstrated effectiveness in increasing adherence. Deschamps and colleagues<sup>22</sup> reported nonadherence rate of 40% in a population of HIV patients using medication event monitoring system. Findings from another study suggested that appropriately trained HIV/AIDS case managers can play a pivotal role in improving HAART adherence among their clients.<sup>23</sup> Recent multidisciplinary programs have successfully increased HAART adherence among intervention participants as compared to those in the control group.<sup>24</sup>

Many studies in the past have examined the association between availability of social support and HIV medication adherence. Cox<sup>9</sup> found emotional support to be a significant predictor of medication drug adherence among persons with HIV disease. Other studies found perceived social support to be a significant predictor of compliance.<sup>25,26</sup> Some studies have examined how coping strategies influence medication adherence in individuals with HIV disease. In one such study, Heckman and colleagues<sup>27</sup> found active coping strategies to be positively associated with medication adherence.

A model of medication adherence within the context of HIV disease is shown in Figure 1. The model demonstrates the link between antecedent factors, including sociodemographic

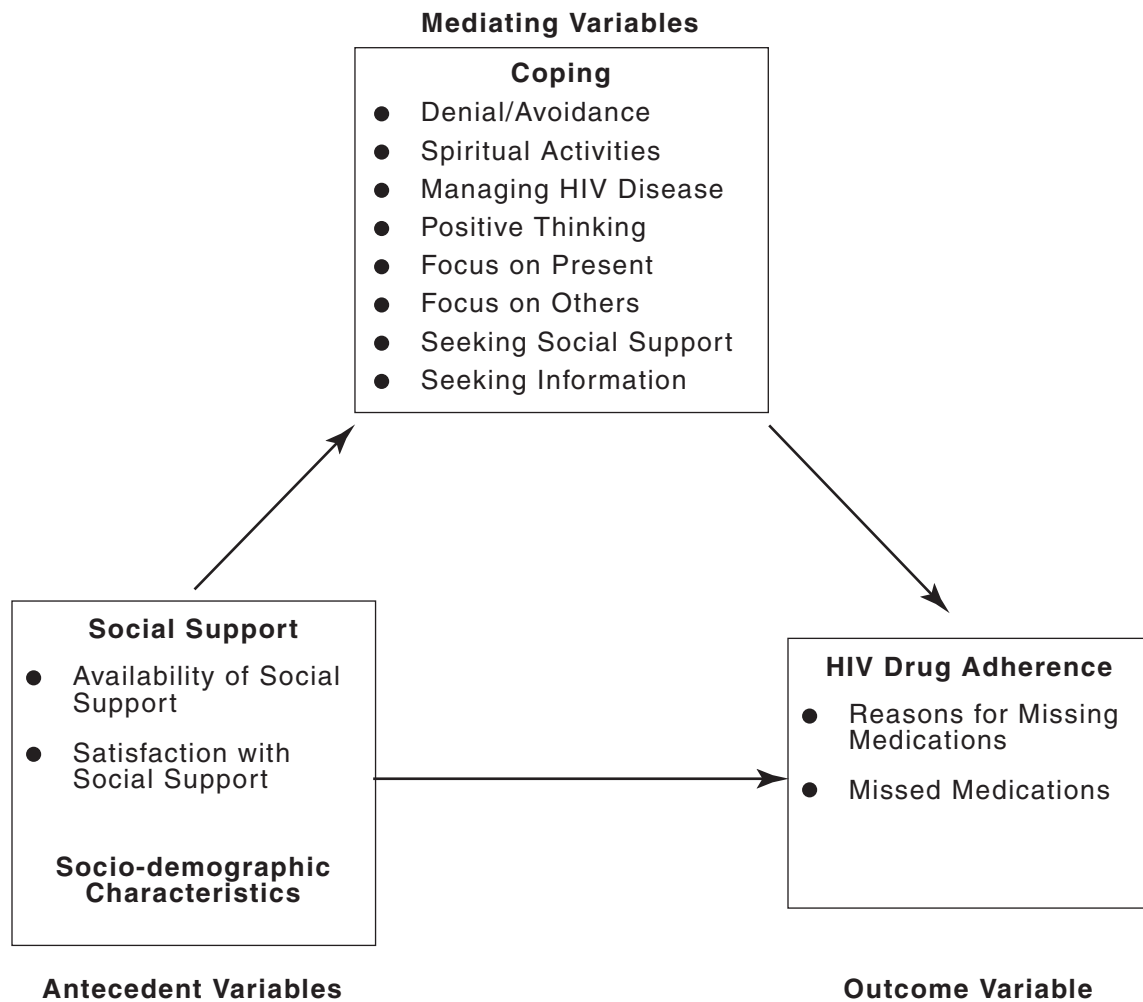


FIG. 1. Model of social support, coping and HIV medication adherence.

variables and social support variables, and the outcome of HIV medication adherence. Additionally, coping strategies are included as process variables that mediate the relationship between social support and medication adherence and account for individual differences. The analysis reported here was an attempt to increase understanding of the relationships among social support, coping, and medication adherence among individuals with HIV disease as a means of identifying potential points of intervention that will support HIV medication adherence.

## METHODS

The cross-sectional data reported here were collected in the first of three interviews of a

longitudinal study designed to test the efficacy of a peer-based social support intervention designed for rural women with HIV disease and depression.

### Sample

The original sample included 280 HIV-infected women recruited from 10 community-based HIV/AIDS service organizations serving rural areas of 3 states in the southeastern United States. The analysis was limited to the subset of 224 participants who were currently receiving antiretroviral therapy. Each recruitment site provided a range of standard HIV/AIDS specific services, including HIV testing and counseling, early intervention, case management, and treatment. Criteria for inclusion in the study were: (1) residence in a rural

