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Alcohol Use and Abuse among Rural Zimbabwean Adults: A Test of a Community-Level Intervention

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Abstract

Background—Understanding what factors contribute to alcohol abuse in resource-poor countries is important given its adverse health consequences. Past research shows that social peers influence substance abuse, suggesting that the social environment may be an effective target for reducing alcohol abuse across a population. This study investigates the determinants of alcohol use and abuse in rural Zimbabwe and tests a Community Popular Opinion Leader (CPOL) community-based intervention partly directed at reducing alcohol abuse.

Methods—Tests were conducted on the impact of the CPOL intervention on alcohol use patterns across communities in rural Zimbabwe over three waves from 2003 to 2007, including community- and individual-level tests using data based on in-person interviews of adult men and women (ages 18 to 30; N = 5,543). Data were analyzed using paired-sample *t*-tests, as well as logistic and ordinary least-squares regression with random effects.

Results—Higher drinking (any use, more frequent use, greater quantity, and/or frequent drunkenness) was generally associated with being male, older, not married, more highly educated, of Shona ethnicity, away from home frequently, employed, having no religious affiliation, or living in areas with a higher crude death rate or lower population density. Over the study period, significant declines in alcohol use and abuse were found in intervention and control sites at relatively equal levels.

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Contributors

Cubbins, Kasprzyk, Montano, and Woelk designed the study and wrote the protocol. Cubbins and Jordan managed the literature searches and summaries of previous related work. Kasprzyk, Montano, and Woelk managed the data collection and intervention. Cubbins and Jordan prepared the data, and Cubbins carried out the analysis and the preparation of the final draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of Interest

All authors declare they have no conflicts of interest.

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Conclusions—Although no support was found for the effectiveness of the CPOL study in reducing alcohol abuse, Zimbabwe is similar to other countries in the impact of socio-demographic and cultural factors on alcohol use and abuse.

Keywords

Alcohol use and abuse; Zimbabwe; Africa; Community intervention; Panel study; Popular opinion leader

1. INTRODUCTION

Understanding what factors contribute to alcohol misuse is important given its health consequences, and this is especially so in societies with few resources to address the harmful effects of alcohol abuse (Obot, 2006), including its links to high-risk sexual behaviors and HIV. Hahn and colleagues (2011) have noted that there is a lack of longitudinal studies specifically addressing alcohol consumption among those at risk for or already infected with HIV in sub-Saharan Africa (SSA; Hahn et al., 2011). The present study seeks to fill this gap by investigating alcohol use and abuse in rural Zimbabwe over a two-year period and testing the impact of a community-level intervention in reducing alcohol misuse.

Although there is limited information on alcohol use in Zimbabwe and other parts of SSA, statistics reported by the World Health Organization (2011) indicate that the high level of lifetime abstinence among men (58.1%) and women (91.6%) in Zimbabwe. Average per capita consumption between 2003 and 2005 was 5.1 liters among Zimbabweans 15 years or older, of which approximately 20 percent was non-standard or unrecorded alcohol consumption (e.g., consumption of homemade or informally produced alcohol whether legal or illegal, smuggled alcohol, alcohol intended for industrial or medical uses, alcohol obtained through cross-border shopping; Obot, 2006; World Health Organization 2004, 2011). Among drinkers 15 years or older, 39 percent of men and 20 percent of women were heavy episodic drinkers (i.e., drank at least 60 grams or more of pure alcohol at least once per week). In addition, the average (2003–2005) per capita liters of alcohol consumed by drinkers in Zimbabwe was 35.3 (World Health Organization, 2011). Although alcohol is often used in ceremonies and rituals, it is primarily consumed in commercial social contexts (e.g., bottle stores, beer halls; Garbus and Khumalo-Sakutukwa, 2003) with men being more likely than women to drink in beer halls or bottle stores. The current research provides additional information on what factors contribute to alcohol use and abuse in rural Zimbabwe and on the effectiveness of an intervention aimed partly at reducing alcohol abuse.

