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CROSS-SECTIONAL STUDY OF ALCOHOL PREFERENCES AND EXPENDITURES ON FOOD INSECURITY BETWEEN URBAN AND RURAL SETTINGS IN ZAMBIA

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ABSTRACT

This study investigated potential differences in rural and urban alcohol expenditures and the relationship between alcohol and food insecurity. The 2015 Zambia Living Conditions Monitoring Survey was used with a sample of 12,260 households. Bivariate analyses and logistical regression evaluated the differences in rural/urban alcohol preferences and the relationship between alcohol and food insecurity. Traditional brew consumption was found to be significantly higher in rural areas ($p<0.001$). Rural households with alcohol expenditures had 23 percent lower odds (OR: 0.770, $p<0.01$) of eating three or more meals a day compared to households without alcohol expenditures. Rural characteristics around alcohol consumption need to be taken into consideration when determining food security and nutrition policies. Alcohol assessments and services should be adapted to rural conditions in Zambia to increase the effectiveness of prevention programs.

INTRODUCTION

Global alcohol consumption is increasing, and the alcohol industry is investing heavily in sub-Saharan Africa to capitalize on this increasing demand (McCall, 2017). Data from the World Health Organization (WHO) African Region shows that alcohol use has been attributed to 4.7 percent of all disability-adjusted life years (DALYs) and 6.5 percent of all deaths (Ferreira-Borges et al., 2016). Alcohol consumption

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is common among the population in central Africa including Zambia. Prevalence of alcohol use disorders among Zambians 15+ years was 5.5 percent, which is larger than the prevalence across the WHO African region (3.7 percent) (World Health Organization, 2019).

Consumption of alcohol has been and continues to be a part of the social structure including many traditions and ceremonies in Zambia (Colson & Scudder, 1988). As such, over 13.5 percent of Zambians 15+ years engaged in heavy episodic drinking in 2016 (World Health Organization, 2019). It is critical to address the prevalence of alcohol use in Zambia, as it contributes to many adverse health and social problems at the individual and societal levels (Zambia Ministry of Health, 2021).[5] Alcohol use is associated with unsafe sex, increased spread of STDs and HIV/AIDS, unplanned pregnancy, mental illness, vehicle accidents, violence, chronic diseases, gender-based violence (GBV), reduced workplace productivity, and work absenteeism, and truancy among students (Taylor & Paltzer, 2019).

Furthermore, a growing number of studies have begun to document links between food insecurity (defined as limited access to enough and nutritious food to everyone) and alcohol use. Several studies have shown significant associations between alcohol use and food insecurity in sub-Saharan Africa (Dewing et al., 2013; Eaton, Cain, et al., 2014; Eaton, Pitpitan, et al., 2014; Regassa & Stoecker, 2012; Wainberg et al., 2018). In rural Mozambique, being food insecure increased the risk of hazardous alcohol use among female heads of households (Wainberg et al., 2018). Nearly half (46.7 percent) of the Zambian population was undernourished between 2016-2018 (Food and Agriculture Organization of the United Nations et al., 2019). This number is already increasing due to the Sars-Cov-2 pandemic (Jafri et al., 2021). Among adults, food insecurity is associated with increased mental health problems, diabetes, hypertension, poor sleep outcomes and overall poor health (Ding et al., 2015; Gucciardi et al., 2014; Jones, 2017).

Access to food in Zambia is limited due to high poverty and unemployment, income inequality, and high food prices in urban areas and low farm revenues in rural areas (World Food Programme, 2019). Rural households specifically, are less food secure with 43.7 percent of households having at least three meals a day compared to 67.8 percent of urban households (Bulawayo et al., 2019). Food insecurity disparities among rural areas may be related to disparities in poverty, with 58 percent of Zambians in rural areas being extremely impoverished compared to 13 percent in urban areas (United Nations Children's Fund, 2015). Absolute poverty and relative rural-urban disparities are determinants of alcohol use in Zambia (Crane et al., 2018; Taylor et al., 2020).