area or town with a population less than 50,000; (2) age 18 or older; (3) verified HIV-positive status; (4) English-speaking; (5) no evidence of dementia verified by medical records; (6) no prior peer counseling experience; and (7) a score of 16 or higher on the Center for Epidemiological Studies-Depression (CES-D) scale. The cutoff point of 16 was selected, as scores at this level or higher are significantly correlated with a clinical diagnosis of depression.<sup>28</sup> Only 20 (7%) of the 300 rural women screened for depressive symptoms did not meet the inclusion criteria.

Demographic characteristics of the sample are summarized in Table 1. The sample was largely single (83%), African American women (82%) living alone with their children. Forty-three percent of the sample reported annual household incomes less than \$5,000, and 78% less than \$10,000. Just over half of the sample lived in small towns and nearly half lived on rural routes. The age of participants ranged from 18 to 66 years, with a mean age of 39.75 years (standard deviation [SD] = 10.37 years). Forty-one percent of the participants had not earned a high school degree. Only a small portion of the sample (21%) was employed either full or part time. Some of these women had a

clinical diagnosis of depression and were on antidepressant medications and/or counseling. However, depression was not a focus of this particular analysis. Patterns of risk for depression among this sample and its influence on medication adherence are described elsewhere.<sup>29,30</sup>

### Procedures

The staff of cooperating agencies served as intermediaries for the investigators in recruitment by distributing information about the study to potential participants. Women who were interested in participating in the study and gave their consent were contacted by female research assistants hired from the local area who received intensive training in recruitment and interviewing techniques. An initial meeting was scheduled to explain the study procedures and to complete the process of informed consent and screening to determine whether or not they met the study inclusion criteria. Those who met the criteria were scheduled for an initial interview conducted at the participant's home or other mutually agreed-upon site where privacy and confidentiality

TABLE 1. SAMPLE DEMOGRAPHICS (*n* = 224)

Variable	Levels	Frequency	%
Race	African American (0)	183	81.7
	Other (1)	41	18.3
Age (years)	18–30 (0)	43	19.2
	31–45 (1)	115	51.3
	> 45 (2)	65	29.0
	Missing	1	
Education	Less than HS degree (0)	92	41.1
	HS degree (1)	72	32.1
	College/technical training (2)	60	26.8
Annual household income	\$5,000 (0)	97	43.3
	< \$5,000–\$9,999 (1)	77	34.4
	\$10,000 and higher (2)	50	22.3
Employed full/part time	No (0)	176	78.6
	Yes (1)	48	21.4
Marital status	Single <sup>a</sup> (0)	186	83
	Non-single <sup>b</sup> (1)	38	17
Living situation	Live alone (0)	40	18
	Live with others (1)	184	82
Live in town?	No (0)	114	51
	Yes (1)	109	49
	Missing	1	

Numbers in parentheses following categorical variables designate coding level for multivariate levels.

