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The Influences of Stress and Social Support on Adherence to Health Promotion Strategies by People Living with HIV/AIDS in Dar es Salaam, Tanzania

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In Tanzania, about 7% of the adult population is HIV-infected. Given limited pharmaceutical options, adherence to strategies that foster health and well-being is vital to reducing both new and repeated HIV exposure. We investigated the influences of HIV/AIDS-related stress and social support on adherence to health promotion strategies by people living with HIV/AIDS in Dar es Salaam, Tanzania. In-person interviews were conducted with 212 individuals who were clients of local AIDS service organizations. Regression analyses indicated that HIV-associated stress had a direct, negative effect on adherence, decreasing the practice of health-maintaining behaviors and increasing engagement in sexual risk behaviors. Informal social support moderated the relationship between stress and sexual risk but did not buffer the impact of stress on health-enhancing behaviors. No moderation

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effect was found for formal social support. The implications of our findings for social work and public health practice are discussed.

KEYWORDS adherence, Africa, HIV/AIDS health promotion, social support, stress, Tanzania

INTRODUCTION

Over 33 million people worldwide were infected with HIV by late 2007, with about 2.5 million cases of new infection occurring each year (Timberg, 2007). Africa, especially the sub-Saharan region, has been hard hit by the HIV/AIDS epidemic (Akukwe & Foote, 2001; Iliffe, 2006). Despite having only about 10% of the world's population, sub-Saharan Africa has been described as "the most affected region in the global AIDS epidemic," being home to fully two-thirds of HIV-infected adults and almost 90% of HIV-positive children as well as about three-quarters of all AIDS-related deaths reported in 2007 (The Joint United Nations Programme on HIV/AIDS [UNAIDS], n.d., para. 1).

This article describes findings from a study of the influences of HIV-related stress and social support on adherence to health promotion strategies by people living with HIV/AIDS (PLWHA) in Dar es Salaam, Tanzania. We begin with an overview of the HIV/AIDS epidemic in Tanzania and the study's theoretical frameworks. Next, we discuss the methods used and then present our findings. We conclude with a discussion of the results and their implications for social work and public health practice.

THE HIV/AIDS EPIDEMIC IN TANZANIA

Tanzania, in eastern Africa, is a country of striking beauty, with tourism accounting for almost 17% of its 2004 gross domestic product ([GDP]; U.S. Agency for International Development [USAID], 2005); relatively high literacy, estimated at 69% among those over age 15; and significant poverty, placed at about 36% in 2006 (World Bank, 2007). Most of its approximately 39.5 million inhabitants (World Bank, 2007) live in the countryside and its economy is heavily dependent on agriculture. However, concentrated poverty in rural areas has spurred urban migration and, as a result, "urbanization . . . increased from 19% to nearly 30% between 1988 and 2003" (USAID, 2005, p. 3).

The first three cases of AIDS in Tanzania were reported in 1983. By 1986, AIDS cases were reported by every region of the country's mainland. By 1999, "the President of Tanzania . . . declared the epidemic a 'National Disaster'" (The Prime Minister's Office and the Tanzania Commission for AIDS [TPMO/TACAIDS], 2003, p. 1).

Approximately 1.6 million Tanzanians were living with HIV/AIDS in 2003 (The Henry J. Kaiser Family Foundation [THJKFF], 2005). UNAIDS and the World Health Organization (WHO) placed the country's 2005 HIV prevalence rate at 6.5% for adults (15 to 49 years) (UNAIDS/WHO, 2008), although the rate has varied greatly among regions and between urban and rural areas. In the Dar es Salaam region, which includes the country's largest city, the HIV prevalence rate was placed at 10.9% by a national survey released in 2003–2004 (University of Dar es Salaam, 2006). Among women using antenatal clinics in the city of Dar es Salaam, 11.5% were HIV-infected in 2002 (World Bank, n.d.). A longitudinal study of the city's STI clinic users found a steadily increasing infection rate: from 13% in 1986 to 24% in 1999 to over 40% in 2001 (World Bank, n.d.).

Heterosexual contact is the primary means of HIV transmission. More than half of those living with HIV/AIDS in Tanzania are women, and young women, ages 15 to 24, are more likely than their male age peers to be HIV-infected (THJKFF, 2005). Outwater (1996, p. 15) asserted that Tanzanian women's traditional roles and professions leave them "vulnerable to the virus in ways that men are not." Women, youth, the poor, and "mobile populations" (i.e., "commercial sex workers [CSW], petty traders, migrant workers, military personnel and long distance truck drivers") have been identified as being particularly at risk of HIV infection (Tanzania Commission for AIDS [TACAIDS], n.d., Population Groups Mostly Affected sect., para. 3).