Despite lower levels of disposable income, consumption rates can reach heavy episodic drinking levels in rural areas given the different types of alcohol available, specifically traditional and opaque beer whether home-brewed or commercially produced. There is little information regarding the influence of such alcohol types, mainly because they are often unrecorded (Lachenmeier et al., 2011). These types of alcohol are of specific concern to food insecurity because the staple cash crop, maize, is often used as the main ingredient. Individuals may assume drinking the thicker opaque beer is

a substitute for food without understanding the harms associated with daily, heavy alcohol consumption. Understanding the differences between rural and urban alcohol consumption and types on health outcomes remain a gap in the research. Understanding this nuance in alcohol consumption is necessary in order to have an accurate understanding of the burden related to alcohol as well as developing appropriate and valid diagnostic tools to evaluate alcohol use disorders. Therefore, the objective of this analysis was two-fold; 1) to understand the variation in most common alcohol types consumed between rural and urban consumption and 2) to determine the association between any alcohol expenditures with food insecurity among participants in the Zambian LCMS household expenditure survey in 2015. We hypothesized that 1) traditional and opaque beer consumption will be higher in rural areas compared to urban areas and 2) alcohol use will be associated with reduced odds of eating three or more meals per day and reduced odds of consuming meat, with profound impacts in rural regions compared to urban regions.

METHODS

Study Population

This study used data from the cross-sectional, nationally representative Zambia Living Conditions Monitoring Survey (LCMS) 2015 (Phase VII) covering the time period between April 2015 and May 2015. Strength of the survey is the ability to assess household-level expenditure differences by region (rural and urban). The total sample included 12,260 households from all ten Zambian provinces. LCMS survey topics included housing conditions and amenities, access to services, healthcare expenditures, food and beverage expenditures, other household expenditures, poverty and community development indicators, and household events. Individuals under the age of 18 and with missing data regarding alcohol expenditures were excluded from the analysis resulting in a total sample size of (N=12,246). This study used a deidentified data set received from the Zambia Central Statistics Office. Ethics review of the analysis and publication were reviewed and approved by the Zambia Central Statistics Agency. No ethical issues were identified or reported.

Independent variable

The primary independent variable was alcohol consumption reported by the head of households reporting one or more Kwacha (Zambian currency) for household alcohol expenditures, alcohol received, or alcohol produced across all seven alcohol types. Alcohol types included clear beer, traditional beer, opaque beer, wine, cider, spirits, and others. The question asked how many units of each alcohol type was purchased, consumed, and received (asked as three separate questions) in the past two weeks. Answers were reported in units and values in Kwacha and summary measures created combining all three questions into a single measure of alcohol use.

Dependent variable

The dependent variable of food security was measured with two questions asking how many meals per day on average and servings of meat eaten per week. For the purpose of this study, eating less than three meals a day or less than four

servings of meat per week were considered indicators of not achieving adequate levels of food security. Meals per day are considered an indicator of quantity and meat servings are an indicator of quality (protein intake) of food intake.

Data Analysis

We used frequencies and percentages to describe the populations' sociodemographic characteristics including alcohol expenditures and type. Logistic regression models stratified by region (rural and urban) were used to assess the association between household alcohol consumption and food security (three plus meals per day and four-plus meat servings per week). Self-reported poverty status, sex of head of household, age of head of household, education level of head of household, and household size were included as covariates in the models. Coefficients are reported as odds ratios.

RESULTS

Sample characteristics are described in Table 1 showing statistically significant differences in age, household size, total alcohol expenditures, meals per day, and meat servings per week between urban and rural households. Approximately a quarter of respondents were female with a mean age of 43 years. Households reporting 3+ meals per day and 4+ meat servings per week were 57 and 52 percent, respectively, with significant differences between urban and rural households.

The first hypothesis states opaque beer and traditional brew consumption are higher in rural areas compared to urban. Table 2 shows household expenditures by alcohol type and region. Among the total sample, mean annual alcohol expenditure was US$33.90 (2020 dollars). For commercial types of alcohol including spirits, wine, cider, and clear beer, urban households have a higher level of expenditures compared to rural households. However, opaque beer and traditional brew were higher in rural areas with a significant difference in traditional brew, which leads us to reject the null hypothesis that consumption of traditional brew was the same between urban and rural households. Table 3 shows alcohol expenditures among those who reported any alcohol expenditure within the three categories of alcohol purchased, received, and produced. Given the likely pattern of high episodic drinking among drinkers compared to those who abstain, the mean annual expenditure among drinkers is US$279 (2020 dollars) with urban drinkers spending approximately three times as much on alcohol