1.1 Background

Past research has shown that both individual and community are related to alcohol consumption. For example, age, gender, marital status, socioeconomic status (SES), and religious and other cultural influences have each been linked to levels of alcohol use (e.g., Adelekan et al., 1993; Hahn et al., 2011; Hargreaves, 2002; Luczak et al., 2002). Peers also can have strong effects on substance use (Camlin and Snow, 2008; Mbizvo et al., 1995; Ndlovu and Sihlangu, 1992), suggesting that the social environment may be an effective intervention target for reducing alcohol abuse across a population.

Some community-level interventions that draw on peer influences have been found to be effective in changing a community's social norms and cultural environment regarding risk-taking behaviors (e.g., Rogers, 1995; Rogers and Kincaid, 1981). Based on the theory of diffusion of innovations (Kelly et al., 1991; Kelly et al., 1992a; Kelly et al., 1992b), the Community Popular Opinion Leader (CPOL) intervention uses popular individuals or

opinion leaders in a community to spread culturally-specific health-related messages to their friends and neighbors through casual conversations delivered in their own words (Kelly, 1999; Kelly et al., 1997; St. Lawrence et al., 1994). The intervention is targeted at the individual level but is expected to diffuse throughout a community via word of mouth and social normative influence. The relative low cost and low technology of this intervention (Kelly, 1999; Pinkerton et al., 1998; St. Lawrence et al., 1994), as well as the ease in implementing the intervention, makes it particularly suitable for rural areas in Zimbabwe where resources are often scarce.

1.2 The Current Study

The current study was an addition to an NIMH AIDS Collaborative Trial involving a two-armed randomized, controlled trial of a CPOL intervention designed to decrease STD rates by addressing sexual and other risk behaviors, including alcohol abuse. The target population was adults (ages 18 to 30) in rural communities in Zimbabwe who were followed over a two-year period. The trial offered an opportunity to evaluate the impact on alcohol use in rural Zimbabwe of a CPOL intervention that conveyed message of *not drinking alcohol excessively*. In this study, we address three research questions. First, what is the impact of socio-demographic, cultural, and provincial characteristics on adult alcohol use in rural Zimbabwe? Second, how effective is the CPOL intervention in reducing alcohol abuse in rural Zimbabwe? And, third, given that peers may have a larger impact on males than females (e.g., Lundborg, 2006), does the intervention effect vary by gender?

2. METHODS

2.1 Intervention

For the study, thirty rural communities were selected from a set of communities designated as growth points (GPs) for economic development by the Zimbabwe state. The thirty GPs were selected for size, population stability, and minimum number (at least 5) of social venues, such as bottle stores and general dealers. Sample communities were paired based on geographic proximity and then randomly assigned to either the intervention or control group. The selected sample communities tended to have small commercial areas, and most residents worked on local area farms, mines, in tourism, or supported themselves by subsistence farming. The sample community populations ranged from 4,744 to over 15,000 residents and tended to be very stable due to government aid for economic development and to close family ties.

The objective of the CPOLs was to communicate the benefits of reducing HIV-related risk behaviors to other community members through everyday conversations and in the language and cultural nuances of the community. Although the primary health-related messages involved reducing risky sexual behaviors related to HIV (e.g., using a condom, practicing monogamy), *not drinking alcohol excessively* was a secondary message that was communicated. The CPOLs consisted of approximately 60 individuals per sample site that were recruited from the social networks of patrons of the micro-venues (e.g., bottle stores or general dealers) that served as recruitment sites for the baseline survey. At the start of the study, the CPOLs completed a 2-week training program after the baseline survey on how to communicate these messages, followed by periodic refresher trainings throughout the intervention period.

2.2 Study Sample and Data Collection

The target population for the study is men and women (ages 18 to 30 years) in rural areas where the majority of Zimbabweans (65%) live (United Nations, 2004). The study sample consists of approximately 185 individuals selected from each of the 30 sample sites. Study

nurses (all women) recruited participants outside of several social venues (e.g., general dealer, bottle store) within a GP that were visited by the survey team at different times over the course of a few days. The nurses stood outside the recruitment site and approached everyone who was going to enter the building. After describing the study and compensation (approximately US\$6 at each survey wave), the nurses would determine eligibility for those who were interested in participating. Eligible participants were those who were 18 to 30 years old, had lived in the area for at least two years, frequented the social venue at least two times a week, and stayed in the community at least nine months of the year.

