Alcohol consumption and fruits and vegetable intake among older adults in Ghana: a cross-sectional survey based on WHO-SAGE Wave 2 data

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ABSTRACT

Background Alcohol consumption and inadequate fruits and vegetable (FnV) intake are major reasons for the shift from communicable to non-communicable diseases (NCDs) over the years. The older Ghanaian adult is at high risk of NCD and data on alcohol and FnV consumption are required to guide policy to mitigate its effect. This analysis aimed to determine the factors associated with alcohol consumption and assess the relationship between alcohol consumption and FnV intake among Ghanaians aged 50 years and older.

Methods This analysis used WHO Study on Global Ageing and Adult Health (SAGE) Wave 2, Ghana data set conducted between 2014 and 2015. Data on demographic characteristics, FnV intake, and alcohol consumption were collated and analysed. Multivariable Poisson, logistic and probit regression analyses were performed to assess the associations between alcohol consumption and inadequate FnV intake.

Results A total of 3533 Ghanaians aged 50 years and older, 41.0% men and 59.0% women, were included in this study. The prevalence of lifetime alcohol consumption was 22.8% (95% CI 20.7% to 25.1%). Alcohol consumption was significantly associated with sex, age group, marital status, religion, place of residence and history of smoking. The prevalence of adequate FnV intake was 52.6% with a mean daily intake of 6.45 servings: 2.98 for fruits and 3.47 for vegetables. There was a significant positive correlation between inadequate FnV intake and alcohol consumption. Inadequate FnV consumption was significantly higher among lifetime alcohol consumers compared with non-alcohol consumers. (Poisson estimate; adjusted Prevalence Ratio (aPR) (95% CI)=1.35 (1.12 to 1.63), logistic estimate; adjusted Old Ratio (aOR) (95% CI)=1.13 (1.05 to 1.21) and probit estimate; adjusted normalized coefficient (aβ) (95% CI)=0.19 (0.07 to 0.31))

Conclusion About a quarter and nearly half of older Ghanaian adults consume alcohol and inadequate FnV, respectively. Alcohol consumption is significantly associated with inadequate FnV intake. Interventions to address inadequate FnV intake among older adults in Ghana should also include policies that regulate the use of alcohol in this population.

What this paper adds

► The prevalence of lifetime alcohol consumption among older adults is similar to that previously reported among secondary school stuents in Ghana

► The prevalecne of inadeqaute FnV is high among older adults in Ghana

► Alcohol comsumption is significantly associated with inadequate FnV intake amog older adults in Ghana

INTRODUCTION

Changes in dietary patterns including fruits and vegetable (FnV) intake and alcohol consumption are considered the major reasons for the shift in disease pattern from communicable to non-communicable diseases (NCDs) observed between 1990 and 2010.[1] FnV are essential ingredients of a healthy diet because they are rich sources of dietary fibre, vitamins, minerals, flavonoids and antioxidants necessary for good health. While the recommendation on adequate levels of FnV intake to obtain health benefits is still variable among countries, many experts and the WHO agree on a minimum intake of 400 g/day (five servings).[2] A high intake of FnV diet has been associated with reduced risk of many NCDs including coronary heart diseases, colorectal cancers and strokes.[2][3] Unfortunately, inadequate FnV intake continues to be a contributor to the global rise in the burden of NCD. Worldwide, low intake of FnV is estimated to contribute to about 19% of gastrointestinal cancers, about 31% of ischaemic heart diseases and 11% of strokes.[2] It also remains among the top 10 risk factors for global mortality. According to estimates by Lock *et al*, about 2.6 million deaths could be prevented annually by simply increasing FnV intake.[4]

The prevalence of inadequate FnV consumption varies globally. In a survey of 52

Table 1 Descriptive prevalence of demographic characteristics associated with alcohol consumption among the older adults in Ghana

