

PREVALENCE OF AND RISK FACTORS ASSOCIATED WITH ALCOHOL ABUSE IN MOSHI, NORTHERN TANZANIA

TISHA MITSUNAGA* AND ULLA LARSEN†

**World Health Organization, Geneva, Switzerland* and †*Department of Sociology,
University of Maryland, USA*

Summary. This study aimed to assess the prevalence of and risk factors associated with alcohol abuse among women and men in Moshi in northern Tanzania. Alcohol abuse was measured by a CAGE score of 2–4, versus 0–1 for no alcohol abuse (Ewing, 1984). Crude and adjusted logistic regression models determined odds ratios (OR) and 95% confidence intervals (95% CI) of alcohol abuse by characteristics of, respectively, women with partners ($n=1200$), women without partners ($n=614$) and men ($n=788$) (women's partners). Prevalence of alcohol abuse was 7.0% (95% CI: 5.6–8.4) among women with partners, 9.3% (95% CI: 7.0–11.6) among women without partners, and more than double among men at 22.8% (95% CI: 19.9–25.8). In general, Christians had higher alcohol abuse than Muslims or other religions, as did Chagga men compared with men of other ethnic groups. Other socio-demographic characteristics, such as education or income, were not significant. Sexual behaviours were significant predictors of alcohol abuse. For example, women without partners who reported more than two partners in the last year had higher alcohol abuse compared with women reporting no partners (OR=8.75; 95% CI: 2.37–32.31), as did men reporting it is 'OK to hit a partner' for any reason (OR=1.79; 95% CI: 1.16–2.77) compared with men who did not. HIV-1 infection was not significantly associated with alcohol abuse by women or men. The Christian Church in Moshi should consider raising awareness about the harmful effects of high alcohol use among its adherents. Comprehensive programmes focusing on reducing number of partners and alcohol use, particularly by men, are needed in this community.

Introduction

Alcohol use is associated with individual mortality and morbidity from a range of mental and physical illnesses (Room, 2002; WHO, 2002). Ezzati *et al.* (2002) have found that alcohol consumption is one of the leading causes of the global burden of disease in 2000, responsible for 4.0% of total disability-adjusted life years (DALYs)

lost and 1.8 million deaths globally. In addition, individual alcohol use may have adverse social effects on family life, in the workplace, and on society in general (Secretary of Health and Human Services, 2000; Room, 2002). While *per capita* alcohol consumption has decreased steadily since the 1980s in the developed world, the opposite is true in developing countries (WHO, 2001; Room, 2002). In fact, Room (2002) suggests that the level of economic development is positively associated with the prevalence of alcohol consumption in developing countries. That is, higher incomes generally lead to higher consumption.

Alcohol use and abuse are well-documented in developed countries, with fewer studies looking at alcohol consumption in developing countries, and in particular in sub-Saharan Africa (Siegfried *et al.*, 2001; Luginaah & Dakubo, 2003). Research carried out in sub-Saharan Africa tends to focus on adolescent alcohol use (Fatoye, 2003; Luginaah & Dakubo, 2003). Several studies have examined alcohol consumption in Tanzania. Kilonzo and his colleagues reported findings about alcohol consumption and substance misuse for all of Tanzania (Kilonzo & Maselle, 1986; Kilonzo, 1992). Rijken *et al.* (1998) looked at alcohol consumption among a rural population in Mwanza, Tanzania. These authors reported that 55% of men and 33% of women had consumed alcohol at least once in the past year, with men reporting higher frequency and quantity of alcohol consumption than women. Overall, these figures were found to be low in comparison to estimates from other parts of Tanzania. Carlson (1992) conducted an ethnographic study of alcohol use among the Haya of Bukoba district, Tanzania, and described and analysed the way in which the Haya view excessive drinking and methods used to address drunkenness as a health problem. Kaaya *et al.* (1992) found the prevalence of alcohol use to be roughly 39% among secondary students in Dar es Salaam, with more than half reporting awareness of associated negative health outcomes. Kilonzo *et al.* (2004) investigated patterns of alcohol consumption around Dar es Salaam. Henricson (1992) looked at alcohol consumption in the Kilimanjaro area. Kapiga *et al.* (2007) analysed alcohol use among female bar and hotel workers in Moshi in the Kilimanjaro region. The latter study found that more than 70% report ever drinking alcohol, with a 35% prevalence of alcohol abuse based on a CAGE score of 2–4.

A number of papers cite alcohol use as a risk factor for negative health outcomes in Tanzanian populations, such as HIV infection (Ao *et al.*, 2006; Sa & Larsen, 2007; Kapiga *et al.*, 2002, 2007), herpes simplex virus type 2 (HSV-2) (Kapiga *et al.*, 2003), hypertension (Edwards *et al.*, 2000), and injuries (Kilonzo, 1990; Nikander *et al.*, 1992). In other sub-Saharan African countries, alcohol use is also associated with sexual abuse (Koenig *et al.*, 2004), domestic violence (Jewkes, 2002; Koenig *et al.*, 2003; Jewkes *et al.*, 2003) and road traffic accidents (Odero & Zwi, 1997; Odero *et al.*, 1997; Odero, 1998; Andrews *et al.*, 1999). In addition, Shayo *et al.* (2000) described the potential for home-brewed alcohol to contain harmful levels of bacteria.

While there are many problems linked to alcohol consumption, there may also be some health benefits associated with its use. For example, opaque beer such as *orubusi*, which is traditionally brewed from bananas in north-west Tanzania, contributes essential nutrients such as vitamin B, minerals, proteins and energy (Shayo *et al.*, 2000). Further, low-to-moderate alcohol consumption may be protective for cardiovascular disease (Secretary of Health and Human Services, 2000; Room,

2002; WHO, 2002; Suter, 2004). Finally, alcohol is often used to relieve stress or for social well-being, and it may be seen as being beneficial for one's health if taken in moderation; however, the relationship between the consumption of alcohol as a coping mechanism is complex (Secretary of Health and Human Services, 2000).

Several studies indicate that alcohol use by men is much more accepted than by women, and therefore men are more likely to consume alcohol than women in many developing countries (WHO, 2001). For example, in Lesotho, though women are the traditional brewers of beer, society strongly disapproves of their consumption of it (Mphi, 1994). In Tanzania, according to Henricson (1992), women are traditionally only permitted to drink beer on particular occasions, and certainly not in public houses. More recently, however, anecdotal evidence suggests that an increasing number of women consume alcohol outside the home. While gender differences in alcohol consumption may exist within certain communities, research shows that there are physiological differences between men and women that affect their sensitivity to alcohol (Ely *et al.*, 1999). For example, Ely *et al.* (1999) found that women are more likely to have a drinking problem for the same amount of alcohol consumption as men, which may be due to differences in metabolism rates or volume of body water.

Results from the few studies that have looked at predictors of alcohol use in sub-Saharan Africa show that occupation, marital status, age and tobacco use may be associated with alcohol use among men, while female predictors include marital and employment status and education (Mphi, 1994; Rijken *et al.*, 1998; Perdrix *et al.*, 1999; Siegfried *et al.*, 2001). Luginaah & Dakubo (2003) found that men in the Upper West region of Ghana drink mainly for coping reasons, whereas women drink socially.