The consequences of the HIV/AIDS epidemic for the country have been wide-ranging and have eroded gains made in a number of areas. For example, AIDS is seen as having reversed the modest gains made against child mortality (TPMO/TACAIDS, 2003). About 140,000 children were living with HIV/AIDS in 2003 (THJKFF, 2005). Over 1.1 million Tanzanian children are orphans, having lost one or both parent to the AIDS epidemic, and more than 50,000 are orphaned each year (USAID, 2005).

According to TPMO/TACAIDS (2003, p. 13), "it is estimated that AIDS is now the leading cause of death among adults." Life expectancy has declined from 65 years of age in 1990 to 44 years of age in 2005, and the downward trend is projected to continue at least through 2010 (USAID, 2005). AIDS-related deaths, and consequent demographic changes, not only have had significant implications for the individuals and families who have borne these losses and the costs associated with them but also have adversely influenced Tanzania's economic development, health sector, and social fabric (Iliffe, 2006). The threats to the country's social fabric, in particular, have been acute given "the general climate of stigma and discrimination surrounding HIV/AIDS" (TPMO/TACAIDS, 2003, p. 15; see also Michiels, 2001; Nyblade et al., 2003; Rankin, Brennan, Schell, Laviwa, & Rankin, 2005, for discussions of HIV/AIDS and stigma in Africa).

Almost half of all of the country's hospital beds are used by patients with AIDS-related illnesses (TPMO/TACAIDS, 2003). The number of tuberculosis

(TB) cases is on the rise after declining in the 1980 s (TACAIDS, n.d.). Deaths due to AIDS are seen as leading to a shrinking labor force, projected to decrease by as much as 20% by 2010, and to a loss of productivity as younger, less educated, and less skilled individuals assume vacant jobs (World Bank, n.d.). Projections suggest that the AIDS epidemic will slow the growth of Tanzania's GDP (TACAIDS, n.d.).

Unfortunately, although significant advances in highly active antiretroviral therapies (HAART) have dramatically changed the course of the disease and the lives of those affected by it in the United States (Mitchell & Linsk, 2004), these medications are not widely available to PLWHA in Tanzania. WHO (2005) reported that 19,600 Tanzanians, ages 0 to 49, were receiving antiretroviral therapy in 2005; however, 315,000 individuals were believed to be in need of such treatment. Many HIV-positive Tanzanians rely on traditional healing practices, which are much more accessible than other forms of treatment (Stangeland, Dhillion, & Reksten, 2008).

Given the continued high rate of infection and the paucity of available pharmaceutical options, it is important to identify what facilitates and constrains Tanzanian PLWHA from engaging in health-promoting and risk-reducing behaviors. Although much has been learned about the impacts of factors such as stress and social support on the physical and emotional well-being of individuals in the United States (see, for example, Aneshensel, 1992; Thoits, 1995), less is known about their influence on the health of African populations. This study, therefore, investigated whether social support and the stress of living with an HIV diagnosis influenced adherence to health promotion strategies by PLWHA in Dar es Salaam, Tanzania.

CONCEPTUAL BACKGROUND

Two theoretical perspectives framed our approach in this study: stress theory and social support theory. Each is briefly described next.

Stress Theory

Stress theorists have defined stress as a stimulus, or stressor (Lazarus, 1966; Lazarus & Folkman, 1984); that is, as "any environmental, social or internal demand which requires the individual to readjust his/her usual behavior pattern" (Thoits, 1995, p. 54). According to Lazarus (1966), changes in affect, cognitive functioning, motor behaviors, or physical health are all possible indicators that someone is experiencing stress. When stressors accumulate, they can overtax a person's ability to readjust, or cope, and thus can lead to a variety of negative outcomes (Thoits).

Whether and how much a specific stimulus stresses a person depends on how that individual appraises the stimulus. Primary appraisal involves

the cognitive evaluation of whether, and how, an event poses a threat to the individual, whereas secondary appraisal is the cognitive process of determining what can be done to manage, or cope with, the threatening event (Lazarus, 1966; Lazarus & Folkman, 1984). In their attempt to manage a threat, individuals draw upon internal (e.g., positive disposition, self-esteem) as well as external (e.g., social support, material resources) coping resources (Lazarus & Folkman; Pakenhan & Rinaldis, 2001). Monetary wealth is seen as an especially salient external coping resource because it significantly increases the number of available coping options (Lazarus & Folkman).