<sup>a</sup>This category includes those never married, separated, divorced or widowed.

<sup>b</sup>This category includes those married or living with a partner.

could be maintained. Research assistants read all interview items to the participants and recorded their responses. Interviews lasted from one to two hours, and participants were paid \$30.

### Instruments

The properties of study instruments are summarized in Table 2.

*Social support.* Social support was measured using two scales that together measure the three major dimensions of social support identified in the literature: the functional components of social support (availability of different types of support), the source of support (network), and the quality of available support (e.g., satisfaction). The functional component of social support was measured by the Medical Outcomes Study Social Support Survey (MOS-SSS).<sup>31</sup> Developed for use with chronically ill patients, the scale is designed to measure the individual's perception of the availability of support along four dimensions: emotional/informational, affectionate, tangible, and positive social interaction. The 19 items describe the different types of support, rated on a 5-point response format of how often a type of support is available if needed, with responses ranging from none of the time (1) to all of the time (5).

Higher scores reflect higher levels of perceived availability.

The short form of the Social Support Questionnaire (SSQ6)<sup>32</sup> was used to measure both the source of support and satisfaction with social support. The SSQ6 contains six items derived from the original 27-item SSQ.<sup>33</sup> Social support was measured in two parts. The number of available support persons was measured by asking the respondent to list up to nine people on whom they can rely for the set of circumstances described in each item. The degree of satisfaction with available support was then measured for each item using a 6-point response format ranging from very satisfied (6) to very dissatisfied (1). For the present analysis we focused on availability and quality (satisfaction) of social support.

*Coping.* Coping responses were measured by the Family Coping Project Coping Scale (FCPCS).<sup>34,35</sup> The scale was developed using 516 descriptions of coping collected from 267 HIV-infected women from rural and urban areas enrolled in a longitudinal study of women's responses to HIV/AIDS. Using qualitative analysis, major categories of coping were identified and items representing each category were developed; a 54-item scale resulted. Exploratory factor analysis using data collected with the instrument in subsequent interviews

TABLE 2. PROPERTIES OF STUDY INSTRUMENTS

Measure	Subscales	# Items	Statistics for sample			
			Range	Mean	SD	$\alpha$
Social support	Availability of support					
	Sources of support	6	0-6	5.12	1.74	0.97
	Satisfaction with support	6	5-36	29.04	10.01	0.97
Family Coping Project Coping Scale	Total coping	54	49-142	100.16	17.40	0.87
	Living positively	9	1-27	20.96	4.74	0.80
	Managing the illness	8	6-24	19.18	4.14	0.78
	Seeking support family	7	0-21	12.14	5.01	0.82
	Isolation/withdrawal	7	0-21	11.64	4.43	0.69
	Spiritual activities	5	1-15	11.74	2.90	0.76
	Seeking information	2	0-6	4.47	1.56	0.65
	Denial/avoidance	6	0-18	9.32	3.90	0.66
	Seeking peer support	9	0-23	10.73	4.89	0.67
Reasons for missed medications	—	14	0-42	9.31	10.42	0.95

Note: The second proxy variable for the medicine adherence was missed HIV-medication, which was dichotomized into two categories of never missed medications (0) indicating complete adherence and missed medication at least once in previous month (1) indicating nonadherence.

SD, standard deviation.

with the women generated five valid and reliable subscales: avoidance/denial, managing the illness, spiritual activities, seeking social support, and focusing on others. The construct validity of the instrument for the current sample of rural women with HIV was assessed using principal components factor analysis. Eight valid and reliable coping factors were identified for the study sample (Table 2). Each item was rated on a 4-point response format of the frequency each strategy had been used in the past 3 months, with responses ranging from never (1) to always (4). The items comprising each factor were summed for a total subscale score.