Tanzania is a heterogeneous country, consisting of more than 130 ethnic groups, with different languages and cultures (CIA, 2004). Presently, traditionally brewed beer (*pombe*) makes up roughly 90% of all alcohol consumed in Tanzania (WHO, 2001). The different ethnic groups within Tanzania grow various crops throughout the year based on geographic and climatic conditions that influence their production of traditional brew (Tusekwa *et al.*, 2000; Kilonzo *et al.*, 2004). For example, the Chagga use bananas (*mbege*), while the Pare generally use sugar cane (*denegehua*) (Kilonzo *et al.*, 2004). Further, the production process is changing with the introduction of additives that accelerate fermentation (Kilonzo, 1990).

This paper focuses on alcohol consumption among the population of Moshi urban district (Moshi) in the Kilimanjaro region of Northern Tanzania. The Kilimanjaro region has traditionally been inhabited by members of the Chagga ethnic group, whose use and misuse of alcohol is an essential part of life (Maula, 1990; Setel, 1999). According to a study conducted in the late 1980s, the Kilimanjaro region has one of the highest levels of alcohol consumption in Tanzania (Henricson, 1992). Further, alcohol dependence as a disease is not generally acknowledged, in part because of the integration of alcohol in all aspects of social life in many traditional sub-Saharan African settings, as well as the ability to control intoxication through customs and social pressure (Carlson, 1992; Henricson, 1992; Kilonzo *et al.*, 2004). For example, alcohol plays an important part in maintaining the social rubric within and across communities, and is used as a form of payment to agricultural workers (McCall, 1996). Today, alcohol is often used as a part of the brideprice.

Due to population growth, the increased value of arable land used for coffee and banana cultivation, and Western influences, there has been substantial migration since the early 1900s from rural areas in the Kilimanjaro region and neighbouring regions to Moshi and other urban centres by both men and women (Setel, 1999). With the out-migration from rural areas and subsequent exposure to colonial institutions, socio-cultural traditions of the once rural population have adapted to the changing environments. For instance, during the economic crisis in the mid-1980s, it was not uncommon for people to supplement their income with money from brewing alcohol (Henricson, 1992). Kilonzo (1990) also suggests that production and consumption of alcohol are being carried out more and more for recreational and economic reasons rather than religious or ceremonial purposes. In addition, a pattern of binge drinking has been observed in East Africa (Kilonzo *et al.*, 2004). It is apparent that patterns and practices of alcohol use among the population of northern Tanzania have changed and are still changing with these social, cultural and economic trends. Given the relatively high prevalence of alcohol consumption in the Kilimanjaro region, the changing patterns of alcohol use, and the negative health and social outcomes associated with it, it is important to quantify the extent to which alcohol is currently being used, and to identify risk factors associated with it in order to influence programmes and policies addressing the use and abuse of alcohol in this community. The objective of this paper was to document the prevalence of and risk factors associated with alcohol abuse (as defined below) among women and their regular partners in Moshi in the Kilimanjaro region of northern Tanzania.

Methods

Community-based survey

This study used data from a community-based survey that was conducted from November 2002 to March 2003 in Moshi. The sample was selected using a two-stage cluster design developed by the Tanzania National Bureau of Statistics. First, 150 clusters were selected proportional to the number of women aged 20–44 from the 2002 census enumeration areas. A sample of eighteen households was then selected using systematic random sampling from each of the clusters in which all women aged 20–44 were eligible to be interviewed. Men who were listed as husbands or partners of these women were also eligible for individual interviews. Information was collected on fertility, infertility, family planning, marriage, sexual practices, symptoms of sexually transmitted diseases (STDs), socio-demographic characteristics, and husband–wife relations including domestic violence and alcohol use (Larsen *et al.*, 2007). In addition, blood and urine specimens were collected and tested for several STDs. The study protocol was approved by the Kilimanjaro Christian Medical Center (KCMC), the Tanzania National Institute for Medical Research, and the Institutional Review Boards of Harvard School of Public Health, University of Maryland, and Centers for Disease Control and Prevention.

The dependent variable, alcohol abuse, was measured by the CAGE questionnaire with yes/no answers to the following questions: (1) Have you ever felt you should *Cut down* on your drinking? (2) Have people *Annoyed* you by criticizing your drinking? (3)

Have you ever felt bad or *Guilty* about your drinking? (4) Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (*Eye-opener*)? The CAGE questionnaire is a validated assessment of alcohol abuse that is generally used as a clinical screening tool in primary care settings (Ewing, 1984). The CAGE score is defined as the number of affirmative answers to these questions ranging from zero to four. The cut-off boundary is site-specific, based on the characteristics of the environment in which it is used. In this study, a score of two or more marked a high likelihood of alcohol abuse. The dependent variable was binary: unlikely to have a drinking problem (CAGE score 0–1) or likely to have a drinking problem (alcohol abuse) (CAGE score 2–4).

The men, as described above, were partners of the women surveyed. Thus, the women were stratified: with partner (currently married or living with a man and $n=1200$) or without partner (widowed, divorced, separated or never been married or lived with a man and $n=614$) in order to match the analysis of the male partners ($n=788$).

Independent variables and possible confounders identified through the literature and theoretical reasoning were broken down into four categories: socio-demographic characteristics including age at survey, ethnic group, religion and education; sexual practices including first sexual experience (women only), first sexual partner and number of partners in last year; partner behaviour, including self-reported partner CAGE score (women only), a violence indicator (women only) and believing it is OK to hit one's partner (men only); and presence of STDs including currently having STD symptoms, laboratory confirmed HIV-1, HSV-2 and *Trichomonas vaginalis* (*T. vaginalis*).

Ethnic group was categorized as Chagga and 'other', which included all other ethnic groups. Religion was categorized as Christian and Muslim or other religious affiliation. Education was broken down into two categories: respondents with zero to eight years of schooling were defined as having less than secondary; and respondents with greater than eight years of schooling were defined as having secondary or higher education. Men's occupation was categorized as farmer, professional, shopkeeper or business, and all others including skilled and unskilled labour, retired, other, unemployed and 'missing'. Women's occupation was excluded as almost half (41%) of the women did not provide information about occupation. Men's average monthly income in the last year was categorized into six groups and was reported in Tanzanian shillings (Tsh). This variable was not captured in the women's survey as the women's income very much depended on the time of year (e.g. many women had relatively higher incomes in December because of sales and other income-generating activities related to Christmas).

Women's first sexual experience was categorized as consensual (the woman wanted to have sex), non-consensual but unforced (the woman did not want to have sex, but had it anyway) and forced (the woman did not want to have sex but was forced to have it). First sexual partner was categorized as wife/husband/cohabiting partner, regular non-cohabiting partner and 'other', which included other friend, casual acquaintance, commercial sex customer, relative and other. The variable 'ever had forced sex' was taken from the Sexual Experiences Survey (Koss & Oros, 1982): 'Within your present relationship/outside of your present relationship have you ever had sexual intercourse when you didn't want to because your husband or partner threatened or used some degree of physical force to make you? (Twisting your arm,

holding you down, etc.).' One item from the Conflict Tactics Scale (Straus, 1990) and two items from the Abuse Assessment Screen (McFarlane *et al.*, 1992) were used to ascertain 12-month and lifetime partner abuse combining physical and psychological types of violence reported by the women. These included: being insulted or sworn at; being threatened with physical abuse; and being hit, slapped, kicked or otherwise physically hurt. A positive response to any of the three items was counted to indicate the presence of intimate partner violence. Men who reported one or more of the following reasons to justify hitting his partner were categorized as 'OK to hit partner': she does not do the housework to satisfaction; she disobeys him; she refuses sex; she asks about girlfriends; she takes a long time to get pregnant; she is childless; he suspects she is unfaithful; or he finds out she is unfaithful.