Table 1. Sample characteristics by region (N=12,246)

	Total	Urban (n=5,702)	Rural (n=6,544)	p-value
Female, n (%)	2,903 (23.7)	1,387 (24.3)	1,516 (23.2)	0.133
Age, mean (SD)	43.0 (14.4)	41.9 (12.9)	44.0 (15.5)	<0.001*
Household Size, mean (SD)	5.13 (2.6)	5.04 (2.5)	5.21 (2.7)	<0.001*
Meals 3+ per day, n (%)	7,034 (57.4)	4,218 (74.0)	2,816 (43.0)	<0.001*
Meat 4+ per week, n (%)	6,337 (51.8)	3,824 (67.1)	2,514 (38.4)	<0.001*

*Note: Significant p-values (< .05) are indicated with an **

compared to rural drinkers. Traditional brew is preferred in rural areas and is also the source of significant unrecorded consumption suggesting the available alcohol consumption data primarily reflects urban consumption.

Figure 1 displays the proportion of annual alcohol purchasing by most preferred type inclusive of alcohol received and produced between rural and urban areas highlighting the difference in alcohol type preferences.

Table 4 shows any alcohol expenditures in rural areas is associated with 23 percent lower odds of eating 3+ meals per day (OR: 0.770; 95% CI: 0.654, 0.906; p<0.01) and 29 percent greater odds of eating 4+ meat servings a week (95% CI: 1.099, 1.507; p<0.01). Among urban households, alcohol expenditure was not significantly associated with skipping meals but was significantly associated with greater odds of eating 4+ meat servings a week (aOR=1.269; 95% CI: 1.052, 1.531; p<0.05). The results partially support the hypothesis that among rural households, alcohol expenditures were associated with a reduced likelihood of eating 3+ meals per day but no association among urban households.

Table 2. Mean annual alcohol expenditures by type and region among total sample (N=12,246) (2020 USD)

	Total, Mean (95% CI)	Urban, Mean (95% CI)	Rural, Mean (95% CI)	p-value
Spirits	3.9 (2.6, 5.3)	6.7 (3.9, 9.5)	1.5 (0.8, 1.2)	<0.001*
Wine	5.2 (3.9, 6.4)	9.3 (6.9, 11.6)	1.6 (0.5, 2.7)	<0.001*
Cider	4.1 (2.8, 5.5)	8.3 (5.4, 11.2)	0.5 (0.2, 0.8)	<0.001*
Clear beer	11.0 (8.4, 13.6)	21.2 (15.8, 26.6)	2.1 (1.2, 3.0)	<0.001*
Opaque beer	4.7 (4.0, 5.5)	4.6 (3.7, 5.6)	4.9 (3.7, 6.02)	0.78
Traditional brew	2.8 (2.4, 3.3)	1.4 (0.7, 2.1)	4.0 (3.5, 4.6)	<0.001*
Other alcohol	2.1 (1.4, 2.7)	2.9 (1.9, 3.9)	1.4 (0.6, 2.2)	0.02*
All types (total)	33.9 (30.0, 7.8)	54.4 (46.6, 62.2)	16.0 (13.5, 18.5)	<0.001*

Note: Significant p-values (< .05) are indicated with an *

Table 3. Mean annual alcohol expenditures by type and region among those who purchased alcohol (N=1,473) (2020 USD)

	Total, Mean (95% CI)	Urban, Mean (95% CI)	Rural, Mean (95% CI)	p-value
Spirits	32.6 (21.3, 43.8)	52.9 (31.0, 74.8)	12.9 (6.8, 19.0)	<0.001*
Wine	42.7 (32.5, 52.9)	72.1 (54.2, 90.1)	14.2 (4.5, 23.8)	<0.001*
Cider	34.3 (23.1, 45.6)	65.2 (42.7, 87.8)	4.4 (1.5, 7.4)	<0.001*
Clear beer	91.2 (70.4, 112.0)	165.9 (125.0, 206.8)	18.7 (10.9, 26.5)	<0.001*
Opaque beer	39.2 (33.1, 45.3)	36.4 (29.4, 43.5)	41.9 (32.1, 51.8)	0.37
Traditional brew	21.7 (18.2, 25.2)	10.6 (5.0, 16.1)	32.6 (28.3, 36.8)	<0.001*
Other alcohol	17.2 (12.0, 22.5)	22.6 (14.6, 30.6)	12.1 (5.1, 19.0)	0.051
All types	279.0 (249.5, 308.5)	425.8 (371.5, 480.1)	136.7 (116.8, 156.6)	<0.001*