The coping responses represented by the factors are similar to those identified in other measures of coping. However, a coping response unique to women with HIV disease was managing the illness. The items making up this factor represent efforts to promote and maintain health and include such behaviors as practicing healthy habits like eating right, exercising, and getting enough rest, avoiding drugs and alcohol, and keeping health care appointments.

*Medication adherence.* Medication adherence was measured by two proxy variables: self-reported missed HIV-medications and reasons for missed medications in the past month. For the purpose of this study, responses to items about missed HIV-medications were used to categorize study participants into two categories of complete adherence (never missed medications) or nonadherence (missed medications at least once in previous month). This approach was used because previous research has indicated that nearly 100% adherence to HAART is necessary to obtain the best results. The second proxy variable, the frequency of self-reported reasons for missed medications in the past month, was assessed by a modified version of the Adult AIDS Clinical Trials Group Adherence Baseline Questionnaire.<sup>36,37</sup> Reasons for missed medications was a continuous score based on 14 commonly reported reasons for missed medications rated on a 4-point scale ranging from 0 (never) to 3 (often). When these 14 items were summed for a total score; higher scores indicated a greater degree of endorsement of reasons for missed medications. Factor

analysis of the reasons for missed medications yielded only one factor suggesting that all the responses measured the same construct. Internal consistency reliability of the scale for the sample was high ( $\alpha = 0.95$ ).

## ANALYSES

Frequencies and percentages were calculated to determine the distribution of the sample on sociodemographic variables.  $\chi^2$  test was performed to determine which sociodemographic variables were significantly associated with medication adherence variables. Pearson's correlations and analysis of variance were used to determine which social support, and coping variables were related to adherence variables and should be included in subsequent analyses. The dependent variable was regressed on the variables found significant in the preliminary analysis to identify the significant predictors of adherence.

The mediating effect of coping was analyzed in three steps using those social support, coping, and medication adherence variables that were found to be significantly associated. First, simple regression analysis was performed for reasons for missed medications on social support variables. Next, simple regression analysis was performed for each of the coping variables that were found to be significantly associated with social support variables, using social support as an independent variable. In the third step, the focus was on the outcome of self-reported reasons for missed medications in the past month. Three sets of multiple regression analyses were performed for missed medications on each of the social support and coping variables that were found significant in the earlier steps.

For the other proxy variable, *t* tests were used to identify the differences in the means of predictor variables for the two adherence levels: never missed medications and missed medications at least once in the previous month. Significant social support and coping variables were then entered into logistic regression analysis to estimate the odds that they were significant predictors of the two levels of missed medications: (1) participants with scores of 0



indicating no missed medications in the past month and (2) participants with scores greater than 0 indicating some degree of missed medications in the past month. The significance level for all analyses was set at  $p \leq 0.05$ .

In addition, Pearson's correlations were performed to explore the patterns of relationships that might be present among the various reasons for missed medications and the social support variables.

## FINDINGS

Of the 280 women in the study sample, 224 were receiving combination antiretroviral therapy at the time of interview and thus were included in the analyses. Of these, 81 (36.16%) reported never skipping medications, while 133 (59.38%) were nonadherent to their medication regimen to various extents in the past month; 10 refused to provide relevant data. Approximately 25% of the participants reported missing doses of their medications within the past 2 weeks. Of all the sociodemographic, social support and coping variables considered individually, 8 were significantly correlated with the measure of reasons for missed medications (Table 3). Two variables, coping by denial/avoidance ( $p = 0.0002$ ), and number of children given birth to ( $p = 0.005$ ), were positively correlated with reasons for missed medications, while availability of social support ( $p = 0.01$ ) and coping by spiritual activities ( $p = 0.005$ ), managing HIV disease ( $p < 0.0001$ ), positive