After obtaining informed consent, the study nurses conducted face-to-face, two-hour interviews with study participants at three time points: at baseline (wave 1); at approximately 12 months after baseline (wave 2); and, approximately 24 months after baseline. Data collection at each interview involved: a computer assisted personal interview (CAPI); the collection of biological samples; a paper questionnaire with questions specific to Zimbabwe; a symptoms assessment; counseling based on symptoms assessment; and, treatment for syndromically assessed STDs. Interviews were conducted in a private room at a rented house or office within the sample community. Data collection occurred from October 2003 to December 2004 for wave 1, October 2004 to January 2006 for wave 2, and December 2005 to January 2007 for wave 3. The total sample size is: 5,543 at wave 1 (85% participation rate); 4,303 at wave 2 (77.6% follow-up rate to wave 1); and, 4,446 at wave 3 (80.2% follow-up rate to wave 1).

Data for the current study were made available by the NIMH Collaborative HIV/STD Prevention Trial Group and Research Triangle Institute (2 U10 MH061544 and U10 MH061537; NIMH 2008). This analysis was performed using the Interview datasets (version 1) from each of the three waves of data, as well as supplemental data collected on alcohol-related risks for HIV. Detailed methods for data collection and intervention implementation are described elsewhere (NIMH, 2007a, 2007b, 2007c), including at the Trial's Web site (NIMH Collaborative HIV/STD Prevention Trial Group 2008).

2.3 Measures

We constructed four indicators of alcohol use behavior: current alcohol use, frequency of alcohol use, quantity of drinks consumed, and frequency of getting drunk. Based on responses to the question, "In the last 30 days, how many days did you have a drink containing alcohol?" we created the dichotomous measure for *current alcohol use* (drank alcohol versus no alcohol consumed). The same responses were used to construct the continuous measure of *frequency of alcohol use* based on the number of days drank in the last 30 days. For survey respondents who were unclear about the questions, interviewers also would provide a culturally-specific example of a "drink" as being a beer (in pint units) or the strong local drink, "kachasu". The continuous measures of *quantity of alcohol consumed* and *frequency of getting drunk* are based, respectively, on responses to the questions, "On days that you have a drink containing alcohol, how many drinks do you have?" and "In the last 30 days, how many times did you get drunk?"

We constructed predictor variables for individual's socio-demographic (age, gender, geographic mobility, marital status, parity, education, months employed last year) and cultural (ethnicity, religious affiliation) characteristics, as well as indicators of the provincial context in which respondents live. *Gender* is measured as a dichotomous indicator with females in the reference category. *Age* is a continuous measure in year units based on reported birth date. *Geographic mobility* is measured as the number of months the respondents report being away from their home in the last 12 months. *Ethnicity* is a three-category measure indicating whether the respondent is of Shona (reference), Ndebele, or another ethnic descent. *Religious affiliation* is a six-category measure indicating whether the

respondents' affiliation is: Protestant, Catholic, African Independent Church, Evangelical, traditional African religion, or no affiliation (reference group).

Marital status is a four-category measure indicating whether the respondents are: married or cohabiting with a single partner (reference), married or cohabiting with multiple partners, never married, or previously married. Our continuous measure of *parity* is based on the respondents' answers to the question, "How many children have you [given birth to/fathered]?" *Education* is measured in years based on the reported number of years of schooling respondents had completed. The continuous measure of *number of months employed in the last year* is based on responses to the question, "How many months of the year do you earn money?" Using statistics from the 2002 *Zimbabwean Census*, we included two measures of the provinces in which respondents lived: *crude death rate* (number of deaths per capita in the province) and the *population density* (population size divided by total square miles of the province). Finally, we constructed a six-category measure for the combined time (wave) and CPOL intervention status of the data observed: wave 1/CPOL site (reference), wave 2/CPOL site, wave 3/CPOL site, wave 1/not CPOL site, wave 2/not CPOL site, and wave 3/not CPOL site.

2.4 Data analysis

There are two parts to our data analysis. First, we conducted a global test at the community-level to determine whether the CPOL intervention reduced the level of drinking (any alcohol use, frequency of use, quantity of drinks consumed, and frequency of drunkenness). For this test, we used paired-sample *t*-tests to test for significant declines in the alcohol use outcomes over time (wave 1 compared to waves 2 and 3) in the intervention sites compared to the control sites ($N = 15$ paired intervention-control community sites).