Demographic variable	Total	Alcohol use		χ^2 P value
		No=77.2 (74.9–79.3)	Yes=22.8 (20.7–25.1)	
	n	Weighted %	Weighted %	
Sex				113.45 (0.000)
Male	1455	63.3	36.7	
Female	2078	89.2	10.8	
Age				
Mean age (+SD)	62.6 (10.2)	62.9 (10.6)	61.7 (8.9)	8.50 (0.004)
Age group, years				
50–59	1275	75.1	24.9	3.48 (0.019)
60–69	1093	77.4	22.6	
70–79	764	80.5	19.5	
80+	401	82.5	17.5	
Marital status				12.23 (0.000)
Never married	114	70	30	
Married	1976	74.3	25.7	
Separated	420	72.5	27.5	
Widowed	1023	88.2	11.8	
Religion				45.39 (0.000)
None	114	42.5	57.5	
Christian	2545	75.1	24.9	
Islam	657	95.1	4.9	
Prima indigenous	217	65.8	34.2	
Place of residence				5.00 (0.026)
Urban	1377	79.7	20.3	
Rural	2156	74.8	25.2	
Region				5.69 (0.000)
Ashanti	575	83.8	16.2	
Brong Ahafo	376	81.3	18.7	
Central	457	73.2	26.8	
Eastern	284	70.7	29.3	
Greater Accra	333	74.1	25.9	
Northern	357	90	10	
Upper East	191	83.4	16.6	
Upper West	184	83.5	16.5	
Volta	328	61.9	38.1	
Western	448	78.8	21.2	
History of smoking				72.42 (0.000)
Yes	247	42.1	57.9	
No	3266	80.2	19.8	
BMI				
Mean BMI (+SD)	24.2 (5.6)	24.4 (5.4)	23.7 (5.9)	1.38 (0.242)
BMI category				
Underweight	427	71.1	28.9	2.49 (0.067)
Normal	1844	75.3	24.7	

Continued

Table 1 Continued

Demographic variable	Total	Alcohol use		χ^2 P value
		No=77.2 (74.9–79.3)	Yes=22.8 (20.7–25.1)	
Overweight	677	81.2	18.8	
Obesity	399	79.6	20.4	
QoL				4.07 (0.008)
Poor	239	86	14	
Low	115	78.5	21.5	
Moderate	1852	77.1	22.9	
High	287	69.1	30.9	
Educational level				16.20 (0.000)
None	1765	85.9	14.1	
Primary	846	74	26	
Secondary	804	68.1	31.9	
Tertiary	118	66.1	33.9	

BMI, body mass index; QoL, quality of life.

countries by Hall et al, the prevalence of low FnV consumption ranged from 36.6% (Ghana) to 99.2% (Pakistan) for men and from 38.0% (Ghana) to 99.3% (Pakistan) for women.[5] A similar trend was also reported by Wu et al in their evaluation of common risk factors for chronic NCDs during the Study on Global Ageing and Adult Health (SAGE) Wave 1 involving five countries.[6] The reasons for inadequate intake of FnV are related to socioeconomic factors, such as income levels, marital status, age and educational attainment, and to health behaviours such as physical inactivity and smoking.[7 8] Alcohol consumption is also recognised as one of the reasons for FnV consumption.[9]

In many societies today, alcohol consumption is a routine part of social life. According to the WHO, some 2.3 billion people are current drinkers who consume on average 32.8 g of pure alcohol per day.[10] This is estimated to be even higher in the African region by some 20% (40.0 g/day).[10] Compared with other regions, the WHO African region also has one of the worse alcohol-related health outcomes.[10] The differences in the harmful effect of alcohol intake may partly be due to differences in the pattern of consumption including volume, frequency and type of alcoholic beverage consumed.[11 12] However, it may also be partly attributable to differences in the effect of alcohol on FnV intake.

Inadequate FnV intake and alcohol consumption have a direct association with NCDs. An inverse relationship, however, exits between these two lifestyles, alcohol consumption and FnV intake. Shimotsu et al reported that adults who consumed five or more servings of FnV per day were less likely to engage in binge drinking relative to those consuming zero to one serving of FnV per day. This finding was more so for adults with lower household incomes suggesting a role for economic status.[13] A study in Laos, a lower-middle-income country reported

past month binge drinking decreased the odds of having even three or more servings of vegetables daily.[14] It is also likely that this relationship extends beyond the socioeconomically lowly placed in society. In a study of 72 904 French women, FnV consumption was similarly negatively correlated with alcohol consumption.[15] Also, in Northern Italy, the mean number of portions of fresh fruit per week was found to be higher (10.5 servings) among male non-drinkers than among heavy drinkers (9.0 servings).[16]

Ghana is a low-middle-income country with a noted decline in total alcohol consumption.[10] However, among drinkers, the volume of consumption remains high with an alcohol per capita of 10 L, especially of locally brewed beverages. This is even considered an underestimation and in 2016 alone, it resulted in 2194 alcohol-attributable deaths from cirrhosis.[10] Separate studies on FnV consumption have often reported levels far below the recommended levels for the majority of the Ghanaian population.[5 6 17] Ruel et al estimates that FnV consumption is approximately 137.3 g per day, just about a third of the daily requirement.[18] Estimates from the 2014 Ghana demographic health survey also show that on average, women in fertile age (15–49 years old) consume FnV on only 3 out of 7 days.[19] These are likely contributors to the increasing burden of NCDs such as obesity, hypertension and diabetes mellitus in Ghana.[20–22]