thinking ( $p < 0.0001$ ), focusing on others ( $p = 0.02$ ), and focusing on the present ( $p = 0.0003$ ), were negatively correlated with reasons for missed medications. Next, in multiple regression analysis, the measure of reasons for missed medications was regressed on the significant covariates (Table 4). The regression model was significant ( $F = 11.55$ ;  $p < 0.0001$ ) and accounted for 30% of the variability in reasons for missed medications. Three of the 8 variables entered in the regression model were significant predictors. Coping by denial/avoidance ( $p < 0.0001$ ), and number of children given birth to ( $p = 0.0003$ ) were positive predictors of reasons for missed medications, whereas coping by managing HIV disease ( $p < 0.0001$ ) was a negative predictor. When non-significant variables were eliminated from the model using backward stepwise regression analyses; there were only minor changes in the adjusted  $R^2$  value.

Two out of the three coping variables examined, focusing on the present and spiritual activities, were found to mediate the effect of social support on reasons for missed medication (Table 5). In the first step of the analysis, the score for reasons for missed medications was regressed on available social support and the model was significant ( $p = 0.0161$ ). In the next step, each of the three coping variables (focusing on others, focusing on present and spiritual activities) was individually regressed on available social support, and each of the models was significant ( $p = 0.002$ ,  $p = 0.0032$ , and  $p = 0.0029$ , respectively). In the final step, three sep-

TABLE 3. PEARSON'S CORRELATIONS BETWEEN PREDICTOR VARIABLES AND REASONS FOR MISSED MEDICATIONS

<i>Predictor variables</i>	<i>Reasons for missed medications</i>
Availability of social support	-0.16 <sup>a</sup>
Satisfaction with available support	-0.08
Coping: denial/avoidance	0.25 <sup>a</sup>
Coping: seeking social support	0.05
Coping: spiritual activities	-0.19 <sup>a</sup>
Coping: managing HIV disease	-0.40 <sup>a</sup>
Coping: focusing on others	-0.16 <sup>a</sup>
Coping: positive thinking	-0.31 <sup>a</sup>
Coping: focus on present	-0.24 <sup>a</sup>
Coping: information seeking	-0.12
Number of children given birth to	0.19 <sup>a</sup>

<sup>a</sup> $p \leq 0.05$ .

TABLE 4. MULTIPLE REGRESSION ANALYSIS OF REASONS FOR MISSED MEDICATIONS ON PREDICTOR VARIABLES

Variable	Variable statistics			Model statistics			
	$\beta$	Standard error	p	F	p	R <sup>2</sup>	Adjusted R <sup>2</sup>
Availability of social support	-0.4375	0.3628	0.2291	11.55	< 0.0001	0.3036	0.2773
Coping: denial/avoidance	0.3869	0.0955	< 0.0001 <sup>a</sup>				
Coping: spiritual activities	-0.0127	0.1908	0.9470				
Coping: focusing on others	-0.0445	0.3096	0.8860				
Coping: managing HIV disease	-0.8007	0.1734	< 0.0001 <sup>a</sup>				
Coping: positive thinking	-0.5421	0.4350	0.2141				
Coping: focus on present	-0.9808	0.5989	0.1030				
Number of children given birth to	1.1933	0.3257	0.0003 <sup>a</sup>				

<sup>a</sup> $p \leq 0.05$ .

arate regression analyses were performed with reasons for missed medication regressed on available social support in combination with each of the three coping variables. The results indicated that coping by the use of spiritual activities and focusing on the present each mediated the effect of social support on the outcome variable ( $p = 0.02$ , and  $p = 0.001$ , respectively). Social support, which was a significant predic-

tor of adherence in the first step, became non-significant in the third step when coping variables were added to the models, with the coping variables (use of spiritual activities and focusing on the present) being the significant predictors of adherence.