Secondly, we generated descriptive and multivariate statistics at the individual-level that take into account variation across respondents in individual, family, and provincial characteristics and exposure to the community-level intervention. In our preliminary work, we found that using listwise deletion of missing data would result in a 28% reduction in the individual-level sample. We used multiple imputation (MI) methods to address missing data resulting from item nonresponse (Acock, 2005; Little and Rubin, 2002; Rubin, 1987, 1996), a practice commonly used in experimental intervention studies to address missing data (e.g., Coley, et al., 2011; DeSouza et al., 2009; Spijkerman, et al., 2010). The advantages of MI include imposing fewer restrictions on the nature of missing information than most other approaches (e.g., case deletion, mean substitution, OLS imputation, weighting cases), generating standard errors that do not suffer from the downward bias that plagues other approaches, and preserving statistical power that would be lost with listwise deletion (Little and Rubin, 1987). Multiple imputation replaces missing values with imputed values produced from a series of simulations that create complete data sets based on the distribution of missing and non-missing values. Using MI by chained equations (Royston, 2004, 2005a, 2005b) within *Stata*, we generated five imputed data sets that were analyzed using standard statistical techniques. The final results from the MI procedures produced parameter estimates based on pooling the results from the analyses across the imputed data sets with the final standard errors adjusted for uncertainty in the estimates resulting from variability across the imputed samples (Acock, 2005).

For the individual-analysis of alcohol use in rural Zimbabwe, we first calculated descriptive statistics (means and standard deviations) for the predictor and dependent variables. Next, we conducted the multivariate analysis using measures of individual, family, and province characteristics, along with the combined wave-CPOL intervention measure, to predict the alcohol use measures. Finally, we used interaction terms to test for gender differences in the

CPOL intervention. The final models include only predictor variables with significant effects on at least one of the outcome variables.

All analyses were performed using a pooled time series analysis with random effects adjusting for non-independence of observations in the panel data set (Hsiao, 1986) and allowing for an unequal number of observations of cases across the waves. Logistic regression was used in analyzing the binary outcome, current alcohol use, and ordinary least-squares (OLS) regression was used to analyze the other continuous. To calculate a test of the overall model's significance (e.g., a likelihood ratio test) when using MI, we calculated and included in the tables the model test statistic based on an F distribution that was developed by Meng and Rubin (1992, page 106) specifically for use with MI analyses.

3. RESULTS

3.1 Community-level Tests

Our first step in testing the effectiveness of the CPOL intervention in rural Zimbabwe was to see whether the expected greater community-level declines in alcohol use in the intervention versus control communities occurred over the course of the study. To do this, we conducted paired-sample difference t -tests between the matched intervention and control sites, comparing the matched sites in terms of the level and direction of change in alcohol use behaviors across the waves (wave 1 versus waves 2 and 3). There were 15 intervention and 15 control matched sites, providing a sample size of 15 for the paired-sample t -tests. Given our prediction of direction of difference, we used a one-tailed t -test with a moderately conservative alpha level ($p < .10$) given the small sample size of 15. All the paired-sample t -tests were either non-significant or were in the opposite direction than expected (i.e., control site having lower use levels over time than the CPOL intervention site). Thus, we found no support for the effectiveness of the CPOL intervention in reducing current use, frequency of use, quantity of drinks consumed, or frequency of getting drunk in rural Zimbabwe.

3.2 Individual-level Analysis

We next considered differences in alcohol use patterns in rural Zimbabwe at the individual-level, taking into account individual variable in socio-demographic characteristics, cultural factors, and exposure to the CPOL intervention. In Table 1, we present descriptive statistics (means and standard deviations) on the dependent and predictor variables included in the final individual-level analyses. As shown in the table, overall alcohol use patterns are fairly consistent across the three waves. Notably, approximately 80 percent of respondents reported no alcohol use in the past 30 days. This percentage is slightly lower than data from the World Health Organization (2011; WHO) for 2003 which showed 85.6% of Zimbabweans ages 15 or older having abstained from alcohol in the previous year. The age range of our sample (18 to 30 years) is restricted to the ages with typically higher drinking levels which likely accounts for the slightly lower percentage than the WHO statistic.