The prevalence of these diseases is higher in older adults. These adults are also less likely to have the financial resources to spend on these diseases as they are often past their prime working lives at this time.[6 23] It is reasonable to expect these adults to adopt simple and cost-effective measures like reducing alcohol consumption and increasing FnV intake to improve their health and reduce their risk of NCD. This will be in line with United Nations Sustainable Development Goals agenda 2030 goal 3 (ensure healthy lives and promote well-being for all at

Table 2 Adjusted logistic regression showing significant factors associated with alcohol consumption among Ghanaians aged 50+ years

Covariate	aOR	P-value	95% CI Lower	Upper
Sex				
Female	Ref			
Male	5.09	0.000	3.58	7.24
Age group, years				
80+	Ref			
50–59	1.61	0.036	1.03	2.51
60–69	1.32	0.201	0.86	2.04
70–79	1.37	0.127	0.91	2.05
Marital status				
Married	Ref			
Never married	1.42	0.346	0.68	2.96
Separated	1.61	0.040	1.02	2.52
Widowed	1.05	0.817	0.71	1.53
Religion				
Christian	Ref			
None	4.10	0.000	2.08	8.09
Islam	0.15	0.000	0.09	0.25
Primal indigenous	1.99	0.012	1.16	3.39
Place of residence				
Urban	Ref			
Rural	1.42	0.010	1.09	1.84
Region				
Northern	Ref			
Ashanti	0.70	0.393	0.31	1.57
Brong Ahafo	0.83	0.693	0.34	2.05
Central	1.62	0.259	0.69	3.81
Eastern	1.51	0.290	0.70	3.29
GT. Accra	1.28	0.558	0.55	2.97
Upper East	0.65	0.422	0.23	1.84
Upper West	0.80	0.630	0.32	1.97
Volta	2.30	0.040	1.04	5.09
Western	0.96	0.920	0.44	2.11
Ever used tobacco				
No	Ref			
Yes	3.81	0.000	2.43	5.97
QoL				
BMI				
Normal	Ref			
Underweight	1.23	0.312	0.82	1.85
Overweight	0.89	0.572	0.59	1.34
Obesity	1.31	0.349	0.74	2.34
Poor	Ref			
Low	1.35	0.463	0.59	3.08

Continued

Table 2 Continued

Covariate	aOR	P-value	95% CI Lower	Upper
Moderate	1.39	0.347	0.69	2.79
High	1.82	0.139	0.82	4.06
Educational level				
None	Ref			
Primary	1.35	0.087	0.96	1.89
Secondary	1.44	0.063	0.98	2.11
Tertiary	1.35	0.365	0.70	2.58

aOR, adjusted Odd Ratio; BMI, body mass index; QoL, quality of life.

all ages.).[24] To achieve this will also require data to guide policy decisions. While there are separate data on alcohol use and FnV consumption, there is a paucity of literature on the relationship between alcohol and FnV consumption in this high-risk group for NCD from Ghana. The aim of this study, therefore, was to determine the factors associated with alcohol consumption and assess the relationship between alcohol consumption and FnV intake among Ghanaians aged 50 years and older.

Methods
This study used WHO SAGE Wave 2 Ghana data set conducted between 2014 and 2015.[25] Data on demographic characteristics, work history and benefits were collected for the study. Also, personal health information for participants including anthropometrics, performance tests, biomarker risk factors and preventive health behaviours (including alcohol, FnV consumption), chronic conditions (self-reported chronic health conditions including hearing difficulty), health services coverage, healthcare utilisation, social networks, subjective well-being and quality of life (QoL), and impact of caregiving were captured in the study.[26 27] The study adopted a complex survey method involving a multistage cluster sampling design of 250 primary sample units and 20 strata with sampling weights for each participant.[25] Details about the study design and procedures for data collection have been published elsewhere.[28]

Study participants
SAGE involved two populations; a nationally representative sample of adults aged 50 years and older, and a smaller comparative sample of persons aged 18–49 years. However, our study only analysed data of the older adults aged 50 years and above with a total sample of 3533 participants.

Dependent variables
Two dependents variables were involved in this study: alcohol consumption and FnV intake among participants.