Scores on the second measure of medication adherence, self-reported missed medications in the past month, were used to group partici-

TABLE 5. COPING AS MEDIATOR BETWEEN AVAILABLE SOCIAL SUPPORT AND REASONS FOR MISSED MEDICATIONS

Step 1: Simple Regression Analysis of Reasons for Missed Medications on Available Social Support

Variable	Variable statistics		
	$\beta$	Standard error	p
Available Social Support	-0.9840	0.4056	0.0161

Step 2: Simple Regression Analysis of Selected Coping Variables on Available Social Support

Dependent variable	Variable statistics for available social support		
	$\beta$	Standard error	p
Coping: Focusing on others	0.2967	0.0948	0.0020
Coping: Focus on Present	0.1423	0.0471	0.0029
Coping: Spiritual Activities	0.4322	0.1452	0.0032

Step 3: Multiple Regression Analysis of Reasons for Missed Medications on Predictor Variables

Independent variables	Variable statistics			Model statistics			
	$\beta$	Standard error	p	F	p	R <sup>2</sup>	Adjusted R <sup>2</sup>
I Available Social Support	-0.8263	0.4119	0.0461	4.74	0.0097	0.0415	0.0327
Coping: Focusing on others	-0.5359	0.2855	0.0618				
II Available Social Support	-0.7217	0.4051	0.0765	8.39	0.0003	0.0712	0.0627
Coping: Focus on Present	-1.8459	0.5659	0.0013 <sup>a</sup>				
III Available Social Support	-0.7904	0.4094	0.0548	5.89	0.0032	0.0510	0.0423
Coping: Spiritual Activities	-0.4449	0.1854	0.0172 <sup>a</sup>				

<sup>a</sup>Statistically significant results for medication effect (for all analyses  $p \leq 0.05$ ).

pants into two adherence categories; those participants who reported no missed medications (adherent) coded as "0" and those participants who missed one or more doses of medications during the past month (non-adherent) coded as "1." *t* tests were conducted to identify the significant differences in means of sociodemographic, social support, and coping variables for the two groups (Table 6). Of the 12 variables assessed, significant differences in means were found for number of children ( $p = 0.05$ ), satisfaction with available support ( $p = 0.02$ ), coping by managing illness ( $p = 0.0003$ ), and coping by positive thinking ( $p = 0.049$ ). Coping by information seeking approached significance ( $p = 0.07$ ). Significant variables were entered into logistic regression analysis to determine the odds they were significant predictors of adherence/nonadherence categories (Table 7). Satisfaction with available social support ( $p = 0.04$ ), and coping by managing HIV disease ( $p = 0.002$ ) were found to be the best positive predictors of drug adherence, whereas number of children ( $p = 0.02$ ) was found to be a negative predictor of medication adherence.

An additional analysis was conducted to examine the pattern of relationships between social support and the reasons for missed medication items. Seven of the 14 reasons for missed medications were significantly negatively correlated with availability of social support (Table 8): (1) had too many pills; (2)

wanted to avoid side effects; (3) did not want others to notice; (4) fell asleep; (5) felt sick; (6) felt depressed; and (7) problem taking pills at specified times.

## DISCUSSION

Findings of the study demonstrated that of the 224 women in the sample receiving combination antiretroviral therapy, 133 (59.38%) were nonadherent to their drug regimens at least once during the past month. This finding is consistent with the reported rates of nonadherence to antiretroviral therapy in previous research.<sup>21</sup> However; it is relatively high compared to the rates reported by recent studies.<sup>22-24</sup> The finding supports that medication adherence is an important issue for rural women with HIV disease.

In this study we examined the role of social support and coping strategies in adherence to the complex multidrug regimens for HIV infection. Previous research has clearly demonstrated the importance of maintaining a nearly perfect adherence to anti-retroviral drug regimens in order to decrease morbidity and mortality, to improve the quality of life of HIV-infected individuals, and to prevent development of drug resistant strains of the virus.<sup>2,4</sup> Social support and coping are particularly important because they can be modi-

TABLE 6. *t*-TEST STATISTICS OF SELECTED ANTECEDENT VARIABLES BY MISSED MEDICATION GROUP (ADHERENT VS. NONADHERENT)