The sample is fairly evenly divided between men and women, average age at wave 1 was about 22 years, and about two-thirds of the sample is from the majority ethnic group, Shona. Over the three waves, there were slight increases in average months away from home and declines in months employed, which are consistent with the economic strains in Zimbabwe during this time. In terms of religious affiliation, more than half of the sample is Catholic and Protestant. Finally, during the study the level of marriage and parity increase, though average education (about 10 years) remains the same.

Table 2 shows the logistic regression results for *current alcohol use*. The likelihood of current drinking was higher compared to others for males, the older one was, and the more months away from home. Among the cultural measures, individuals are more likely to drink

on average if they are Shona (compared to Ndebele) or have no religious affiliation (compared to having any affiliation). Being married reduces the likelihood of drinking compared to those previously or never married. But parity, education, and months employed are not significantly related to current alcohol use. Of the regional measures, drinking was more likely in provinces with a higher crude death rate or lower population density.

Regarding the individual-level impact of the CPOL intervention, there were significant declines in the likelihood of drinking associated with being in an intervention site. However, by wave 3 the control site also saw somewhat large declines in drinking. A comparison of the coefficients and standard errors for the intervention and control sites indicates no significant difference in the level of change. That is, the significant decline in current alcohol use appears to have been of a similar size across the intervention and control sites.

Table 3 presents the OLS regression results for frequency of alcohol use, quantity of drinks consumed, and frequency of getting drunk. The observed effects are nearly identical for the three alcohol use outcomes. Alcohol is consumed more frequently or at larger quantities: if one is male or older; if one is Shona (compared to Ndebele) for frequency of use only; if one has no religious affiliation (compared to any affiliation); if one is previously married (compared to married); and, if the regional crude death rate is higher than elsewhere. Differing from current alcohol use, neither population density nor months away from home is significant for the frequency or quantity of use outcomes. But higher education and more months employed are positively related to frequent and higher quantities of alcohol use, perhaps reflecting more money to purchase alcohol. Also similar to the findings for current alcohol use, in both the intervention and control sites the frequency or quantity of alcohol use declined significantly over time.

Finally, we tested whether the CPOL intervention had differing effects by gender across all four measures of alcohol use. We found no significant interaction effects between gender and the CPOL/wave status in predicting the four outcomes variables. This suggests that the CPOL intervention did not have an effect on the alcohol use behaviors of either men or women.

4. DISCUSSION

This study addressed three research questions regarding alcohol use and abuse in rural Zimbabwe. First, we addressed what are the key factors affecting alcohol use in rural Zimbabwe and found that the factors with significant effects were similar to those in other countries. Higher drinking (e.g., any use, more frequent use, and/or greater quantities consumed) was generally associated with higher status (education), being male, older, or not married, or having no religious affiliation. Unique to Zimbabwe, we found ethnic differences between Shona and Ndebele, with Shona being more likely to be current drinkers and to drink more often. There is little research on ethnic differences in substance use or other risk behaviors in Zimbabwe. This finding suggest future research should be undertaken to understand more fully how ethnic differences contribute to substance use behaviors in Zimbabwe. We also found that the more time respondents were away from home the more likely they were to drink alcohol, which is notable given the substantial inter- and intra-migration in Zimbabwe during the survey period. However, months away from home did not affect the frequency or quantity of use. Higher education and longer periods of employment were linked to greater alcohol consumption.

Among the provincial effects, we found that the regional factor, crude death rate, is consistently important in predicting alcohol use and abuse, suggesting possible self-medication due to high stress in areas of higher mortality. Prior research supports the role of alcohol as self-medication in response to stress (Pence et al., 2008), and our consistent

finding of the relationship between ecological crude death rates in the areas of the study and alcohol use and abuse provides some support for a stress response. However, it is possible that the death rates and alcohol use could be due to some common underlying factor that does not involve self-medication. Given the turmoil that was occurring in Zimbabwe during the years of the study, if self-medication was occurring, drinking as a stress response might have increased rather than declined. However, the counterfactual finding of decreasing alcohol use over time could also be true given the increasingly scarce disposable income. We also found that higher population density reduced the likelihood of using alcohol currently but had no impact on the frequency or quantity of use.