*Note: Significant p-values (< .05) are indicated with an **

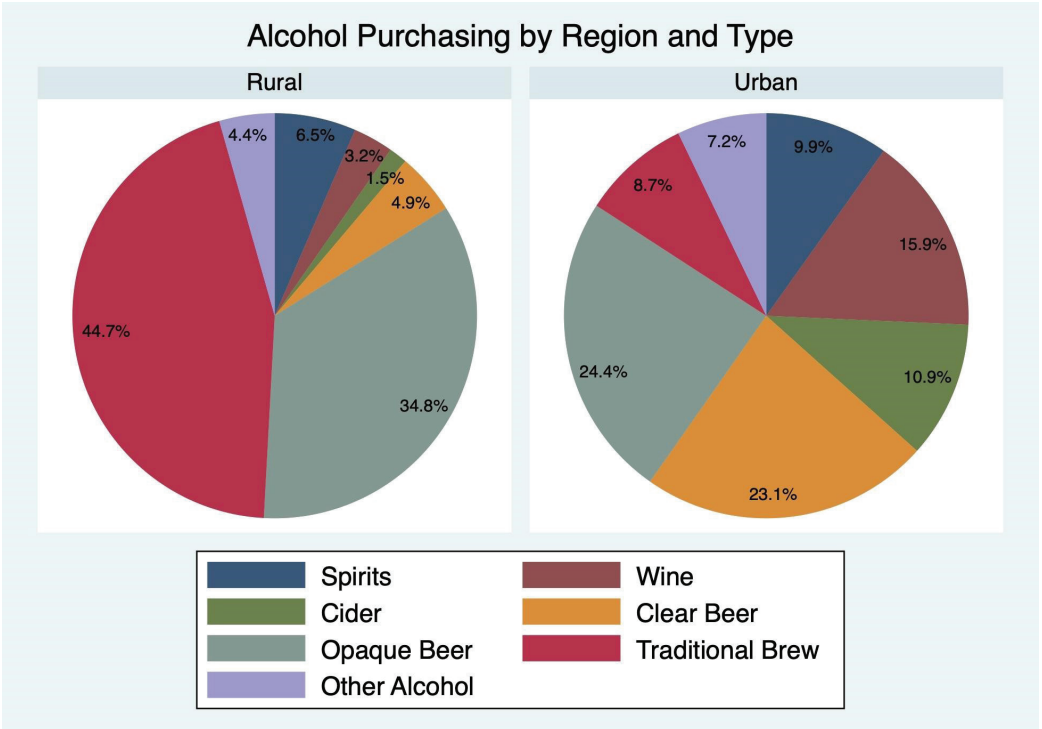

Figure 1. Alcohol type preference based on greatest household expenditure by region.

DISCUSSION

This study sought to better understand the rural/urban differences in alcohol consumption in Zambia and related association with measures of food insecurity. Our results show that mean alcohol expenditure is significantly higher in urban versus rural regions of Zambia. Further, whereas, urban residents had significantly higher expenditures on spirits, wine, cider, and clear beer (than rural residents), rural residents spent more on traditional and opaque beer (than urban residents). This partially supports the hypothesis that traditional brew is higher in rural areas compared to urban in Zambia, but similar preferences exist for opaque beer. The observed preferences for clear beer, wine, cider, and spirits in the urban areas represents the higher economic status of urban drinkers relative to rural drinkers but may not indicate lower absolute levels of alcohol consumed. Unrecorded alcohol consumption is a major gap in the global alcohol data, which creates a bias in understanding the true burden of alcohol use disorders and related health outcomes (Lachenmeier et al., 2011). Traditional brew is often produced in the home or "shabeens" and is a major source of unrecorded consumption. The results show that traditional brew is preferred in the rural areas and provides evidence that the burden of rural alcohol consumption in Zambia may not be getting the attention it deserves because of its unrecorded nature. Standardized drink units of traditional brew and opaque beer preferred in rural areas of Zambia have