Men and women who reported currently having any one of the following STD symptoms were categorized as such: deep lower abdominal pain; abnormal genital discharge; foul smell in genital area; excessive genital secretions; swelling of lymph nodes in genital area; itching in genital area; burning pain on micturition; deep pain during intercourse; genital ulcers or open sores; and others. The Cronbach α coefficient was determined for each of these last three indices. For partner violence $\alpha=0.71$ for women with partners, $\alpha=0.95$ for women without partners and for OK to hit partner $\alpha=0.62$ for men. The STD symptoms had $\alpha=0.69$ for women with partners, $\alpha=0.74$ for women without partners and $\alpha=0.63$ for men. While consenting men and women were tested for several STD infections, due to the likely high correlation between STD infections, HSV-2 was included as a non-treatable STD as well as a marker for prior STD infection, and *T. vaginalis* was included as a treatable STD. HIV-1 was included in the model for theoretical reasons. The correlation between HIV-1 and HSV-2 was 0.85, 0.83 and 0.86 for women with a partner, women without a partner and men, respectively. None of the variables was substantially different in models excluding HIV-1.

Laboratory analyses

HIV-1 infection was determined using an enzyme-linked immunosorbent assay (ELISA) (Vironostika HIV Uni-Form II plus O, Organon, Boxtel, the Netherlands) and reactive samples were confirmed using a second ELISA (Murex 1.2.0, Murex Biotech Ltd, England, UK). Indeterminate or conflicting results were resolved by Western blot (Genetic Systems HIV-1 Western blot, Bio-Rad Laboratories, Redmond, WA, USA). Antibodies to HSV-2 were detected using type-specific HSV-2 enzyme immune assay (EIA) according to the manufacturer's instructions (HerpeSelect 2 ELISA, Focus Technologies, Cypress, CA, USA). HIV-1 and HSV-2 tests were based on sera, while urine was used for testing of *T. vaginalis*. *T. vaginalis* was tested for using the real-time multiplex polymerase chain reaction (M-PCR) assay (Rotor-Gene 3000, Corbett Research, Australia).

Statistical analyses

Statistical analyses were performed using the STATA version 8 statistical package (Stata Corporation, College Station, TX, USA).

First, prevalence of ever-use of alcohol, alcohol abuse (as a 0–1 or 2–4 category CAGE score) and frequency of alcohol use in past year were presented for women with partners, women without partners and men (partners of the women with partners).

Second, the socio-demographic characteristics, sexual practices, partner practices and presence of STDs were compared between women with partners and women without partners using a Pearson's χ^2 test. This same comparison was carried out between women with partners and men (their male partners).

Third, the association between CAGE score (0–1 and 2–4) and socio-demographic characteristics, sexual practices, partner practices and presence of STDs was examined using a Pearson's χ^2 test for women with partners, women without partners and men.

Fourth, logistic regression was used to calculate crude odds ratios (ORs) and 95% confidence intervals (CIs) for all independent predictors of alcohol abuse for women with partners, women without partners and men. Next, adjusted models were calculated. The men's 'OK to hit' variable roughly approximated the women's partner violence variable. Only women gave information about first sexual experience and only women with partners provided information about the partner's CAGE score. The latter two variables were maintained in the adjusted models to preserve the information provided. These two variables did not affect the remaining variables substantively. Variables deemed important for theoretical reasons and variables associated with the CAGE score at the 0.20 level of significance were included in the adjusted models.

The risk factor analysis was replicated using frequency of alcohol use (at least once a week; at least once a month or less than once a month; never) and a three-category CAGE score (0–1; 2; 3–4) as the dependent variable, both of which resulted in similar models. The binary CAGE score (0–1; 2–4) is a validated measure of alcohol abuse (Ewing, 1984); therefore, the findings presented about risk factors of alcohol abuse in this paper were limited to models using the binary CAGE score.

Results

A total of 2019 women were interviewed. Of these, 176 women who reported never having had sex were removed from the data set as the survey instrument skipped questions relating to alcohol use and sexual risks for these respondents. Additionally, 29 women were omitted because they were missing data about the dependent or independent variables. The final data set included 1814 women (90% of the 2019 women interviewed): 1200 women with partners and 614 women without partners. A total of 794 husbands and partners of these women were interviewed. One man was omitted due to a missing response for the dependent variable. In addition, five men were removed due to missing data for one or more independent variables analysed. The final data set included 788 men (99% of the men interviewed).

Prevalence of ever use of alcohol (not shown) among women with partners was 50.8% (95% CI: 47.9–53.6) and slightly higher among women without partners at 57.5% (95% CI: 53.5–61.4). Among men, ever-use was much higher at 68.3% (95% CI: 64.9–71.5). While prevalence of alcohol abuse (CAGE score 2–4) was overall much

lower, the trends between the three groups were similar: prevalence of alcohol abuse was 7.0% (95% CI: 5.6–8.4) among women with partners, 9.3% (95% CI: 7.0–11.6) among women without partners, and more than double among men at 22.8% (95% CI: 19.9–25.8). Interestingly, 21.4% (95% CI: 19.1–23.7) of women reported having partners with alcohol abuse, which roughly approximates the men's own reports. Finally, with respect to frequency of drinking, 3.9% (95% CI: 2.9–5.2) of women with partners drank alcohol every day in the last year, compared with 4.6% (95% CI: 3.1–6.6) of women without partners and 15.9% (95% CI: 13.4–18.6) of men (not shown).

Table 1 shows characteristics of women with partners, women without partners and men. Women with and without partners were statistically different in reported age, ethnic group, religion, education, first sexual experience, first sexual partner, number of partners in last year and partner violence. Furthermore, women without partners had a higher prevalence of HIV-1 (11.2% versus 9.4%) and *T. vaginalis* (10.1% versus 9.1%). Women with partners differed from men in the following characteristics: age, ethnic group, education, first sexual partner and number of partners in last year. In addition, 26.9% of women with partners reported partner violence and 19.5% of men thought it acceptable to hit their partner for any reason; there was a higher prevalence of reported current STD symptoms among women with or without partners than men (25.8%, 24.3% versus 8.0%); and 47.4% of women with partners compared to 39.3% of men were HSV-2 positive.

Table 1 also presents differences in characteristics by CAGE score within the three groups. In general, there was more variability across the three groups than within each group. Among women with partners, first sexual experience, first sexual partner, partner violence and *T. vaginalis* infection were statistically different by CAGE score. A greater proportion of women who reported partner alcohol abuse (CAGE score 2–4) also reported abusing alcohol themselves compared with those reporting that their partner did not abuse alcohol (CAGE score 0–1) (17.1% versus 4.2%). In addition, alcohol abuse was more prevalent among Christians as compared with Muslims or others (9.1% versus 3.9% for women with a partner and 10.2% versus 7.2% for women without a partner).

Among women without partners, first sexual experience, number of partners and current STD symptoms were significantly different between those who abused alcohol and those who did not. For instance, a greater proportion of women who reported their first sexual experience as being forced also reported alcohol abuse as compared with women who reported their first sexual experience as being consensual (18.4% versus 8.7%).