Chronic strains, or chronic stressors, represent persistent demands that can cause substantial physical and emotional harm to an individual (Aneshensel, 1992). Whereas a situation that poses an immediate threat to someone's well-being is an acute stressor (e.g., waiting for HIV test results), an ongoing situation that persistently taxes a person's ability to cope is a chronic stressor (e.g., the experience of repeated rejection because of one's HIV/AIDS status) and can have a cumulatively corrosive effect. Chronic illnesses, including the life-long experience of living with an HIV/AIDS diagnosis, can engender "a variety of illness-related stressors" (Melamed & Brenner, 1990, p. 105) and thus can give rise to chronic stress. We conceptualize the status of living with an HIV/AIDS diagnosis as creating chronic stress; we term this form of stress HIV Status Stress (HSS).

Social Support Theory

Although a large body of research links social support and health, there is not a consensus about how to define social support and a number of definitions have been offered (Taylor, Sylvestre, & Botschner, 1998). Barrera (1986), for example, distinguished among social embeddedness (e.g., connections with others), perceived support (e.g., a cognitive appraisal of the reliability of those connections), and enacted support (e.g., the actual support received from others). Thoits (as cited in Hutchinson, 1999) suggested that social networks, perceived social support, and enacted social support differentially influence mental or physical health outcomes. Perceived support, in contrast to received support, has been found to relate more consistently to health outcomes (Sarason, Sarnson, & Pierce, 1990).

"Sources of social support can be material and emotional . . . and provided informally by friends and family and by formal social service systems" (Reilly & Woo, 2004, p. 97). Investigations in the United States have found that PLWHA who have social support experience less distress (Hudson, Lee, Miramontes, & Portillo, 2001), achieve better physical health outcomes (Leserman et al., 2000), and report better mental health and overall quality of life (Gielen, McDonnell, Wu, O'Campo, & Faden, 2001).

Social support has been found to moderate the deleterious effects of stress, though there has been debate about which aspects of social support

contribute to this result (Taylor et al., 1998). The "protective effect of social support is thought to operate both by contributing to the resources available to individuals to cope with the stressor, as well as by reducing the stress response to the stressor" (Koopman et al., 2000, p. 664). We conceptualized social support as buffering, or moderating, the impact of stress associated with a person's HIV status on that individual's adherence to health promotion recommendations.

STUDY HYPOTHESES

We tested two hypotheses:

H1: There is a direct relationship between HIV status stress and adherence to health promotion strategies.
H2: Social support, whether informal or formal, moderates the relationship between HIV status stress and adherence to health promotion strategies.

METHODOLOGY

In-person interviews were conducted by trained local interviewers with a sample of individuals who were clients of WAMATA (Walio katika Mapambano na AIDS Tanzania, meaning "people in the frontline against AIDS in Tanzania") and SHDEPHA (Service, Health, and Development for People Living Positively with HIV/AIDS), two Dar es Salaam–based AIDS service organizations (ASOs). SHDEPHA defined its clientele as PLWHA, whereas WAMATA served both PLWHA and family members of infected and/or affected Tanzanians. Both organizations provided counseling, HIV testing, home care, and prevention information. Weekly group counseling sessions for PLWHA, which were offered by the two ASOs, emphasized the importance of complying with medical treatments as well as with strategies for maintaining one's health and preventing HIV transmission and reinfection. In addition, both organizations' home care programs included individually tailored educational and health promotion activities. Each ASO afforded all of its clients equal access to its services, although actual utilization likely varied by client's level of education and health status.

A letter introducing the study was sent by the WAMATA Executive Officer to the ASOs' clients who met the study's eligibility criteria, which are described later. This was followed by a recruitment letter from the lead author that described the study as well as the voluntary and confidential nature of the research. Because most clients did not have a postal address, a member of WAMATA's home care team hand delivered the letters and retrieved the responses.

Almost all of the interviews took place at respondents' homes. Before beginning an interview, the interviewer and respondent reviewed the study's purpose; the potential benefits and risks of participation; and the respondent's right to refuse specific questions and/or to terminate the interview without fear of jeopardizing the services being received from the ASO. Care was taken to ensure that the respondent understood that responses would not be linked to him or her or shared with the ASO. Respondents were told they would receive the equivalent of US$2.00 as a token of appreciation for their time, and compensation was not dependent on interview completion. The study was approved by the National Institute for Medical Research (NIMRI), Tanzania, and the Institutional Review Board of the University of Pittsburgh, U.S.A.

Sampling

To be eligible for the study, WAMATA and SHDEPHA clients had to be age 18 or older and physically and mentally healthy enough to participate; both male and female clients were eligible. In addition, clients had to reside in the municipalities of Ilala or Kinondoni. The 426 individuals who met these criteria were asked to indicate their willingness to be selected for participation in the study; all of those contacted agreed to be considered for selection.