Importantly, in addressing our second research question on CPOL intervention effects, we found that alcohol use and abuse declined over the three waves, and significant declines were found in both the CPOL intervention and control sites at relatively equal levels. Thus, at least in rural Zimbabwe, the CPOL intervention may not be effective in reducing alcohol risky behaviors. The failure to detect a significant intervention effect may be partly due to the small number of communities being compared (15 paired sample sites). As such, our study had very limited power to be able to detect a significant change in the outcome variables. However it is also notable that other peer-based, normative interventions in Zimbabwe have not been successful at reducing risk behaviors, such as combining being drunk with having sexual behavior (Fritz et al., 2011). In addressing our third question, we found no evidence of a gender-specific effect of the CPOL intervention.

We believe that the CPOL intervention was not effective in reducing the alcohol use behaviors for three reasons. First, participants may have had insufficient exposure to the community-level intervention because of increased absences from their community when seeking employment elsewhere due to the deteriorating economy in Zimbabwe. Second, the general decline in alcohol use in both the intervention and control sites related to economic forces may have overwhelmed the intervention's ability to show any reductions in alcohol use. Given that our sample was drawn from customers of bottle stores and other commercial venues, it is likely that most participants relied on store-bought rather than homemade alcohol which would be consistent with the relatively low level of trade in homemade alcohol in Zimbabwe (World Health Organization, 2011). As such, drinkers with declining financial resources and facing rapid inflation may have opted to stop spending money on alcohol leading to a general decline in drinking in both control and intervention sites. Third, though the CPOL intervention addressed the problem of excessive drinking, the primary focus of the intervention messages was on HIV with alcohol consumption being a secondary focus. As such, the frequency of CPOL conversations focused on stopping excessive drinking may have been more limited.

Although our study provides insights on alcohol use in rural Zimbabwe, it also has limitations to be addressed in future research. Our measurement of alcohol consumed is not based on standard units of alcohol within a drink. As such, our findings on quantity of drinks consumed may be somewhat biased due to measurement error. If feasible, future research should include measures for specific units of alcohol consumed. We unfortunately did not have adequate measures of individual or family economic well which would have strengthened our analysis given the economic changes in the country. Between 2000 and 2007, Zimbabwe's economy contracted by 40 percent while inflation jumped to over 66,000 percent. Individual Zimbabweans faced shortages of fuel, medicine, and food, and unemployment rates climbed to 85 percent, partly due government land reforms, along with persistent droughts, that badly damaged the commercial farming sector (Central Intelligence Agency, 2011; Economist, 2007; New Farm, 2005). Such economic conditions increase social stress that may lead to higher alcohol abuse or, alternatively, fewer funds to buy alcohol. Although our survey included a question on total annual income, Zimbabwe's hyper

inflation during the study period essentially invalidated our income measure. Instead, we relied on months employed in the last year as a limited proxy for individual economic resources. In addition, our analysis relies on self-report data that may vary in nonrandom ways across some of our predictor variables (e.g., gender, ethnicity), and our sample characteristics—rural Zimbabweans ages 18 to 30—may limit the generalizability of the study findings. Finally, given that the CPOL intervention was primarily focused on reducing HIV-related risk behaviors (including alcohol abuse), an intervention specifically addressing alcohol abuse may present a less diluted message for behavioral change. Hopefully, other studies can overcome these limitations in future efforts to reduce alcohol abuse in Zimbabwe and other sub-Saharan African countries.