Among men, ethnic group, religion, number of partners and OK to hit were statistically different between those who reported alcohol abuse and those who did not (greater proportions were Chagga, Christian, had two or more partners in the last year, and reported it was OK to hit). For all three STDs (HIV-1, HSV-2 and *T. vaginalis*), a greater proportion of men reporting alcohol abuse tested positive compared with those who did not.

Tables 2, 3 and 4 present results from the crude and adjusted logistic regression models for women and men by CAGE score (0–1, 2–4). The effects estimates were similar, but generally attenuated in the adjusted compared with crude models.

Table 1. Comparison of characteristics between women with partners, women without partners and men and by alcohol abuse as measured by CAGE score

Variable	Women with partners (N=1200)				p value ^a	Women without partners (N=614)				p value ^a	p value ^b	Men (N=788)				p value ^a	p value ^c
	Sample size		CAGE score 2-4			Sample size		CAGE score 2-4				Sample size		CAGE score 2-4			
	n	%	n	%		n	%	n	%			n	%	n	%		
Age at survey (years) ^d					0.74					0.54	<0.0001					0.19	<0.0001
20-24	258	21.5	14	5.4		215	35.0	18	8.4			155	19.7	28	18.1		
25-29	304	25.3	23	7.6		155	25.2	19	12.3								
30-34	280	23.3	21	7.5		86	14.0	7	8.1			194	24.6	42	21.6		
35-39	358	29.8	26	7.3		158	25.7	13	8.2			168	21.3	35	20.8		
40-44												126	16.0	35	27.8		
45+												145	18.4	40	27.6		
Ethnic group					0.08					0.09	<0.001					<0.001	0.01
Chagga	561	46.8	47	8.4		345	56.2	38	11.0			322	40.9	95	29.5		
Other	639	53.3	37	5.8		269	43.8	19	7.1			466	59.1	85	18.2		
Religion ^e					0.001					0.25	<0.0001					0.001	0.52
Christian	715	59.6	65	9.1		433	70.5	44	10.2			458	58.1	127	27.7		
Muslim, other	485	40.4	19	3.9		181	29.5	13	7.2			330	41.9	53	16.1		
Education ^f					0.44					0.75	0.04					0.57	0.001
Less than secondary	916	76.3	67	7.3		442	72.0	40	9.0			547	69.4	128	23.4		
Secondary or higher	284	23.7	17	6.0		172	28.0	17	9.9			241	30.6	52	21.6		
Occupation ^g																0.91	
Farmer												115	14.6	26	22.6		
Professional, business, shopkeeper												108	13.7	23	21.3		
Other												565	71.7	131	23.2		
Income (Tsh)																0.3	
0												44	5.6	12	27.3		
<30,000												129	16.4	36	27.9		
30,000-49,000												254	32.2	51	20.1		
50,000-69,000												163	20.7	31	19.0		

Alcohol abuse in northern Tanzania

Table 1. Continued

Variable	Women with partners (N=1200)				p value ^a	Women without partners (N=614)				p value ^a	p value ^b	Men (N=788)				p value ^a	p value ^c	
	Sample size		CAGE score 2-4			Sample size		CAGE score 2-4				Sample size		CAGE score 2-4				
	n	%	n	%		n	%	n	%			n	%	n	%			
70,000-99,000													80	10.2	18	22.5		
≥ 100,000													118	15.0	32	27.1		
First sexual experience					0.01					0.008	0.002							
Consensual	925	77.1	54	5.8		427	69.5	37	8.7									
Non-consensual, unforced	169	14.1	17	10.1		111	18.1	6	5.4									
Forced	106	8.8	13	12.3		76	12.4	14	18.4									
First sexual partner ⁱ					0.001					0.80	<0.0001					0.18	<0.0001	
Spouse/cohabiting partner	695	57.9	33	4.7		52	8.5	6	11.5			123	15.6	22	17.9			
Regular non-cohabiting partner	244	20.3	27	11.1		386	62.9	36	9.3			162	20.6	33	20.4			
Other	261	21.8	24	9.2		176	28.7	15	8.5			503	63.8	125	24.9			
Number partners in last year					0.68					0.001	<0.0001					<0.0001	<0.0001	
None	16	1.3	1	6.3		223	36.3	9	4.0									
One	1168	97.3	81	6.9		364	59.3	42	11.5			691	87.7	142	20.5			
Two or more	16	1.3	2	12.5		27	4.4	6	22.2			97	12.3	38	39.2			
Partner's CAGE score					<0.0001													
0-1	943	78.6	40	4.2														
2-4	257	21.4	44	17.1														
Partner violence/OK to hit ⁱ					<0.0001					0.45	<0.0001					0.02	<0.0001	
No	877	73.1	46	5.5		180	29.3	20	11.1			634	80.5	134	21.1			
Yes	323	26.9	38	13.3		128	20.8	13	10.2			154	19.5	46	29.9			
Missing						306	49.8	24	7.8									
Currently have STD symptoms ^j					0.27					0.001	0.47					0.15	<0.0001	
Yes	310	25.8	26	8.4		149	24.3	24	16.1			63	8.0	19	30.2			

Table 1. Continued

Variable	Women with partners (N=1200)				p value ^a	Women without partners (N=614)				p value ^a	p value ^b	Men (N=788)				p value ^a	p value ^c					
	Sample size		CAGE score 2-4			Sample size		CAGE score 2-4				Sample size		CAGE score 2-4								
	n	%	n	%		n	%	n	%			n	%	n	%							
No	890	74.2	58	6.5	0.39	465	75.7	33	7.1	0.85	0.002	725	92.0	161	22.2	0.004	0.16					
HIV-1 status																						
Positive	79	9.4	8	10.1			69	11.2	7			10.1			37			6.6	14	37.8		
Negative	765	63.8	55	7.2		364	59.3	35	9.6			525	66.6	129	24.6							
Not tested	356	29.7	21	5.9		181	29.5	15	8.3			226	28.7	37	16.4							
HSV-2 status					0.62					0.72	0.40						0.001	0.009				
Positive	400	47.4	30	7.5		188	30.6	20	10.6			221	39.3	68	30.8							
Negative	444	37.0	33	7.4		245	39.9	22	9.0			342	43.4	75	21.9							
Not tested	356	29.7	21	5.9		181	29.5	15	8.3			225	28.6	37	16.4							
<i>T. vaginalis</i>					0.04					0.08	0.02						<0.0001	0.14				
Yes	79	9.1	10	12.7		62	10.1	9	4.5			38	6.5	17	44.7							
No	789	65.8	58	7.4		377	61.4	38	10.1			546	69.3	130	23.8							
Not tested	332	27.7	16	4.8		175	28.5	10	5.7			204	25.9	33	16.2							
Total	1200		84	7.0		614		57	9.3			788		180	22.8							

^aPearson's χ^2 test comparing CAGE score 0-1 versus 2-4.

^bPearson's χ^2 test comparing characteristics between women with partners and women without partners.

^cPearson's χ^2 test comparing characteristics between women with partners and men.

^dAge categories for women: 20-24; 25-29; 30-34; 35-44. Age categories for men: 20-29; 30-34; 35-39; 40-44; 45+.