Systematic sampling with a random start was used to select a sample of 216 individuals. However, two of these people died before the interview date, one became too ill to participate, and one moved. The final sample of 212 exceeds the number of cases needed to detect an increment to R^2 of 0.10 when one study variable is added to a set of six control variables at a significance level of 0.05 and a desired power of 0.80. A 10% change in R^2 approximates Cohen's (1988) definition of a medium effect size (i.e., an R^2 change of 13%) and can be considered to have practical as well as statistical significance.

Instrumentation

The questionnaire contained both demographic items and scales representing the study variables. It was pretested with a convenience sample of 32 PLWHA who were participating in support groups conducted by the ASOs and who, according to ASO staff, were healthy enough to participate in an interview. The questionnaire was modified based on the pretest results; for example, a question on drug addiction was added on the basis of pretest respondents' comments. The final version of the questionnaire was translated into Kiswahili, the primary language of Tanzania.

The demographic items largely were represented by nominal variables whose categories were assigned codes, although the codes themselves did

not have quantitative meaning (Pedhazur, 1982). The scales were either newly created or adapted for first-time use in a setting outside the United States and are therefore described below in some detail. Face validity for the scales was established by the pretest and by feedback from the ASO staff. Two approaches were used to establish content validity (Engel & Schutt, 2005): an extensive literature review and input from the staff of the two ASOs. In addition, feedback was elicited from the pretest respondents.

HIV STATUS STRESS

HIV Status Stress (HSS), the independent variable, was measured by a 30-item scale created for this study. The HSS Scale's development was informed by the Coping & Stress Profile (Inscape Publishing, 1995), which assesses personal, work, couple, and family stressors. The HSS Scale departed from the Coping & Stress Profile by specifying the period under consideration as being since the HIV diagnosis. The HSS Scale items also were made context specific, and the types of stressors considered were expanded to encompass those that may be unique to living with HIV/AIDS in Tanzania.

The HSS Scale explored respondents' feelings about: the future ("I no longer have big plans for my future"); disclosing their HIV status, others' reactions to it, and relationships with family members and neighbors (e.g., "I regret having disclosed my HIV status to my spouse/partner," "I feel ashamed when my neighbors talk about my past"); changes in physical appearance (e.g., "I fear that people know my HIV status just by looking at me"); intimate relations and sexuality (e.g., "Due to my HIV status, it is hard to have intimate relationships"); employment and economic status (e.g., "I regret that I can no longer work as much because of my HIV status"); and the progression of the disease, being cared for when ill, and death (e.g.," I worry about dying from AIDS"). Items were scored on a five-point Likert format, ranging from 1 = Never to 5 = Always. A Not Applicable (NA) option was also provided. In the pretest, the HSS Scale had a reliability coefficient of .83.

Although a factor analysis revealed a two-factor solution, the second factor was not interpretable. Examination of the items that loaded on the first, prerotated factor found that 17 had factor loadings of 0.4 or greater. These items tapped all of the areas initially assessed except for: controlling the progression of the disease and being cared for when ill. To compute the HSS Scale score, the mean of all valid values was computed. Thus, scale scores have the same range as response options (e.g., on a five-point scale) and can range from 1 to 5. This method of scoring, in effect, applies the technique of individual mean substitution for missing values; missing item scores for each participant are replaced by the mean of the participant's valid item scores (e.g., person mean substitution), an approach that Bono, Ried, Kimberlin, and Vogel (2007), Roth, Switzer, and Switzer, (1999), and Shrive,

Stuart, Quan, and Ghali (2006) have found to be an acceptable method of handling missing data. The HSS Scale had an alpha of .89 in the full sample.

Social support

Social support was the moderator variable. A modified version of the Sources of Social Support (SOSS) Scale developed by Koeske and Koeske (1990, 2001) was used. The original scale was changed in three ways. First, the social support items were oriented to the period since the respondents received their HIV diagnosis. Second, perceived availability of informational support was added to the scale's two original dimensions: perceived practical support and perceived emotional support. Third, the sources of social support were expanded to reflect those that might be available to the respondents; they subsequently were grouped into informal sources (i.e., family members, friends, neighbors), formal sources (i.e., doctors, ASO clinical staff), and "other" sources (i.e., faith healers, traditional healers), which was eventually dropped due to the prevalence of missing data.