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Table 1

Means and Standard Deviations for Dependent and Predictor Variables among Rural Zimbabwean Adults

<u>Variables</u>	<u>Wave1</u>		<u>Wave 2</u>		<u>Wave 3</u>	
	<u>Mean</u>	<u>sd</u>	<u>Mean</u>	<u>sd</u>	<u>Mean</u>	<u>sd</u>
Current alcohol use	.226	.418	.205	.403	.204	.403
Frequency of alcohol use	2.325	6.373	2.122	6.158	2.166	6.262
Quantity of drinks consumed	1.497	4.075	1.530	4.166	1.375	3.826
Frequency of getting drunk	1.559	5.000	1.377	4.649	1.411	4.735
Male	.531	.499	.514	.500	.513	.500
Age in years	21.875	3.380	23.248	3.473	24.151	3.421
Number of months away from home in last year	1.303	3.059	2.142	3.427	2.648	4.085
Ethnicity						
Shona	.662	.473	.681	.466	.699	.459
Ndebele	.231	.422	.217	.412	.203	.402
Other	.106	.308	.101	.302	.098	.297
Religious affiliation						
Protestant	.219	.414	.185	.388	.200	.400
Catholic	.102	.303	.093	.290	.095	.294
African Independent Church	.261	.439	.239	.427	.253	.435
Evangelical	.163	.369	.178	.383	.188	.391
Traditional religion	.101	.302	.090	.286	.055	.229
No affiliation	.154	.361	.215	.410	.209	.406
Marital status						
Married/cohabiting with single partner	.232	.422	.347	.476	.422	.494
Married/cohabiting, multiple partners	.021	.144	.028	.164	.028	.165
Never married	.639	.480	.530	.500	.459	.498
Previously married	.108	.310	.095	.293	.091	.287
Parity (number of live births)	.638	1.086	.807	1.080	.912	1.111
Years of education	10.389	3.313	10.434	3.292	10.437	3.327
Months employed in last year	6.666	5.917	4.177	5.250	4.541	5.421
Province: Crude death rate (number of deaths per capita in the province)	17.521	2.413	17.626	2.385	17.704	2.333
Province: Population density (population size divided by total square miles of the province)	27.076	12.738	27.289	12.639	27.860	12.490

Variables	Wave 1		Wave 2		Wave 3	
	Mean	sd	Mean	sd	Mean	sd
Sample size	5,543		4,303		4,446	

NOTE: Current alcohol use is a binary measure indicated whether the respondent drank any alcohol in the last 30 days (0=no; 1=yes). Frequency of alcohol use is the number of days the respondent reports drinking alcohol in the last 30 days. Quantity of drinks consumed is the number of drinks the respondent reports drinking on drinking days in the last 30 days. Frequency of getting drunk is the number of days the respondent reports getting drunk in the last 30 days.

Table 2

Results from Logistic Regression Analysis with Random Effects of Current Alcohol Use among Rural Zimbabwean Adults

<u>Predictor Variables</u>	<u>Current alcohol use</u>		
	b	exp(b)	(se)
Male	4.360 ***	78.229	(.161)
Age in years	.204 ***	1.227	(.017)
Number of months away from home in last year	.025 *	1.025	(.011)
Ethnicity			
Ndebele	-.493 **	.611	(.157)
Other	-.319	.727	(.180)
Religious affiliation			
Protestant	-1.518 ***	.219	(.123)
Catholic	-.775 ***	.461	(.147)
African Independent Church	-2.616 ***	.073	(.129)
Evangelical	-2.273 ***	.103	(.139)
Traditional religion	-1.508 ***	.221	(.144)
Marital status			
Married, multiple partners	.315	1.371	(.353)
Never married	.376 **	1.456	(.116)
Previously married	1.125 ***	3.081	(.161)
Parity (number of live births)	.064	1.066	(.062)
Years of education	-.010	.990	(.015)
Months employed in last year	.016	1.016	(.008)
Province: Crude death rate (number of deaths per capita in the province)	.136 ***	1.146	(.026)
Province: Population density (population size divided by total square miles of the province)	-.014 **	.986	(.005)
Wave and CPOL status			
Wave 2/CPOL	-.695 ***	.499	(.139)
Wave 3/CPOL	-.825 ***	.438	(.143)
Wave 1/No CPOL	-.211	.810	(.127)
Wave 2/No CPOL	-.767 ***	.464	(.160)
Wave 3/No CPOL	-1.071 ***	.343	(.162)
Constant	-10.396 ***		(.670)
Model F statistic	55.032 _(23,17550235) ***		

Note: Current alcohol use is a binary measure indicated whether the respondent drank any alcohol in the last 30 days (0=no; 1=yes). Logistic regression coefficients (*b*) and log odds (*exp(b)*) are shown with standard errors (*se*) in parentheses. The reference category includes: females, Shona ethnicity, married/cohabiting with single partner, no religious affiliation, and CPOL intervention site at Wave 1. Sample size is 5,543.