^eMuslim and other for women with partners: Muslim ($n=431$), none ($n=3$), other ($n=51$); women without partners: Muslim ($n=165$), none ($n=1$), other ($n=15$); Men: Muslim ($n=287$), none ($n=2$), other ($n=41$).

^fSecondary or higher education refers to having completed 9+ years of schooling.

^gOther includes skilled and unskilled labour, retired, other, unemployed and missing.

^hOther includes other friend, casual acquaintance, commercial sex customer, relative and other.

ⁱMen's OK to hit variable (yes/no) roughly approximates women's partner violence variable.

^jSTD symptoms include: deep lower abdominal pain, abnormal genital discharge, foul smell in genital area, excessive genital secretions, swelling of lymph nodes in genital area, itching in genital area, burning pain on micturition, deep pain during intercourse, genital ulcers or open sores, and others.

Table 2. Crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for characteristics associated with alcohol abuse for women with partners ($N=1200$)

Variable	Crude			Adjusted		
	OR	95% CI	<i>p</i> value ^a	OR	95% CI	<i>p</i> value
Age at survey (years)						
20–24	1.00			1.00		
25–29	1.43	0.72–2.83	0.31	1.20	0.59–2.48	0.61
30–34	1.41	0.70–2.84	0.33	1.17	0.56–2.45	0.68
35–44	1.36	0.70–2.67	0.36	1.18	0.57–2.43	0.65
Ethnic group						
Chagga	1.00			1.00		
Other	0.67	0.43–1.05	0.08	0.99	0.60–1.66	0.98
Religion ^b						
Christian	2.45	1.45–4.15	0.001	1.80	0.99–3.26	0.05
Muslim, other	1.00			1.00		
Education ^c						
Less than secondary	1.24	0.72–2.15	0.44	1.21	0.67–2.19	0.53
Secondary or higher	1.00			1.00		
First sexual experience						
Consensual	1.00			1.00		
Non-consensual, unforced	1.80	1.02–3.20	0.04	1.43	0.77–2.66	0.26
Forced	2.25	1.19–4.29	0.01	1.25	0.61–2.55	0.54
First sexual partner ^d						
Husband/cohabiting partner	1.00			1.00		
Regular non-cohabiting partner	2.50	1.47–4.25	0.001	2.07	1.16–3.70	0.01
Other	2.03	1.18–3.51	0.01	1.65	0.91–2.99	0.10
Number partners in last year						
None	1.00			1.00		
One	1.12	0.15–8.57	0.92	1.72	0.20–14.50	0.62
Two or more	2.14	0.17–26.33	0.55	1.26	0.09–17.02	0.86
Partner's CAGE score						
0–1	1.00			1.00		
2–4	4.66	2.96–7.34	<0.001	3.47	2.11–5.71	<0.0001
Partner violence ^e						
No	1.00			1.00		
Yes	2.40	1.53–3.76	<0.001	1.49	0.88–2.50	0.140
Currently have STD symptoms ^f						
Yes	1.31	0.81–2.13	0.27	0.92	0.54–1.57	0.76
No	1.00			1.00		
HIV-1 status						
Positive	1.45	0.67–3.18	0.35	1.42	0.62–3.27	0.41
Negative	1.00			1.00		
Not tested	0.81	0.48–1.36	0.42			

Table 2. Continued

Variable	Crude			Adjusted		
	OR	95% CI	<i>p</i> value ^a	OR	95% CI	<i>p</i> value
HSV-2 status						
Positive	1.01	0.60–1.69	0.97	0.81	0.46–1.42	0.46
Negative	1.00			1.00		
Not tested	0.78	0.44–1.37	0.39	1.55	0.66–3.63	0.32
<i>T. vaginalis</i>						
Yes	1.83	0.89–3.73	0.10	1.47	0.67–3.20	0.33
No	1.00			1.00		
Not tested	0.64	0.36–1.13	0.12	0.56	0.23–1.34	0.19

^aWald test.

^bMuslim and other: Muslim (*n*=431), none (*n*=3), other (*n*=51).

^cSecondary or higher education refers to having completed 9+ years of schooling.

^dOther includes other friend, casual acquaintance, commercial sex customer, relative and other.

^eDefined as a positive response to any one of the following: being insulted or sworn at by a partner; being threatened with physical abuse by a partner; or being hit, slapped, kicked or otherwise physically hurt by a partner.

^fSTD symptoms include: deep lower abdominal pain, abnormal genital discharge, foul smell in genital area, excessive genital secretions, swelling of lymph nodes in genital area, itching in genital area, burning pain on micturition, deep pain during intercourse, genital ulcers or open sores, and others.

With respect to the effects of socio-demographic characteristics, Christians had greater odds of a high CAGE score (2–4) relative to Muslims or other for women with partners (OR=1.80; 95% CI: 0.99–3.26) and for men (OR=1.69; 95% CI: 1.08–2.62).

Sexual practices were highly predictive of alcohol abuse. For instance, reporting two or more partners in the last year relative to none was associated with higher alcohol abuse among women without partners (OR=8.75; 95% CI: 2.37–32.31), while the number of partners did not matter for the group of women with partners. Men with two or more partners relative to one also had higher odds of alcohol abuse (OR=2.37; 95% CI: 1.45–3.86). HIV-1, HSV-2 and *T. vaginalis* infections were non-significant for women with and without partners, while men with *T. vaginalis* at the survey date had more than double the odds of a high CAGE score (OR=2.93; 95% CI: 1.42–6.03) in the adjusted model.

Finally, for women with a partner, the most important predictor of alcohol abuse was the partner's CAGE score, i.e. women whose partner scored 2–4 on the CAGE scale were more likely to abuse alcohol themselves (OR=3.47; 95% CI: 2.11–5.71). It should be noted that in the adjusted model, controlling for partner's CAGE score and first sexual partner made the effects of partner violence and first sexual experience non-significant.

Table 3. Crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for characteristics associated with alcohol abuse for women without partners ($N=614$)

Variable	Crude			Adjusted		
	OR	95% CI	<i>p</i> value ^a	OR	95% CI	<i>p</i> value
Age at survey (years)						
20–24	1.00			1.00		
25–29	1.53	0.77–3.02	0.22	1.65	0.78–3.50	0.19
30–34	0.97	0.39–2.41	0.95	0.95	0.34–2.69	0.93
35–44	0.98	0.47–2.07	0.96	1.64	0.67–3.99	0.28
Ethnic group						
Chagga	1.00			1.00		
Other	0.61	0.35–1.09	0.10	0.67	0.34–1.33	0.26
Religion ^b						
Christian	1.46	0.77–2.79	0.25	1.35	0.62–2.94	0.44
Muslim, other	1.00			1.00		
Education ^c						
Less than secondary	0.91	0.50–1.65	0.75	0.80	0.40–1.60	0.53
Secondary or higher	1.00			1.00		
First sexual experience						
Consensual	1.00			1.00		
Non-consensual, unforced	0.60	0.25–1.47	0.26	0.67	0.27–1.69	0.4
Forced	2.38	1.22–4.66	0.01	1.99	0.93–4.24	0.08
First sexual partner ^d						
Husband/cohabiting partner	1.00			1.00		
Regular non-cohabiting partner	0.79	0.32–1.97	0.61	0.69	0.25–1.93	0.49
Other	0.71	0.26–1.95	0.51	0.64	0.21–1.92	0.42
Number partners in last year						
None	1.00			1.00		
One	3.10	1.48–6.50	0.003	3.38	1.49–7.67	0.004
Two or more	6.79	2.20–20.95	0.001	8.75	2.37–32.31	0.001
Partner violence ^e						
No	1.00			1.00		
Yes	0.90	0.43–1.89	0.79	1.01	0.43–2.35	0.98
Missing	0.68	0.36–1.27	0.23	0.98	0.48–1.96	0.94
Currently have STD symptoms ^f						
Yes	2.51	1.43–4.41	0.001	1.87	0.98–3.56	0.06
No	1.00			1.00		
HIV-1 status						
Positive	1.06	0.45–2.50	0.89	0.83	0.33–2.07	0.68
Negative	1.00			1.00		
Not tested	0.85	0.45–1.60	0.61	1.95	0.77–4.94	0.16
HSV-2 status						
Positive	1.21	0.64–2.28	0.56	1.05	0.51–2.14	0.9
Negative	1.00			1.00		
Not tested	0.92	0.46–1.82	0.80			