With regards to alcohol consumption, participants were asked, 'Have you ever consumed a drink that contains alcohol (such as beer, wine, spirits)?' Those

Table 3 Sex and place of residence mean daily differential of alcohol consumption among older adults in Ghana

	Equality of variance: sex				Equality of variance: residence			
	Male	Female	Difference	F-test (P value)	Urban	Rural	Difference	F-test (P value)
Day								
Monday	1.34	0.81	0.53	21.87 (0.000)	1.06	1.32	−0.26	4.23 (0.041)
Tuesday	1.27	0.67	0.6	26.29 (0.000)	0.94	1.25	−0.31	5.58 (0.019)
Wednesday	1.28	0.7	0.58	30.99 (0.000)	0.96	1.26	−0.3	4.41 (0.0370
Thursday	1.25	0.72	0.53	21.94 (0.000)	0.92	1.27	−0.35	5.18 (0.024)
Friday	1.45	0.89	0.56	22.87 (0.000)	1.14	1.48	−0.34	4.70 (0.031)
Saturday	1.68	0.99	0.69	24.40 (0.000)	1.35	1.62	−0.27	2.31 (0.131)
Sunday	1.44	0.86	0.58	26.39 (0.000)	1.09	1.45	−0.36	4.66 (0.032)
Total	9.76	5.65	4.11	32.36 (0.000)	7.47	9.67	−2.2	−5.07 (0.000)

who answered 'yes' were classified as lifetime consumers. The lifetime consumers were further asked, 'Have you consumed alcohol in the last 30 days?' requiring a yes or no answer. Those who answered 'yes' were classified as current consumers. The current consumers were further asked 'During the past 7 days, how many drinks of any alcoholic beverage did you have each day'. Respondents were shown cards to tell the number of 'standard' drinks they consumed per day from Monday to Sunday. Frequencies of alcohol consumption were accumulated for each day for every participant. An index discrete variable was generated to obtain the total consumption of alcohol in a week. The study further assessed the hazardous nature of alcohol consumption among participants using the index variable generated. The classification comprised non-hazardous drinking (women consuming ≤14 drinks/week and men consuming ≤21 drinks/week) and hazardous drinking (women consuming >14 drinks/week and men consuming >21 drinks/week).[29]

For FnV intake, participants were asked, 'How many servings of fruit do you eat on a typical day? (this can include a slice or bowl of fresh fruit.)' and 'How many servings of vegetables do you eat on a typical day? (this can include Kontomire leaves, carrots, garden eggs (aubergine/eggplant), cabbage and green beans)'. A composite variable was generated by classifying the variable as a dummy comprising; inadequate FnV intake (total intake of FnV <5 servings/day) coded as one and adequate FnV intake (total intake of FnV ≥5 servings/day) coded as 0.

Independent variables

Covariates which were analysed in this study included the following; sex, age group (50–59 years, 60–69 years, 70–79 years and 80+ years), educational level (none, primary, secondary and tertiary), marital status (married, never married, separated/divorced, widowed), religion (none, Christian, Islam and Primal Indigenous), place of residence (rural and urban), region (involving the then 10 administrative regions), history of smoking (yes or no), body mass index (BMI) and QoL (poor, low, moderate and high). BMI was derived from the weight and height measurements using the formula $BMI = \frac{Weight\,(kg)}{[Height\,(m)]^2}$.[30] BMI

was then classified as underweight, normal, overweight and obese using the cut-offs <18.5 kg/m^2, 18.5–24.9 kg/m^2, 25.0–29.99 kg/m^2 and >30 kg/m^2 respectively.

Data analysis

This study adjusted for the primary sampling units, stratification and the individual sampling weights in all the estimates. Rao-Scott χ^2 for testing association (for a complex survey) between covariate variables and the outcome variable (alcohol consumption) and equality of mean test statistic to assess the significant mean difference of alcohol consumption weekly by reporting F-test statistic were adopted individually. Multivariate logistic regression was performed to assess significant factors associated with alcohol consumption. Finally, multivariable Poisson, logistic and probit regression analysis were performed to assess the associations between alcohol consumption and inadequate FnV intake. The models were adopted to estimate log ratio (Poisson estimate), log odds (logistic) and normalised coefficient (probit) to have an in-depth evaluation of the effect of alcohol consumption on inadequate FnV intake.

Ethical requirements

Written informed consent was obtained from all study participants.

RESULTS
Alcohol consumption

A total of 3533 Ghanaians 50 years and older, 41.0% men and 59.0% women, were included in this study. The mean age of the study participants was 62.6 years and mean BMI was 24.2 kg/m^2. The demographic and other characteristics of the study population are shown in table 1.