Table 4. Logistic regression of food insecurity on any alcohol expenditures by region (rural and urban)

	3 or more meals per day		4 or more meat servings per week	
Urban	**Odds Ratio**	**95% CI**	**Odds Ratio**	**95% CI**
Alcohol Expenditures (Yes/No)	0.861	0.706, 1.051	1.269*	1.052, 1.531
Female	0.975	0.836, 1.136	0.994	0.860, 1.142
Education				
College or post-secondary	Ref	Ref	Ref	Ref
High school	0.447***	0.382, 0.521	0.531***	0.461, 0.612
Grade 7 or below	0.333***	0.278, 0.398	0.405***	0.342, 0.480
Poverty				
Non-poor	Ref	Ref	Ref	Ref
Moderately poor	0.3***	0.246, 0.366	0.383***	0.327, 0.450
Very poor	0.092***	0.074, 0.115	0.149***	0.123, 0.180
Household size	1.09***	1.059, 1.121	1.037**	1.011, 1.064
Age	0.987***	0.982, 0.992	0.990***	0.985, 0.995
Rural				
Alcohol Expenditures (Yes/No)	0.770**	0.654, 0.906	1.287**	1.099, 1.507
Female	0.923	0.807, 1.055	0.804**	0.702, 0.921
Education				
College or post-secondary	Ref	Ref	Ref	Ref
High school	0.797**	0.684, 0.929	0.809**	0.695, 0.940
Grade 7 or below	0.622***	0.545, 0.711	0.637***	0.558, 0.726
Poverty				
Non-poor	Ref	Ref	Ref	Ref
Moderately poor	0.456***	0.374, 0.556	0.423***	0.350, 0.511
Very poor	0.153***	0.126, 0.187	0.190***	0.158, 0.230
Household size	1.095***	1.073, 1.118	1.059***	1.037, 1.081
Age	0.989***	0.986, 0.993	0.994**	0.990, 0.997

*, **, *** p<0.05, 0.01, and 0.001, respectively.

not been established making it difficult to accurately compare alcohol use disorders based current quantity-frequency measures. In sub-Saharan Africa, the commercial alcohol industry is promoting these types of traditional and opaque alcohol in rural areas creating even greater availability and affordability of these products (McCall, 2017).

The literature also shows that lower-income households may not consume alcohol as much as higher-income households but experience greater alcohol-related economic and physical health burden (Eaton, Cain, et al., 2014; Eaton, Pitpitan, et al., 2014; Regassa & Stoecker, 2012; Wainberg et al., 2018). Food insecurity remains a growing concern for global health and development. Pandemics and climate-related shocks are issues that influence food availability but also stress and associated substance use. Natural disasters on top of existing levels of poverty create acute-on-chronic events putting countries

like Zambia at significant risk for reversing positive movement toward development. Food security is the foundation for improving health and economic stability. Alcohol use can undermine the nutritional status of families. Skipping meals (quantity) and meat servings (quality) are two indicators of nutritional status and food security. According to the Zambia National Food and Nutrition Policy, food security is defined as "access by all households to food needed for a healthy life for all its members (adequate in terms of quality, quantity, safety and culturally acceptable) and when it is not at undue risk of losing such access" (Zambia Ministry of Health, 2006).

The second hypothesis tested in this study was the association of alcohol use with food insecurity. Region (rural and urban status) is important to consider as rural areas have a higher prevalence of malnutrition and lower availability of healthcare to manage subsequent disease related to malnutrition. The role of alcohol in exacerbating the burden of disease in rural areas is largely unknown in sub-Saharan Africa due to the inability to accurately record consumption and diagnose alcohol-related conditions. The results of this study support the alternative hypothesis that alcohol expenditure is associated with lower odds of eating 3+ meals per day among rural households. This estimate is likely underestimated given the consistent underreporting in measures of self-reported alcohol use. Interestingly, this study also finds that alcohol use is associated with greater odds of eating 4+ meat servings in a week compared to those not purchasing alcohol in both rural and urban regions. In many parts of sub-Saharan Africa, alcohol is consumed in a social setting with different types of meat servings, which could explain this positive finding. If this is correct, only some members of the household are likely eating meat 4+ times per week but not all. Future research is needed to explore this finding as it could suggest a potential economic benefit of alcohol use either through social networks related to alcohol use, economic status gained through consumption, or the benefit of reciprocity associated with alcohol use often observed in central Africa (Colson & Scudder, 1988).