The types of support (i.e., practical, emotional, informational) were found to be highly correlated within each source of social support (i.e., informal, formal). Therefore, within each source, scores for the types of support were summed and averaged to produce two scales: an Informal SOSS Scale and a Formal SOSS Scale. Informal SOSS Scale scores were computed for cases that had valid data on at least five of the 11 informal support items; Formal SOSS Scale scores were computed for cases that had valid data on at least two of the three formal support items. Individual items were coded on a five-point Likert format, with higher scores indicating more perceived support; scale scores were based on the average of valid responses and could range from 1 to 5.

Adherence

Adherence to health promotion strategies, the dependent variable, was defined as the self-care and risk reduction strategies commonly available in Tanzania during the period when the interviews were conducted. Self-care strategies encompassed the use of formal treatments, such as taking medications prescribed for specific opportunistic infections and diseases, as well as informal approaches, such as getting proper nutrition, engaging in productive activities, and having adequate rest. Risk reduction strategies involved the various approaches adopted by respondents to limit their risk of being reinfected or infecting others.

Adherence to health promotion strategies was assessed by a newly developed 23-item scale that had one question worded differently for male and female respondents. Items were scored using a five-point Likert-type

format, where 1 = Never and 5 = Always; negatively worded items were reverse coded. The scale's pretest reliability coefficient was alpha =.77.

Subsequent to data collection, two items were eliminated, one because of a high number of missing cases and the other because it was found to duplicate the content of another item. Although a factor analysis of the remaining 21 items yielded a two-factor solution, conceptual themes could not be discerned in the factors. Inspection of the items suggested they could be divided into two logical grouping: those that addressed sexual risk (6 items) and those that captured adherence to general health maintenance recommendations (15 items). Examples of items that addressed sexual risk are "I use a condom whenever having sex" and "I have not reduced my number of sex partners," whereas items tapping adherence to health promotion strategies included "I do not eat a balanced diet," "I reserve time for myself to maintain my health," and "I follow the treatment plan my doctor has given me."

The six items involving sexual risk were not normally distributed and had high levels of missing data. Therefore, a count procedure was used to create a sexual risk index, such that higher scores denoted engagement in greater numbers of risky sexual behaviors. Because the resulting index was still highly skewed, a dichotomous Sexual Risk measure was produced and was coded: 1 = low risk (i.e., no more than one sexual risk behavior) and 2 = higher risk (i.e., engagement in two or more sexual risk behaviors).

Reliability analysis of the 15 variables that reflected adherence to general health maintenance regimens achieved an alpha of.65. Eliminating two items raised the reliability coefficient to.68. An Adhere Scale based on those 13 items was computed by taking the average, when there were data for at least six items. As discussed earlier in relation to the HSS Scale, this method of computing the scale score is comparable, in effect, to using an individual mean substitution approach to handling missing data. Thus, the Adhere Scale could range from 1 to 5, with higher scores indicating greater adherence to health promotion strategies.

Analytic Plan

Frequency distributions and associated descriptive statistics were generated for all variables. Correlations were produced to assess the study variables' bivariate associations. We used linear regression to test the hypotheses when the Adhere Scale was the dependent variable and logistic regression when the Sexual Risk measure was the outcome variable. Six regression models were produced to examine the study's two hypotheses – three using the Adhere Scale as the dependent variable and three using the Sexual Risk measure. In each analysis, demographic variables were entered first in a block as control variables. The codes representing the categories of a dichotomous nominal variable are arbitrary, since the codes themselves have no

quantitative meaning, and the overall results of a regression analysis will be the same across coding scheme, although predicted values of the dependent variable will vary (Pedhazur, 1982).

For the first hypothesis, after the demographic variables were entered as a block, the HSS Scale was entered. For the second hypothesis, which assesses the moderation effects of social support, separate models were tested for the HSS Scale and the Informal SOSS Scale and for the HSS Scale and the Formal SOSS Scale. In each analysis, after entering the demographic variables as a block, the HSS Scale and either the Informal or the Formal SOSS Scale were entered together. An interaction term composed of the product of the HSS Scale and the Informal or the Formal SOSS Scale was entered last.

RESULTS

Respondents were, on average, 38.2 years of age (SD = 8.68; range 19 to 63). Slightly over three-quarters were women. Over half reported being widowed; just 16% said they were married at the time of the interview. The overwhelming majority (85%) were parents, and those who were had, on average, three to four children (mean 3.54, SD = 0.96). Almost 60% had no more than primary schooling (i.e., up to grade 7). Fully 83% were unemployed. Forty-three percent reported a monthly income of US$35.00 or less. A third said they had an income of US$35.01 to US$55.00 per month (Table 1).