The prevalence of lifetime alcohol consumption (history of ever consuming alcohol) was 22.8%. Of these, 93.7% had consumed alcohol within 7 days and 100% within 30 days (current drinkers) of the study. Among current drinkers, the prevalence of hazardous drinking was 6.2% (95% CI 4.4% to 8.6%) and non-hazardous drinking 93.8% (95% CI 91.4% to 95.6%). The prevalence of lifetime alcohol use was significantly (p<0.05) more in men (36.6%), the 50–59 years

Table 4 Distribution of fruit and vegetable intake among alcohol users and non-users

Variable	Alcohol use			χ²
	No	Yes		
Number of fruit intake				1.15 (0.332)
None	282 (9.0)	86 (12.2)	368 (9.7)	
1	680 (26.0)	155 (21.4)	835 (24.9)	
2	825 (31.1)	226 (32.6)	1051 (31.4)	
3–4	641 (25.6)	154 (25.7)	795 (25.6)	
5+	152 (8.4)	31 (8.1)	183 (8.3)	
Total	2580	652	3232	
Mean (SD)	2.13 (1.67)	2.05 (1.65)	2.98 (1.11)	
Number of vegetable intake				1.44 (0.222)
None	13 (0.4)	6 (0.9)	19 (0.5)	
1	524 (18.9)	138 (19.5)	662 (19.1)	
2	810 (30.6)	235 (32.0)	1045 (30.9)	
3–4	848 (31.4)	205 (33.6)	1053 (31.9)	
5+	457 (31.4)	88 (14.0)	545 (17.6)	
Total	2652	672	3323	
Mean (SD)	2.96 (1.97)	2.77 (1.86)	3.47 (1.01)	

group (24.9%), the never-married (30%), the non-religious (57.5%), rural residents (25.2%), residence in the Volta Region (38%), self-reported high QoL (30.9%) and participants with tertiary education (33.9%) than in their other counterparts (table 1).

Logistic regression showed that alcohol consumption was associated with sex, age group, marital status, religion, place of residence and history of ever smoking. The results depict that men were over fivefold more likely to consume alcohol compared with women (aOR (95% CI)=5.09 (3.58 to 7.24)). Also, the prevalence of alcohol consumption among respondents without religion was over four times more compared with Christians (aOR (95% CI)=4.10 (2.08 to 8.09)) while the practice of Islam significantly decreased the log odds to consume alcohol by 0.15 (aOR (95% CI)=0.15 (0.09 to 0.25)). Rural residents and respondents with a history of ever smoking were also more likely to consume alcohol compared with urban residents and respondents with no history of ever smoking. (aOR (95% CI)=1.42 (1.09 to 1.84) and 3.81 (2.43 to 5.97)), respectively) (table 2).

The mean daily alcohol consumption was significantly higher on all days of the week for men than women and in rural than in urban areas. Alcohol consumption was also highest for Friday, Saturday and Sunday. The mean total weekly alcohol consumption was 9.76 and 5.65 for men and women, respectively (table 3).

FnV intake
The prevalences of adequate and inadequate daily FnV intakes were 52.6% and 47.4%, respectively. The mean daily FnV intake was 6.45 servings: 2.98 for fruits and 3.47 for vegetables. The mean daily FnV intakes for alcohol consumers

were 2.05 and 2.77 servings, respectively. Also, 12.2% and 0.9% of alcohol consumers ate no daily fruits or vegetables, respectively (table 4).

Relationship between alcohol and FnV consumption
There was a significant positive correlation between inadequate FnV intake and lifetime alcohol consumption as presented in table 5. Controlling for significant factors influencing alcohol consumption, using Poisson and logistic regression showed that alcohol consumption was significantly associated with inadequate FnV intake. The analysis shows that inadequate FnV consumption among lifetime alcohol consumers was significantly higher compared with non-alcohol consumers. Inadequate FnV intake as estimated by Poisson and logistic regressions was 35% and 13% higher (aPR (95% CI)=1.35 (1.12 to 1.63) and aOR (95% CI)=1.13 (1.05 to 1.21), respectively) among alcohol consumers compared with non-alcohol consumers. Similarly, the probit model showed that alcohol consumption significantly increased the log odds by 0.19 of inadequate FnV intake compared with non-alcohol consumption (aβ (95% CI)=0.19 (0.07–0.31)) (table 6).