This study confirms the need to investigate alcohol use, specifically among rural Zambian households. National alcohol policies target urban alcohol environmental and physical contexts, and some policies have lower standards when it comes to traditional brew versus clear beer and spirits (16 years versus 18 years). When considering the lack of safety nets and behavioral health services in rural areas, alcohol policies should consider the unique circumstances and opportunities to control alcohol use in rural and urban areas, especially when minimizing the harm associated with alcohol use. Rural drinkers have a much higher likelihood of experiencing food insecurity and therefore, negative health outcomes because of alcohol use yet lower access to healthcare, especially behavioral health services. This leads to higher healthcare costs, family burden, and social costs limiting the development opportunities and programs already in place.

Other alcohol use like homemade spirits was not included as a specific alcohol type in the LCMS survey. "Other alcohol" was listed as a type, but it is not defined as homemade spirits often found in rural or lower-income urban areas. Known as kachasu or changaa in some areas, this

type of alcohol also needs to be taken into consideration when measuring the health outcomes associated with alcohol in countries like Zambia. Using expenditures may not be the best approach to measure consumption given the variation in costs and social drinking patterns found in Zambia. The cost of and production method (commercial versus home-brew) for each type of alcohol needs to be taken into consideration as costs per drink are not representative of the amount of alcohol consumed. One suggestion might be to measure the time spent at a drinking venue and the type consumed during that event. Individuals share the responsibility of paying for alcohol and networks are often based on reciprocity or cost-sharing models. The communal style of drinking traditional beer also makes it difficult to measure individual drinks and, therefore, alcohol use disorders based on existing quantity-frequency screening tools. Without being able to measure the burden of alcohol use disorders in communities, it often goes unaddressed as it is assumed the burden is relatively low compared to other health behaviors and problems. Alcohol use is often associated with risky sexual behaviors connected with HIV and sexually transmitted diseases, but it is also necessary to understand the role and impact of alcohol use associated with other health outcomes such as nutrition and food insecurity.

Strengths of this study include the use of a nationally representative data set incorporating measures of various alcohol expenditures by type among rural and urban households. The large sample size allowed for a stratified analysis to assess differences by region. The study is generalizability to Zambia given the population-based survey used in the analysis.

Limitations of the study include the use of expenditures as an indicator of consumption. Even though this is common in the alcohol literature, expenditures can be a biased measure given the significant differences in cost of the same alcohol type between rural and urban contexts particularly if the alcohol is a type of home-brew. The household level data was also limited in differentiating the effects between the individual drinker and the rest of the family regarding food security measures.

Further research is needed to better understand the role of traditional brew and opaque beer in the development of alcohol use disorders and individual, family, and community health impacts. Given the variation in alcohol purchasing between rural and urban areas, specific screening tools should be developed to help diagnose and address such disorders to treat and prevent the continued harm related to alcohol use among families with limited safety nets. Further research is also needed to understand the context within which alcohol consumed given the finding of increased odds of eating meat among those consuming alcohol. Future epidemiologic or economic studies should include measures of alcohol consumption for all members of the family to build a more robust alcohol data base.

CONCLUSION

This study used the Zambian Living Conditions Monitoring Survey to investigate the difference in alcohol expenditures and associated impacts on food security between rural and urban drinkers. The results show that alcohol use is not only different between urban and rural settings but that rural Zambian families experience

a greater chance of skipping meals if a member of the household consumes alcohol. Future research needs to incorporate traditional brew and opaque beer as specific alcohol measures in order to capture better estimates of alcohol use in rural areas. Identifying better measures to incorporate unrecorded and commercially produced alcohol would also strengthen the ability to diagnose problems associated with alcohol use. The study highlights the importance of alcohol use on food security concerns and evidence to support behavioral health treatment services specific for urban and rural settings.

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JP and KT conceptualized the study. KT organized and cleaned the data. JP conducted the analysis and drafted the initial manuscript. BC assisted in obtaining the data and study approvals from the Zambia Statistics Agency. JP, KT, EO, and BC designed the analysis, interpreted the results, and revised the manuscript.

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