*
 $p < .05$,

**
 $p < .01$,

 $p < .001$

Table 3

Results from Ordinary Least-Squares Regression Analyses with Random Effects of the Frequency of Alcohol Use, Quantity of Drinks Consumed, and Frequency of Getting Drunk among Rural Zimbabwean Adults

Predictor Variables	Model 1: Frequency of alcohol use		Model 2: Quantity of drinks consumed		Model 3: Frequency of getting	
	b	(se)	b	(se)	b	(se)
Male	3.025 ***	(.145)	1.924 ***	(.138)	1.959 ***	(.107)
Age in years	.226 ***	(.021)	.143 ***	(.019)	.133 ***	(.016)
Number of months away from home in last year	.016	(.013)	.001	(.009)	.007	(.010)
Ethnicity						
Ndebele	-.411 *	(.199)	-.035	(.129)	-.199	(.147)
Other	-.263	(.227)	-.144	(.140)	-.121	(.169)
Religious affiliation						
Protestant	-2.165 ***	(.162)	-1.347 ***	(.145)	-1.786 ***	(.130)
Catholic	-1.186 **	(.203)	-.642 ***	(.134)	-1.086 ***	(.163)
African Independent Church	-2.900 ***	(.153)	-1.776 ***	(.134)	-2.262 ***	(.123)
Evangelical	-2.751 ***	(.167)	-1.755 ***	(.167)	-2.158 ***	(.134)
Traditional religion	-1.718 ***	(.189)	-1.278 ***	(.179)	-1.487 ***	(.153)
Marital status						
Married, multiple partners	-.159	(.326)	-.072	(.245)	-.026	(.260)
Never married	.122	(.131)	.136	(.097)	.118	(.105)
Previously married	.661 ***	(.177)	.400 **	(.148)	.555 ***	(.142)
Parity (number of live births)	.073	(.068)	.023	(.043)	.054	(.055)
Years of education	.052 **	(.020)	.033 **	(.012)	.039 *	(.015)
Months employed in last year	.037 *	(.016)	.029 ***	(.007)	.028 **	(.011)
Province: Crude death rate (number of deaths per capita in the province)	.115 ***	(.032)	.071 **	(.020)	.100 ***	(.024)
Province: Population density (population size divided by total square miles of the province)	.004	(.006)	.002	(.004)	.0003	(.005)
Wave and CPOL status						
Wave 2/CPOL	-.507 *	(.199)	-.150	(.175)	-.390 *	(.166)
Wave 3/CPOL	-.525 **	(.198)	-.365 *	(.164)	-.436 *	(.168)

Predictor Variables	Model 1: Frequency of alcohol use		Model 2: Quantity of drinks consumed		Model 3: Frequency of getting	
	b	(se)	b	(se)	b	(se)
Wave 1/No CPOL	-.076	(.159)	.002	(.106)	-.168	(.123)
Wave 2/No CPOL	-.748**	(.216)	-.128	(.204)	-.623***	(.175)
Wave 3/No CPOL	-.982***	(.218)	-.465**	(.171)	-.709***	(.179)
Constant	-5.144***	(.795)	-3.363***	(.564)	-3.068***	(.595)
Model F statistic	63.928 (23,2118)	***	34.573 (16,1881)	***	53.917 (23,4409)	***

Note: Frequency of alcohol use is the number of days the respondent reports drinking alcohol in the last 30 days. Quantity of drinks consumed is the number of drinks the respondent reports drinking on drinking days in the last 30 days. Frequency of getting drunk is the number of days the respondent reports getting drunk in the last 30 days. Unstandardized OLS regression coefficients (*b*) are shown with standard errors (*se*) in parentheses. The reference category for the three models includes: females, Shona ethnicity, married/cohabiting with single partner, no religious affiliation, and CPOL intervention site at Wave 1. Current non-drinkers are coded as zero on each of the outcomes. Sample size is 5,543 at wave 1, 4,303 at wave 2, and 4,446 at wave 3.

* $p < .05$,

** $p < .01$,

*** $p < .001$