DISCUSSION
This analysis reports a lifetime alcohol consumption prevalence of 23% among older adults in Ghana. Interestingly, all lifetime consumers are also current consumers (consumption within the past 30 days). This is quite similar to lifetime alcohol use prevalence of 25.1% previously reported among secondary school students in Ghana.[31] This could suggest drinking habits once acquired in adolescence remain unchanged into older adulthood. This is worrying because, it is expected of all individuals especially as they grow, to become more health conscious and modify their lifestyles to have better health. This does not appear to be the case from this study. Fortunately, the hazardous drinking level of 6.2% among the current drinkers is low.

This analysis further confirms previous reports of gender differences in alcohol consumption with more men than women reporting alcohol use.[32] However, the prevalence of lifetime alcohol use among the older, adult female population was 10%, lower than the 17.5% reported among a relatively younger Ghanaian population of 15–49 year olds by Tampah-Naah and Amoah.[33]

Also, alcohol use was higher among the non-religious than the religious. Among the religious, fewer Muslims than Christians and the primal indigenous used alcohol. This is similar to other reports that attending a religious service once a week and religiosity were protective against alcohol use and associated with more restrictive alcohol policies.[34 35] The majority Muslim (60%) community in the Northern Region of Ghana is more likely to have more restrictive alcohol policies accounting for the low prevalence of lifetime alcohol use (10%) in the Northern Region.[36]

Table 5 Pairwise correlation coefficients between alcohol use, fruit intake, vegetable intake

Variable	Alcohol use
Inadequate fruit and vegetable	0.04**
Fruit intake	−0.02
Vegetable intake	−0.045**

P-value notaion: **p-value≤0.01

The difference in alcohol consumption patterns between regions of the world and between countries is well documented.[1 10 37] This analysis found differences in consumption patterns within geographical locations (place and region of residence) in Ghana. The observation that rural dwellers consume more alcohol than urban dwellers is similar to reports in the Rodam Study from Ghana and other similar studies.[34 38] The reasons for this most likely include lower cost of alcohol consumed in the rural areas which are mostly locally brewed beverages like 'Akpeteshie', 'Brukutu' and 'Pito'.[34 39] Another reason is the limited availability of alternatives to alcohol for socialisation in rural settings. In Ghana, it is also a truism that cultural and traditional practices are still more elaborately celebrated in rural areas than in many urban settings. These are often strongly linked to alcohol

consumption. Thus, overall, rural communities do have a more permissive drinking culture than urban areas. These cultural and traditional practices such as funerals often occur from Fridays to Sundays and these days are associated with more alcohol drinking as demonstrated by this analysis.

The prevalence of alcohol use was relatively higher among older adults with higher perceived QoL. This observation is consistent with the findings of Chan *et al* who reported that regular alcohol consumption is associated with increased QoL in older men and women.[40] What is not certain, however, is whether the difference in the QoL was the reason for drinking or the effect. This could not be determined from this study due to the nature of the data used for this analysis.

Another observation from this analysis was that increased prevalence of lifetime alcohol use was associated with an increasing level of education. The demands and stress of higher learning and more socialisation associated with the prolonged stay in institutions of higher learning are possible reasons for this finding. This is, however, contrary to other reports that suggest that alcohol consumption is higher in persons with lower educational attainment.[34 41] Differences in the amounts of alcohol consumed in the different studies may be the reason for

Table 6 Sensitivity analysis showing the impact of alcohol consumption on inadequate fruit or vegetable fruit per day

	Poisson	Logistic	Probit
Covariate	aPR (95% CI)	aOR (95% CI)	aβ (95% CI)
Alcohol consumption			
No	Ref	Ref	Ref
Yes	1.35 (1.12 to 1.63)***	1.13 (1.05 to 1.21)***	0.19 (0.07 to 0.31)**
Sex			
Female	Ref		
Male	0.81 (0.69 to 0.94)**	0.92 (0.86 to 0.97)**	−0.13 (−0.23 to −0.03)**
Religion			
Christian	Ref	Ref	Ref
None	0.78 (0.53 to 1.15)	0.91 (0.77 to 1.06)	−0.15 (−0.39 to 0.09)
Islam	0.80 (0.66 to 0.97)*	0.91 (0.84 to 0.99)*	−0.14 (−0.25 to −0.02)*
Prima indigenous	0.65 (0.48 to 0.87)**	0.83 (0.73 to 0.95)**	−0.27 (−0.45 to −0.08)**
Place of residence			
Urban	Ref	Ref	Ref
Rural	0.96 (0.83 to 1.12)	0.98 (0.93 to 1.04)	−0.02 (−0.11 to 0.07)
No	Ref		
Yes	1.08 (0.81 to 1.43)	1.03 (0.92 to 1.15)	0.05 (−0.13 to 0.22)
Educational level			
None	Ref	Ref	Ref
Primary	0.87 (0.73 to 1.04)	0.95 (0.88 to 1.02)	−0.08 (−0.19 to 0.03)
Secondary	0.89 (0.74 to 1.08)	0.96 (0.89 to 1.03)	−0.07 (−0.19 to 0.05)
Tertiary	0.97 (0.65 to 1.44)	0.99 (0.84 to 1.15)	−0.02 (−0.27 to 0.22)