Fully 98.5% said they had experienced symptoms of one or more opportunistic infections; however, only four people (1.9% of the total sample) reported being on ART. Despite having experienced AIDS-related symptoms, half characterized their general health status as satisfactory and 28% described it as good or very good. In contrast, the respondents gave a somewhat more negative picture of their satisfaction with their life. Although just over half said they were satisfied with their life in general, fully 39% rated their overall life satisfaction as poor or very poor (see Table 1).

The average HSS Scale score was 2.62 (median = 2.53, SD = 0.80). The Informal SOSS Scale's mean was 3.91 (median = 3.11, SD = 0.79), whereas the mean for the Formal SOSS Scale score was 3.02 (median = 3.01, SD = 0.72). The average Adhere Scale score was 3.57 (median = 3.61, SD = 0.52). For the dichotomized Sexual Risk measure, 44.8% of respondents were categorized as being at low sexual risk (i.e., no more than one sexual risk behavior) and 55.2% were found to be at higher sexual risk (i.e., engagement in two or more sexual risk behaviors associated with HIV transmission).

As Table 2 displays, the HSS Scale was not associated with either measure of social support. It did have a statistically significant and moderately strong, negative correlation ($r = -0.58$) to the Adhere Scale and a statistically significant but very weak, positive association with the Sexual Risk measure ($r = 0.16$). The Informal SOSS Scale had a statistically significant and

TABLE 1 Distribution of Demographic and Background Characteristics

Variable	Category	*N*	%
Gender	Female	163	76.9
	Male	49	23.1
Marital status	Married	33	15.7
	Single	35	16.5
	Divorced/separated	26	12.3
	Widowed	118	55.7
Parental status	Yes	180	84.9
	No	32	15.1
Education	None	16	7.5
	Primary (grade 7) or less	125	59.0
	More than primary	71	33.5
Employment	Employed	30	14.2
	Retired	6	2.8
	Unemployed	176	83.0
Monthly income	US$15.00	22	10.4
	US$15.01–US$35.00	68	32.1
	US$35.01–US$55.00	73	34.4
	Over US$55.00	49	23.1
Any symptoms	Yes	209	98.5
	No	3	1.5
General health status	Poor or very poor	45	21.2
	Satisfactory	107	50.5
	Good or very good	60	28.3
Life satisfaction	Poor or very poor	82	38.7
	Satisfactory	118	55.7
	Good or very good	12	5.7

moderately strong correlation with the Formal SOSS Scale ($r = 0.58$). However, neither social support scale was associated with the Adhere Scale or the Sexual Risk measure. The two dependent variables – the Adhere Scale and the Sexual Risk measure – had a statistically significant, moderate, negative correlation ($r = -0.32$).

Table 3 displays the final coefficients from the six regression models used to test the study's two hypotheses. Consistent with the first hypothesis,

TABLE 2 Correlations of Study Variables

	HSS Scale ($N = 211$)	Informal SOSS scale ($N = 212$)	Formal SOSS scale[a] ($N = 211$)	Adhere scale ($N = 211$)	Sexual risk measure[b] (N = 212)
HSS Scale	–	0.04	–0.02	–0.58**	0.16*
Informal SOSS scale		–	0.58**	0.04	0.10
Formal SOSS scale			–	0.08	0.05
Adhere scale				–	–0.32**

[a]Square transformation.

[b]1 = Low risk, 2 = Higher risk.

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

TABLE 3 Linear and Logistic Regressions of Direct Effect of HIV Status Stress and Moderation Effects of Social Support

	Direct effects: HIV status stress			Moderation effects: Informal social support			Moderation effects: Formal social support		
	Adhere scale (N = 211)	Sexual risk[e] measure (N = 212)		Adhere scale (N = 211)	Sexual risk[e] measure (N = 212)		Adhere scale (N = 211)	Sexual risk[e] measure (N = 212)	
	B	B	(Exp)B	B	B	(Exp)B	B	B	(Exp)B
(Constant)	4.37***	−1.32	.27	4.58***	−7.45*	.00*	4.72***	−4.81**	.01
Gender[a]	−.04	.54	1.72	−.05	.64	1.89	−.03	.50	1.65
Age in years	−.00	−.04	.97	−.00	−.04	.96	−.00	−.03	.97
Education[b]	−.03	.60	1.82	−.03	.61	1.84	−.02	.59	1.81
Monthly income	.08*	−.22	.80	.08*	−.26	.77	.08*	−.27	.77
Marital status: Married[c]	.01	1.18*	3.24*	−.00	1.27*	3.57*	−.00	1.31**	3.72**
Single[c]	−.06	.66	1.95	−.07	.77	2.17	−.08	.74	2.10
Separated/Divorced[c]	.03	.38	1.47	.04	.67	1.96	.02	.51	1.67
Parental status[c]	.05	.63	1.87	.06	.94	2.57	.05	.75	2.11
HSS scale	−.36***	.46*	1.58*	−.48***	2.21*	9.09*	−.50***	1.46*	4.29*
Informal SOSS scale	–	–	–	−.08	.64*	1.90*	–	–	–
Formal SOSS scale[d]	–	–	–	–	–	–	−.00	.02*	1.03*
HSS* Informal SOSS	–	–	–	.01	−.19*	.82*	–	–	–
HSS* Formal SOSS[d]	–	–	–	–	–	–	.01	−.01	.99