Table 3. *Continued*

Variable	Crude			Adjusted		
	OR	95% CI	<i>p</i> value ^a	OR	95% CI	<i>p</i> value
<i>T. vaginalis</i>						
Yes	1.51	0.69–3.31	0.30	1.78	0.74–4.28	0.2
No	1.00			1.00		
Not tested	0.54	0.26–1.11	0.10	0.45	0.17–1.25	0.13

^aWald test.

^bMuslim and other: Muslim ($n=165$), none ($n=1$), other ($n=15$).

^cSecondary or higher education refers to having completed 9+ years of schooling.

^dOther includes other friend, casual acquaintance, commercial sex customer, relative and other.

^eDefined as a positive response to any one of the following: being insulted or sworn at by a partner; being threatened with physical abuse by a partner; or being hit, slapped, kicked or otherwise physically hurt by a partner.

^fSTD symptoms include: deep lower abdominal pain, abnormal genital discharge, foul smell in genital area, excessive genital secretions, swelling of lymph nodes in genital area, itching in genital area, burning pain on micturition, deep pain during intercourse, genital ulcers or open sores, and others.

Discussion

The results of this study showed that alcohol abuse exists in the general population in Moshi. It was more prevalent among men than women, and there was no significant difference between women with and without partners. While less than 10% of women had a CAGE score of 2–4, almost one quarter of men scored 2–4. This pattern corresponded with the ever-use of alcohol for which men reported a higher prevalence than women. However, this study involving a community-based sample indicated that the level of alcohol abuse among Moshi women was much lower than the 35% found among a group of bar and hotel workers in the same region (Kapiga *et al.*, 2007). Women's perceptions of alcohol abuse in their male partners approximated closely what the men themselves reported. In general, Chagga men and Christian men and women with partners were more likely to report higher CAGE scores. These findings were not surprising given the history of the region. One male interviewee in a qualitative study conducted by P. Setel claims, 'Chagga are boozers'. Otherwise, socio-demographic characteristics were not related to alcohol abuse.

Education was not significantly associated with alcohol abuse (a 2–4 CAGE score). Preliminary analyses showed that occupation and income were not significantly associated with alcohol abuse among men and those variables could not be measured among women. It is therefore difficult to determine how wealth may interact with alcohol consumption and abuse, and to support the theory presented in the introduction suggesting that economic development leads to higher alcohol consumption (Room, 2002). However, Moshi is relatively well-developed compared to many other areas of Tanzania or the East African region in general, and it is possible that

Table 4. Crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for characteristics associated with alcohol abuse for men ($N=788$)

Variable	Crude			Adjusted		
	OR	95% CI	<i>p</i> value ^a	OR	95% CI	<i>p</i> value
Age at survey (years)						
20–29	1.00			1.00		
30–34	1.25	0.74–2.14	0.41	1.34	0.75–2.37	0.32
35–39	1.19	0.69–2.08	0.53	1.21	0.67–2.20	0.53
40–44	1.74	0.99–3.07	0.05	1.69	0.91–3.14	0.09
45+	1.73	0.99–2.99	0.05	1.72	0.93–3.18	0.08
Ethnic group						
Chagga	1.00			1.00		
Other	0.53	0.38–0.75	<0.001	0.64	0.43–0.97	0.03
Religion ^b						
Christian	2.01	1.40–2.87	<0.0001	1.69	1.08–2.62	0.02
Muslim, other	1.00			1.00		
Education ^c						
Less than secondary	1.11	0.77–1.60	0.57	1.16	0.74–1.80	0.52
Secondary or higher	1.00			1.00		
Occupation ^d						
Farmer	1.00			1.00		
Professional, business, shopkeeper	0.93	0.49–1.75	0.81	1.19	0.58–2.43	0.63
Other	1.03	0.64–1.67	0.89	1.40	0.83–2.38	0.21
Income (Tsh)						
0	1.00			1.00		
<30,000	1.16	0.54–2.48	0.70	1.28	0.55–2.98	0.57
30,000–49,000	0.75	0.37–1.55	0.44	0.76	0.34–1.70	0.51
50,000–69,000	0.70	0.33–1.51	0.37	0.73	0.31–1.68	0.45
70,000–99,000	0.87	0.37–2.01	0.75	0.89	0.35–2.24	0.81
≥100,000	1.17	0.54–2.53	0.69	1.38	0.57–3.34	0.47
First sexual partner ^e						
Wife/cohabiting partner	1.00			1.00		
Regular non-cohabiting partner	1.17	0.65–2.14	0.60	0.94	0.49–1.81	0.86
Other	1.52	0.92–2.51	0.10	1.31	0.76–2.25	0.33
Number partners in last year						
One	1.00			1.00		
Two or more	2.49	1.59–3.90	<0.0001	2.37	1.45–3.86	0.001
OK to hit partner ^f						
Yes	1.59	1.07–2.36	0.02	1.79	1.16–2.77	0.01
No	1.00			1.00		
Currently have STD symptoms ^g						
Yes	1.51	0.86–2.66	0.15	1.06	0.56–2.00	0.86
No	1.00			1.00		
HIV-1 status						
Positive	1.87	0.93–3.74	0.08	1.53	0.72–3.28	0.27
Negative	1.00			1.00		
Not tested	0.60	0.40–0.90	0.01	0.86	0.42–1.78	0.69

Table 4. Continued

Variable	Crude			Adjusted		
	OR	95% CI	<i>p</i> value ^a	OR	95% CI	<i>p</i> value
HSV-2 status						
Positive	1.58	1.08–2.32	0.02	1.32	0.87–2.02	0.20
Negative	1.00			1.00		
Not tested	0.70	0.45–1.08	0.11			
<i>T. vaginalis</i>						
Yes	2.59	1.33–5.06	0.01	2.93	1.42–6.03	0.004
No	1.00			1.00		
Not tested	0.62	0.41–0.94	0.03	0.76	0.37–1.57	0.46

^aWald test.

^bMuslim and other: Muslim ($n=287$), none ($n=2$), other ($n=41$).

^cSecondary or higher education refers to having completed 9+ years of schooling.

^dOther includes skilled and unskilled labour, retired, other, unemployed and missing

^eOther includes other friend, casual acquaintance, commercial sex customer, relative and other.