Variable	Never missed medication			Missed medication			p Value
	n	Mean	SD	n	Mean	SD	
Availability of social support	81	5.284	1.60	133	5.008	1.79	0.24
Satisfaction with available support <sup>a</sup>	80	30.963	8.94	132	27.758	10.54	0.02
Coping: avoidance	81	18.235	6.11	133	19.383	6.59	0.20
Coping: seeking social support	81	21.704	7.72	133	20.835	7.38	0.42
Coping: spiritual activities	81	16.198	3.99	133	15.406	3.66	0.15
Coping: managing illness <sup>a</sup>	81	22.543	3.36	133	20.579	4.47	0.0003
Coping: focusing on others	81	9.432	2.55	133	9.226	2.46	0.56
Coping: positive thinking <sup>a</sup>	80	7.325	1.74	133	6.805	1.94	0.04
Coping: focus on present	81	4.914	1.24	133	4.940	1.21	0.88
Coping: information seeking	81	11.506	2.80	133	10.714	3.55	0.07
Number of children <sup>a</sup>	81	2.173	1.53	133	2.65	2.04	0.05

<sup>a</sup> $p \leq 0.05$ .

Note: the observations (*n*) do not add to 224 due to missing data.  
SD, standard deviation.

TABLE 7. SUMMARY OF LOGISTIC REGRESSION ANALYSIS PREDICTING MISSED MEDICATION GROUP (ADHERENT VS. NONADHERENT)

<i>Variable</i>	$\beta$	<i>Standard error</i>	<i>Odds ratio</i>	<i>95% Confidence interval</i>
Satisfaction with available support <sup>a</sup>	-0.0326	0.0163	1.033	1.001-1.067
Coping: Managing HIV disease <sup>b</sup>	-0.1493	0.0490	1.161	1.055-1.278
Coping: Positive thinking	0.0039	0.0993	0.996	0.820-1.210
Coping: Information seeking	-0.0016	0.0531	1.002	0.903-1.112
Number of Children <sup>a</sup>	0.1933	0.0844	0.824	0.699-0.973

<sup>a</sup>*p* < 0.05.

<sup>b</sup>*p* < 0.01.

Note: 13 observations were deleted due to missing values for the response or explanatory variables.

fied through a variety of intervention approaches, including cognitive, behavioral, and social approaches.

The finding that coping by denial/avoidance was a predictor of non-adherence to medications was not unexpected. Denial has long been associated with poor outcomes in chronic illnesses. Similarly, the finding that coping by managing HIV disease was a negative predictor of nonadherence was expected as this coping strategy represents an active approach to taking control of the disease through health promoting behaviors. This was consistent with the findings of other researchers who reported that individuals who engaged in more active coping in response to HIV-related life stressors were more likely to adhere to their medication regimens.<sup>27</sup> It was interesting to note that the number of children given birth to had an influence on medication adherence, such that the number of reported missed medications in-

creased as the number of children increased. A well-established fact in women's health is that women very often put the needs of their children above their own,<sup>38</sup> and this is a possible explanation for the association between number of children and adherence.

We also found that coping by the use of spiritual activities and focusing on the present both mediated the effect of social support on medication adherence. There are several possible explanations for this finding. First, the sample was recruited from the southern United States, an area known to be dominated by conservative values and norms that include religion. Furthermore, the large majority of the sample was African American, and religion is a core component of the southern African American culture. Additionally, the church is a valued source of support in the southern African American culture. Ethnographic studies have found that African American women's spiri-

TABLE 8. PEARSON'S CORRELATIONS BETWEEN EACH OF THE REASONS FOR MISSED MEDICATIONS AND AVAILABLE SUPPORT

<i>Reasons for missed medications</i>	<i>Correlation coefficient</i>	<i>p value</i>
Away from home	-0.01	0.83
Busy with other things	-0.09	0.16
Simply forgot	-0.10	0.11
Had too many pills	-0.17	0.01 <sup>a</sup>
Wanted to avoid side effects	-0.13	0.04 <sup>a</sup>
Did not want others to notice	-0.15	0.03 <sup>a</sup>
Had a change in daily routine	-0.11	0.10
Felt drug was toxic	-0.08	0.22
Fell asleep	-0.14	0.03 <sup>a</sup>
Felt sick/ill	-0.20	0.00 <sup>a</sup>
Felt depressed	-0.19	0.00 <sup>a</sup>
Problem taking pills at specified times	-0.16	0.02 <sup>a</sup>
Ran out of pills	-0.08	0.26
Felt good	-0.07	0.31