[a]1 = Female, 2 = Male.

[b]1 = Primary or less, 2 = More than primary.

[c]0 = No, 1 = Yes.

[d]Square transformation.

[e]1 = Low risk, 2 = Higher risk.

*p < .05, **p < .01, ***p < .001.

the HSS Scale displayed a direct, negative impact on the Adhere Scale, such that increases in HIV status stress produced decreases in adherence to health maintenance recommendations. The result of the logistic regression of the HSS Scale on the Sexual Risk measure also supported the first hypothesis; the HSS Scale had a direct, positive impact on the Sexual Risk measure ($B = .46$), achieving an odds ratio of 1.58.

The hypothesized buffering effect of social support posited by the second hypothesis was only partially supported (see Table 3). The interaction term of the HSS Scale and the Informal SOSS Scale was not a statistically significant predictor of the Adhere Scale. However, it was a statistically significant predictor of the Sexual Risk measure, which suggests that informal social support buffers the effect of HIV status stress on sexual risk ($B = .46$), achieving an odds ratio of 0.82. Finally, contrary to the hypothesized expectation, the Formal SOSS Scale did not moderate the HSS Scale's impact on either the Adhere Scale or the Sexual Risk measure.

DISCUSSION

This study investigated the direct effect of HIV-related stress and the potential moderating effect of social support on the impact of such stress on adherence to health promotion strategies by clients of two AIDS service organizations in Dar es Salaam, Tanzania. Although there is a fairly robust body of literature on these issues among various U.S. populations, including individuals living with HIV/AIDS, this topic has not previously been studied among African PLWHA. Thus the findings of this investigation offer an initial glimpse into how HIV-related stress and social support affect the ability of Tanzanian PLWHA to follow health maintenance and risk reduction recommendations.

The predominance of female respondents in the sample may reflect the higher prevalence of HIV/AIDS among women in Tanzania (THJKFF, 2005) as well as African women's historic role as the primary caregiver in the family (Ankrah, Schwartz, & Miller, 1996; Outwater, 1996). Women may become involved with ASOs not only on their own behalf as PLWHA but also on behalf of family members, close friends, and other relatives.

Although the average age of respondents placed them in their prime working years, the overwhelming majority were not working at the time of the interview. The high proportion unemployed could have been a consequence of deteriorating health, caregiving responsibilities, or discrimination in employment based on HIV/AIDS status. In addition, the high unemployment rate in Dar es Salaam, placed at about 46% according to a national definition of unemployment (Tanzania National Website, n.d.), may have both been reflected in the level of unemployment found in our sample and made it difficult for respondents to obtain jobs, even if they wanted them.

Given their absence from the labor force, as well as the fact that many were widowed and had children, it is, perhaps, not surprising that over 40% had incomes that placed them at or below the Tanzanian poverty line, which has been set at between US$0.79/day and US$1.08/day by different definitions (Research and Analysis Working Group, 2005). If the higher cost of living associated with an urban area like Dar es Salaam is taken into account, an even greater number of respondents can be considered very poor. Although we do not know their income level before becoming HIV-infected, Bradley-Springer's (2007, p. 1) comment about the impact of HIV on U.S. populations seems apropos: "If you aren't poor when you start out, you will be before you're through." Our finding on income lends support, as well, to Kaijage and Tibaijuka's (1996) contention that the AIDS epidemic has exacerbated the economic position of Tanzanian women and children, making them vulnerable to social exclusion from the mainstream of society.

Nearly all of the respondents said they had had symptoms of one or more opportunistic infections. That only 4 of the 212 people interviewed were receiving ART illustrates the continuing lack of availability of pharmaceutical treatments in Tanzania, a situation well documented by WHO (2005). Yet although offering a favorable characterization of their general health status, respondents expressed less satisfaction with their life in general, reminding us that self-assessed quality of life is influenced by much more than just the presence or absence of disease symptoms.