^fDefined as men who reported one or more of the following reasons to justify hitting his partner: she does not do the housework to satisfaction; she disobeys him; she refuses sex; she asks about girlfriends; she takes a long time to get pregnant; she is childless; he suspects she is unfaithful; or he finds out she is unfaithful.

^gSTD symptoms include: deep lower abdominal pain, abnormal genital discharge, foul smell in genital area, excessive genital secretions, swelling of lymph nodes in genital area, itching in genital area, burning pain on micturition, deep pain during intercourse, genital ulcers or open sores, and others

community development, rather than individual development, affects levels of alcohol abuse. This is a question that could be addressed in subsequent analyses.

Partner's CAGE score was the foremost important predictor of alcohol abuse for women with partners, while for women without partners sexual risk factors were the main predictors. For men, both sexual risk factors and partner relations were associated with alcohol abuse. However, the direction of the association between sexual behaviours, partner relations and alcohol abuse cannot be determined on the basis of a cross-sectional study. Further longitudinal studies are warranted to assess the direction of these associations.

Despite the rough approximation of intimate partner violence, women with partners with CAGE scores 2–4 were more than twice as likely to report partner violence, although this association was non-significant in the adjusted model. This finding corresponded to the results of a study conducted in South Africa by Jewkes *et al.* (2003). Similarly, men who admitted to a number of reasons for hitting their partners were at greater risk of alcohol abuse. These associations point to a link between partner violence and alcohol abuse that should be further explored. Again, the direction of this association is unclear.

Risky sexual behaviour – specifically reporting more than two partners in the last year – was associated with alcohol abuse among men and women without a partner.

Women without a partner, who reported current STD symptoms, were more likely to abuse alcohol than women who had no symptoms, although the association was not significant in the adjusted model. Similarly, men who tested positive for *T. vaginalis* were also more likely to report alcohol abuse than those who did not. These associations, together with multiple partners, point to an association between sexual risk and alcohol abuse that must also be further explored. However, unlike Kapiga *et al.* (2003), who found an association between HSV-2 and alcohol use in a group of bar and hotel workers in Moshi, there was no significant relationship between HSV-2 and alcohol abuse in any of the three groups in this study (the crude association was significant for men ($p=0.02$), but the adjusted was non-significant ($p=0.20$)).

There are some limitations associated with this study. First, only women with sexual experience were included in the analyses. While consequently, the results may not be generalizable across all women, the vast majority of non-sexually experienced women were younger than age 25 and age was not linked to alcohol use. By analysing only sexually experienced women the analyses were able to look specifically at sexual practices and STDs that were presented in the literature as being important predictors of alcohol abuse. The sample of women was divided into those with and without partners to allow for a comparison with men (partners of the women). Women who reported never having had sex were primarily a subset of women without partners. Second, only 794 male partners were questioned out of a possible 1233 (64%) and 788 men were analysed (64%). It is unclear how the men who were not represented in the survey were different from those who were included. Men are generally more difficult to survey due to their mobility, particularly in this region, and therefore capturing 64% of all possible partners may be considered a reasonable response rate among the men. Finally, only men with a female partner were analysed and they may have different alcohol use patterns than single men.

In sum, a proportion of both men (23%) and women (7–9%) in Moshi in northern Tanzania reported alcohol abuse. While past studies may reflect the societal acceptance of such behaviour, it is important to explore further the association between risky sexual behaviours and alcohol abuse, and the potential risk of HIV infection and other STDs. While this study was exploratory in nature, it highlights the need to address alcohol abuse as a potential risk factor for unhealthy behaviours.

Acknowledgments

This research was funded by grant NIH/NICHD RO1 HD41202 to Ulla Larsen. Said Aboud and his colleagues from the Tanzania National Bureau of Statistics were responsible for the survey work. The authors would also like to acknowledge the contribution of the local interviewers, the data entry personnel and the laboratory staff.

References

- Andrews, C. N., Kobusingye, O. C. & Lett, R. (1999) Road traffic accident injuries in Kampala. *East Africa Medical Journal* **76**, 189–194.

- Ao, T. T., Sam, N. E., Masenga, E. J., Seage, G. R. & Kapiga, S. H. (2006) Human immunodeficiency virus type 1 among bar and hotel workers in northern Tanzania: the role of alcohol, sexual behavior, and herpes simplex virus type 2. *Sexually Transmitted Diseases* **33**, 163–169.
- Carlson, R. G. (1992) Symbolic mediation and commoditization: a critical examination of alcohol use among the Haya of Bukoba, Tanzania. *Medical Anthropology* **15**, 41–62.
- Central Intelligence Agency (CIA) (2004) *The World Factbook 2004: Tanzania*. Washington DC, <http://www.cia.gov/cia/publications/factbook/geos/tz.html#People>.
- Edwards, R., Unwin, N., Mugusi, F., Whiting, D., Rashid, S., Kissima J. *et al.* (2000) Hypertension prevalence and care in an urban and rural area of Tanzania. *Journal of Hypertension* **18**, 145–152.
- Ely, M., Hardy, R., Longford, N. T. & Wadsworth, M. E. (1999) Gender differences in the relationship between alcohol consumption and drinking problems are largely accounted for by body water. *Alcohol and Alcoholism* **34**, 894–902.
- Ewing, J. A. (1984) Detecting alcoholism: the CAGE questionnaire. *Journal of the American Medical Association* **252**(14), 1905–1907.
- Ezzati, M., Lopez, A. D., Rodgers, A., Vander Hoorn, S. & Murray, C. J. (2002) Selected major risk factors and global and regional burden of disease. *Lancet* **360**, 1347–1360.
- Fatoye, F. O. (2003) Psychosocial correlates of substance use amongst secondary school students in South Western Nigeria. *East Africa Medical Journal* **80**, 154–158.
- Henricson, C. G. (1992) Alcohol consumption in the Kilimanjaro area. In Kilonzo, G. P. & Pitkanen, Y. T. (eds) *Pombe: Report of Alcohol Research Project in Tanzania, 1988–90*. University of Helsinki Institute of Development Studies, Helsinki, Finland.
- Jewkes, R. (2002) Intimate partner violence: causes and prevention. *Lancet* **359**, 1423–1429.
- Jewkes, R. K., Levin, J. B. & Penn-Kekana, L. A. (2003) Gender inequalities, intimate partner violence and HIV prevention practices: findings of a South African cross-sectional study. *Social Science and Medicine* **56**, 125–134.
- Kaaya, S. F., Kilonzo, G. P., Semboja, A. & Matowo, A. (1992) Prevalence of substance abuse among secondary school students in Dar es Salaam. *Tanzania Medical Journal* **7**, 21–24.
- Kapiga, S. H., Sam, N. E., Bang, H., Ni, T., Quanhong, N., Trong, T. H. *et al.* (2007) The role of herpes simplex virus type 2 and other genital infections in the acquisition of HIV-1 among high-risk women in northern Tanzania. *Journal of Infectious Diseases* **195**, 1260–1269.
- Kapiga, S. H., Sam, N. E., Shao, J. F., Masenga, E. J., Renjifo, B., Kiwelu, I. E. *et al.* (2003) Herpes simplex virus type 2 infection among bar and hotel workers in northern Tanzania: prevalence and risk factors. *Sexually Transmitted Diseases* **30**, 187–192.
- Kapiga, S. H., Sam, N. E., Shao, J. F., Renjifo, B., Masenga, E. J., Kiwelu, I. E. *et al.* (2002) HIV-1 epidemic among female bar and hotel workers in northern Tanzania: risk factors and opportunities for prevention. *Journal of Acquired Immune Deficiency Syndrome* **29**, 409–417.
- Kilonzo, G. P. (1990) Production and consumption of alcohol in Tanzania and alcohol-related accidents: an interdisciplinary study. In Maula, J., Lindblad, M. & Tigerstedt, C. (eds) *Alcohol in Developing Countries: Proceedings from a Meeting in Oslo, Norway, August 7–9, 1988*. Nordic Council for Alcohol and Drug Research (NAD) (No. 18), Helsinki, Finland.
- Kilonzo, G. P. (1992) Consumption of alcohol in Tanzania: country description. In Kilonzo, G. P. & Pitkanen, Y. T. (eds) *Pombe: Report of Alcohol Research Project in Tanzania, 1988–90*. University of Helsinki Institute of Development Studies, Helsinki, Finland.
- Kilonzo, G. P., Hogan, N. M., Mbwambo, J. K., Mamuya, B. & Kilonzo, K. (2004) Pilot studies on patterns of consumption of nonindustrial alcohol beverages in selected sites, Dar es Salaam, Tanzania. In Haworth, A. & Simpson, R. (eds) *Moonshine Markets: Issues in Unrecorded Alcohol Beverage Production and Consumption*. Brunner-Routledge, New York.