<sup>a</sup>Significant correlations.

tual beliefs are often linked closely to beliefs about health, disease, and behavior.<sup>39</sup> One study in particular examined the association of religion, religious beliefs and practices with treatment adherence among individuals with HIV disease in one of the southern states.<sup>40</sup> The results of this study indicated that certain religious practices and beliefs were among the multiple factors influencing adherence. The role of focusing on the present in this equation is less clear. Focusing on the present is an important coping strategy for effective stress management. By focusing on the present, one is less likely to focus on the future threats posed by the illness, and hence, less distress is generated.<sup>12</sup> Because individuals with chronic illness frequently learn how to cope with the illness through their interaction with others with the disease, the support received from others with HIV disease could be a factor accounting for the use of this coping strategy by the women in this study.

Coping by managing HIV disease was found to be an important predictor of medication adherence. The finding suggests that a belief in one's ability to control the disease may be the key to adherence. This is consistent with the theory of psychological stress and coping, where emphasis is placed on the importance of belief in one's ability to affect outcomes by effectively coping with difficult life situations such as chronic illness.<sup>12</sup> Satisfaction with social support was also found to be a significant predictor of medication adherence, a finding that is consistent with current thought on the importance of the match between the type of support that is available and what is desired or needed to effectively cope with a specific situation.<sup>12</sup> Satisfaction with available support is a good indicator of the quality of this match. However, the findings do not provide insight into the specific types of support that may promote medication adherence within the context of HIV disease. Further research is needed to identify the types of support that are not only the most satisfying within the context of HIV disease, but which also support positive outcomes such as adherence to medications. Such findings are central to the development of predictably effective social support interventions for medication adherence. Despite such limita-

tions, the findings support the need to assess the individual's perception of the support they want and/or need in order to achieve adherence to their medication regimen.

The study is limited in several ways. Medication adherence was assessed by self-report and true adherence levels are often overestimated when self-reported.<sup>41</sup> The reduction of data for missed medications into adherent and nonadherent categories reduces variability in the dependent variable and this may have been a factor in findings of nonsignificance of some independent variables. The scope of the analysis was limited to an examination of social support and coping as predictors of medication adherence, and there may be other important predictors not represented in this analysis. The relationship among medication adherence and two such predictors, sleep disturbance and depression, are reported elsewhere.<sup>30</sup> Future research is warranted to identify such factors and understand their relation to medication adherence. Another limitation is the exclusion of HIV-positive women with CESD scores of less than 16, and it is possible that the dynamics of medication adherence may differ for women who are not depressed. Additionally, the sample was limited to rural women from one geographic region of the United States and the results cannot be generalized to women from urban areas or other geographic regions.

It is well established that adherence to HIV medication is a key factor in managing the progression of the disease. The findings of the study have implications in designing, implementing, and testing interventions based on social support and coping theories. Social support and coping are particularly important because they can be modified through a variety of intervention approaches, including cognitive, behavioral, and social approaches.

## CONCLUSION

Findings indicate that social support and coping strategies influence adherence to antiretroviral drug regimens among rural women with HIV disease. It is not mere availability of social support, but the satisfaction of the available support which is important for better ad-

herence. Coping by spiritual activities and focusing on the present mediated the effect of social support on medication adherence. Satisfaction with available support and coping by managing HIV disease were the best positive predictors of medication adherence, whereas the number of children was a negative predictor of medication adherence. Further research is warranted to identify and better understand the complex factors influencing drug adherence among different populations and in different geographic regions.

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Address reprint requests to:

*Medha Vyavaharkar  
c/o The Rural Women's Health Project  
College of Nursing  
University of South Carolina  
1601 Greene Street  
Columbia, SC 29208*

*E-mail: medha@sc.edu*

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