*p≤0.05; **p≤0.01; ***p≤0.001.
aβ, adjusted normalized coefficient; aOR, adjusted Odd Ratio; aPR, adjusted Prevalence Ratio.

our contradictory findings. Hazardous drinking is more prevalent in persons with lower education, but this study did not determine the relationship between amount of alcohol consumed and level of education.

Overall, FnV consumption is essential to the health of individuals especially among older adults and was key in this analysis. Even though the mean FnV serving is higher than recommended by experts and the previous estimates by Ruel *et al* among Ghanaians, nearly half (47.4%) of the study population did not consume adequate FnV.[2 18] This finding of inadequate FnV intake agrees with that found among older adults in China.[8] The prevalence of inadequate FnV intake among older adults in Ghana reported in this study is better than the prevalence of 68.9% reported in SAGE Wave 1 and also relatively better than previous estimates from other Sub-Saharan African countries; 68% in South Africa, 73% in Nigeria, 87.8% in Uganda and 94% in Kenya.[6 12 42–45] It is also lower than the previously reported global mean prevalence of inadequate FnV of 77.6% for men and 78.4% for women but higher than the means for Ghanaian men and women (36. 8% and 38%, respectively) in a study of 52 low-income middle-income countries.[5] Availability may likely play a role in these differences, but further studies will be required to identify the true reasons for these wide differences.

This study also concurs with previous reports that alcohol consumption impairs FnV intake.[14–16] In a study among elderly Chinese between 1991 and 2009, despite an increase in FnV intake, a significant association between alcohol drinking and inadequate FnV intake was maintained.[46] This potentially could be due to the tendency for the clustering of harmful lifestyles including alcohol consumption, smoking, physical inactivity and poor diet. Persons who consume alcohol tend to have concomitant risky health behaviours including low FnV intake.[47] Additionally, alcohol contributes to the daily calorie requirement of its consumers and therefore is likely to lower their intake of other foods including FnV. However, the negative influence of alcohol use on FnV intake has not been consistently reported in all studies. In a study among older adults in South Africa, alcohol use did not have any effect on FnV intake.[42] Other studies have also reported increased FnV intake with consumption of some alcoholic beverages such as wine but not others.[48] It will be interesting to explore the relationship between the amount and type of alcohol consumed and the influence on the FnV intake among the older, adult population in Ghana.

The findings and interpretations from this study must be viewed with consideration for some limitations. Alcohol consumption and FnV intake were subjectively assessed (were self-reported) and therefore could have been affected by recall bias and local social, cultural and religious nuances, and permissiveness and acceptability of certain behaviours. This has however been used in many population-based studies and found to be reliable. Also, the cross-sectional nature of the SAGE Wave 2 Study did not allow evaluation of changes in alcohol consumption

and FnV intake over time. Longitudinal studies will be needed to study these changes. The release of SAGE Wave 3 will allow such a longitudinal study.

CONCLUSIONS

About one out of five older Ghanaian adults are current alcohol consumers. The prevalence of alcohol consumption among older Ghanaian adults is like that of the younger population. Nearly half of the older, adult population consumes inadequate FnV. Alcohol consumption is significantly associated with inadequate FnV intake. Interventions to address inadequate FnV intake among older adults in Ghana should include policies that address factors that influence the use of alcohol in this target population.

REFERENCES

1 Lim SS, Vos T, Flaxman AD, *et al*. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the global burden of disease study 2010. *Lancet* 2012;380:2224–60.

2 World Health Organization. *Diet, nutrition, and the prevalence of chronic diseases*. 916. Geneva, Switzerland: World Health Organization; WHO Technical Report Series, 2003.

3 He FJ, Nowson CA, Lucas M, *et al*. Increased consumption of fruit and vegetables is related to a reduced risk of coronary heart disease: meta-analysis of cohort studies. *J Hum Hypertens* 2007;21:717–28.

4 Lock K, Pomerleau J, Causer L, *et al*. The global burden of disease attributable to low consumption of fruit and vegetables: implications for the global strategy on diet. *Bull World Health Organ* 2005;83:100–8.