- Kilonzo, G. P. & Maselle, A. Y.** (1986) Substance misuse in Tanzania. *Tanzania Medical Journal* **3**, 21–22.
- Koenig, M. A., Lutalo, T., Zhao, F., Nalugoda, F., Kiwanuka, N., Wabwire-Mangen, F. et al.** (2004) Coercive sex in rural Uganda: prevalence and associated risk factors. *Social Science and Medicine* **58**, 787–798.
- Koenig, M. A., Lutalo, T., Zhao, F., Nalugoda, F., Wabwire-Mangen, F., Kiwanuka, N. et al.** (2003) Domestic violence in rural Uganda: evidence from a community-based study. *Bulletin of the World Health Organization* **81**, 53–60.
- Koss, M. P. & Oros, C. J.** (1982) Sexual Experiences Survey: a research instrument investigating sexual aggression and victimization. *Journal of Consultative Clinical Psychology* **50**, 455–457.
- Larsen, U., Mlay, J., Aboud, S., Ballard, R., Sam, N., Shao, J. & Kapiga, S.** (2007) Design of a community-based study of sexually transmitted infections/HIV and infertility in an urban area of Northern Tanzania. *Sexually Transmitted Diseases* **34**(1), 20–24.
- Luginaah, I. & Dakubo, C.** (2003) Consumption and impacts of local brewed alcohol (*akpeteshie*) in the Upper West Region of Ghana: a public health tragedy. *Social Science and Medicine* **57**, 1747–1760.
- McCall, M.** (1996) Rural brewing, exclusion, and development policy-making. *Gender and Development* **4**, 29–38.
- McFarlane, J., Parker, B., Soeken, K. & Bullock, L.** (1992) Assessing for abuse during pregnancy: severity and frequency of injuries and associated entry into prenatal care. *Journal of the American Medical Association* **267**, 3176–3178.
- Maula, J.** (1990) Research in the production and consumption of alcohol in Tanzania: some preliminary reflections. In Maula, J., Lindblad, M. & Tigerstedt, C. (eds) *Alcohol in Developing Countries: Proceedings from a Meeting in Oslo, Norway, August 7–9, 1988*. Nordic Council for Alcohol and Drug Research (NAD) (No. 18), Helsinki, Finland.
- Mphi, M.** (1994) Female alcoholism problems in Lesotho. *Addiction* **89**, 945–949; discussion 951–960.
- Nikander, P., Honkanen, R., Huttunen, P., Kilonzo, G. P. & Pitkanen, Y. T.** (1992) Role of alcohol in injuries treated in the Muhimbili Medical Centre casualty department, Dar es Salaam, Tanzania. In Kilonzo, G. P. & Pitkanen, Y. T. (eds) *Pombe: Report of Alcohol Research Project in Tanzania, 1988–90*. University of Helsinki Institute of Development Studies, Helsinki, Finland.
- Odero, W.** (1998) Alcohol-related road traffic injuries in Eldoret, Kenya. *East Africa Medical Journal* **75**, 708–711.
- Odero, W., Garner, P. & Zwi, A. B.** (1997) Road traffic injuries in developing countries: a comprehensive review of epidemiological studies. *Tropical Medicine and International Health* **2**, 445–460.
- Odero, W. & Zwi, A. B.** (1997) Drinking and driving in an urban setting in Kenya. *East Africa Medical Journal* **74**, 675–679.
- Perdrix, J., Bovet, P., Larue, D., Yersin, B., Burnand, B. & Paccaud, F.** (1999) Patterns of alcohol consumption in the Seychelles Islands (Indian Ocean). *Alcohol and Alcoholism* **34**, 773–785.
- Rijken, T., Velema, J. P. & Dijkstra, R.** (1998) Alcohol consumption in the rural population of Misungwi subdistrict in Mwanza Region, Tanzania. *Journal of the Studies of Alcohol* **59**, 146–151.
- Room, R. V.** (2002) *Alcohol and the Developing World: A Public Health Perspective*. Finnish Foundation for Alcohol Studies in collaboration with World Health Organization, Helsinki.
- Sa, Z. & Larsen, U.** (2007) Gender inequality and HIV-I infection among women in Moshi, Tanzania. *Journal of Biosocial Science* (in press).

- Secretary of Health and Human Services (HHS)** (2000) *10th Special Report to the US Congress on Alcohol and Health: Highlights from Current Research*. US Department of Health and Human Services, Washington, DC.
- Setel, P. W.** (1999) *A Plague of Paradoxes: AIDS, Culture and Demography in Northern Tanzania*. University of Chicago Press, Chicago and London.
- Shayo, N. B., Kamala, A., Gidamis, A. B. & Nnko, S. A.** (2000) Aspects of manufacture, composition and safety of *orubisi*: a traditional alcoholic beverage in the north-western region of Tanzania. *International Journal of Food Sciences and Nutrition* **51**, 395–402.
- Siegfried, N., Parry, C. D., Morojele, N. K. & Wason, D.** (2001) Profile of drinking behaviour and comparison of self-report with the CAGE questionnaire and carbohydrate-deficient transferrin in a rural Lesotho community. *Alcohol and Alcoholism* **36**, 243–248.
- Straus, M.** (1990) The conflict tactics scale revisited. In Straus, M. A. & Gelles, R. (eds) *Physical Violence in Families*. Transaction Publishers, New Brunswick, NJ.
- Suter, P. M.** (2004) Alcohol, nutrition and health maintenance: selected aspects. *Proceedings of the Nutrition Society* **63**, 81–88.
- Tusekwa, A. B., Mosha, T. C., Laswai, H. S. & Towo, E. E.** (2000) Traditional alcoholic beverages of Tanzania: production, quality and changes in quality attributes during storage. *International Journal of Food Science and Nutrition* **51**, 135–143.
- World Health Organization (WHO)** (2001) *Global Status Report on Alcohol*. WHO, Geneva.
- World Health Organization (WHO)** (2002) *World Health Report 2002*. WHO, Geneva.