Our first hypothesis regarding the direct effect of HIV-related stress on adherence to health promotion strategies was supported. Much has been written recently about the continuing stigma associated with HIV/AIDS in Africa (e.g., Michiels, 2001; Nyblade et al., 2003; Rankin et al., 2005); living with such stigmatization is, undoubtedly, stressful, and the HIV Status Stress measure may have captured some of the deleterious effects of stigma. Our sample's generally low income, coupled with their parental and other caregiving responsibilities, also may have heightened their stress about living with HIV/AIDS, a suggestion consistent with Koopman et al.'s (2000) finding that income negatively impacts perceived stress as well as with Lazarus and Folkman's (1984) view of money as an important coping resource.

Our second hypothesis about the buffering effect of social support was not supported in the main, the exception being the moderation effect found for informal social support on the impact of HIV-related stress on the Sexual Risk measure. It appears that positive support from family and friends does afford a partial antidote to high HIV-related stress such that the level of sexual risk-taking is lowered. The lack of support for the other three potential buffering relationships is consistent with the results of Pakenham and Rinaldis (2001), who found that social support did not moderate gay and bisexual men's adjustment to HIV/AIDS. It may be, as they suggest, that different types of stressors may require functionally different types of social support. It also may be that where informal networks of mutual assistance have been

a normative aspect of the culture, as is the case in Tanzania (Ankrah et al., 1996), social support as a construct may lose some of it potency for alleviating stress and promoting positive behavioral outcomes.

Limitations

There are several limitations that should be kept in mind when considering this study's findings. First, social desirability and memory issues could have affected the accuracy of the self-reported data. Second, whenever concepts are used in a different cultural context, issues arise about the appropriateness and meaning of those concepts to the new population. Although we developed several new scales and modified others to make them applicable to an African population, further use of these instruments is needed to establish their validity and reliability. Third, although it did not appear to be patterned, missing data may have affected the scales. Fourth, the cross-sectional nature of this study constrains our ability to make causal statements with certainty. Fifth, although all of the respondents had full access to the activities and services offered by their respective ASO, it is likely that their exposure to health enhancement and prevention information varied, and in the case of WAMATA clients, individuals' gains may have been reinforced by participating family members. Therefore, degree of exposure to ASO-delivered information represents a potential confounding variable and may be an unmeasured influence affecting the results. Finally, there are limitations to the generalizability of our findings; respondents were selected from among those using the services of two ASOs in Dar es Salaam and may not be representative of all Tanzanian PLWHA who are ASO clients, let alone all Tanzanian PLWHA or all African PLWHA.

CONCLUSIONS: IMPLICATIONS FOR SOCIAL WORK AND PUBLIC HEALTH PRACTICE

The results of this study have several implications for social work and public health practice in Tanzania. There is a clear need for social workers to work with women who are ASO clients to ensure that they are obtaining maximum benefits for themselves and their families from their participation. Social work practitioners also can play a key role in designing and implementing strategies to encourage women to adopt and maintain behaviors that promote good health and that reduce their own and their family members' risks of primary and secondary HIV exposure. Working to empower women, and in particular devising ways to raise their economic position, could help to curb the spread of HIV.

Our findings also challenge us to ask: What about men? Ascertaining how to support men in living healthier lives is critical to controlling the

HIV/AIDS epidemic in Africa and elsewhere. Social workers could collaborate with ASO members to promote men's engagement with these organizations. To foster men's recruitment and retention, it will be important to identify any unique concerns they might have and to develop programs and resources to address those issues.

New approaches are needed to reduce the impact of stress on Tanzanian PLWHA. Efforts also must be undertaken to eliminate stigma, which likely increases people's stress and reduces their motivation and ability to adhere to health promotion recommendations. Social work and public health practitioners are uniquely situated to carry out the sort of two-pronged campaign required: working with individuals, families, and small groups to find ways to relieve HIV-related stress and internalized expressions of stigma (e.g., shame, inferiority) and working with communities, organizations, and policy makers to promote HIV/AIDS education, combat myths and stereotypes, and address discrimination. Social work-public health initiatives need to be connected both to efforts to prevent initial and repeated exposure to HIV and to actions to promote health-enhancing behaviors.

Finally, this study suggests several avenues for further research. Future studies should assess the relative importance of different types of stressors in the lives of African PLWHA as well as investigate the relationship of HIV-related stress and stigma. The meaning of the concept of social support and its utility to African populations also merit further examination. Longitudinal studies need to be undertaken to clarify the factors that encourage, or discourage, PLWHA to initiate and to maintain health-promoting and risk-reducing behaviors. And, of course, all programs initiated should be evaluated to identify what works, with whom, under what circumstances, and at what costs.

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