5 Hall JN, Moore S, Harper SB, *et al*. Global variability in fruit and vegetable consumption. *Am J Prev Med* 2009 ;;36:402–9.

6 Wu F, Guo Y, Chatterji S, *et al*. Common risk factors for chronic non-communicable diseases among older adults in China, Ghana,

Mexico, India, Russia and South Africa: the study on global ageing and adult health (SAGE) wave 1. *BMC Public Health* 2015;15:88.

7 Franchini B, Poínhos R, Klepp K-I, *et al*. Fruit and vegetables: intake and sociodemographic determinants among Portuguese mothers. *Ann Nutr Metab* 2013;63:131–8.

8 Li YC, Jiang B, Zhang M, *et al*. Vegetable and fruit consumption among Chinese adults and associated factors: a nationally representative study of 170,847 adults. *Biomed Environ Sci* 2017;30:863–74.

9 Herbeth B, Samara A, Stathopoulou M, *et al*. Alcohol consumption, beverage preference, and diet in middle-aged men from the STANISLAS study. *J Nutr Metab* 2012;2012:1–6.

10 World Health Organization. Substabce abuse: global status report on alcohol and health 2018.

11 Shield KD, Parry C, Rehm J. Chronic diseases and conditions related to alcohol use. *Alcohol Res* 2013;35:155–73.

12 Zhou Y, Zheng J, Li S, *et al*. Alcoholic beverage consumption and chronic diseases. *Int J Environ Res Public Health* 2016;13:522.

13 Shimotsu ST, Jones-Webb RJ, Lytle LA, *et al*. The relationships among socioeconomic status, fruit and vegetable intake, and alcohol consumption. *Am J Health Promot* 2012;27:21–8.

14 Pengpid S, Vonglokham M, Kounnavong S, *et al*. The prevalence and social determinants of fruit and vegetable consumption and its associations with noncommunicable diseases risk factors among adults in Laos. *Asia Pac J Public Health* 2019;31:157–66.

15 Kesse E, Clavel-Chapelon F, Slimani N, *et al*. Do eating habits differ according to alcohol consumption? results of a study of the French cohort of the European prospective investigation into cancer and nutrition (E3N-EPIC). *Am J Clin Nutr* 2001;74:322–7.

16 La Vecchia C, Negri E, Franceschi S, *et al*. Differences in dietary intake with smoking, alcohol, and education. *Nutr Cancer* 1992;17:297–304.

17 Ghose B, Yaya S. Fruit and vegetable consumption and anemia among adult non-pregnant women: Ghana demographic and health survey. *PeerJ* 2018;6:e4414.

18 Ruel MT, Minot N, Smith L. Patterns and determinants of fruit and vegetable consumption in sub-Saharan Africa: a multicountry comparison: who Geneva 2005.

19 Ghana Statistical Service, (GSS), Ghana Health Service, (GHS), International I. *Ghana demographic and health survey 2014*. Rockville, Maryland, USA: GSS, GHS, and ICF International, 2015.

20 Abubakari AR, Bhopal RS. Systematic review on the prevalence of diabetes, overweight/obesity and physical inactivity in Ghanaians and Nigerians. *Public Health* 2008;122:173–82.

21 Dosoo DK, Nyame S, Enumeh Y, *et al*. Prevalence of hypertension in the middle belt of Ghana: a community-based screening study. *Int J Hypertens* 2019;2019:1–7.

22 de-Graft Aikins A, Addo J, Ofei F, *et al*. Ghana's burden of chronic non-communicable diseases: future directions in research, practice and policy. *Ghana Med J* 2012;46:1–3.

23 Tagoe HA. Household burden of chronic diseases in Ghana. *Ghana Med J* 2012;46:54–8.

24 Colglazier W. Sustainability. sustainable development agenda: 2030. *Science* 2015;349:1048–50.

25 Who study on global ageing and adult health (SAGE), health statistics and information systems, 2015. Available: http://www.who.int/healthinfo/sage/en/ [Accessed 29 May 2019].

26 Agrawal G, Patel SK, Agarwal AK. Lifestyle health risk factors and multiple non-communicable diseases among the adult population in India: a cross-sectional study. *J Public Health* 2016;24:317–24.

27 Minicuci N, Biritwum RB, Mensah G, *et al*. Sociodemographic and socioeconomic patterns of chronic non-communicable disease among the older adult population in Ghana. *Glob Health Action* 2014;7:21292.

28 Kowal P, Chatterji S, Naidoo N, *et al*. Data resource profile: the world Health organization study on global ageing and adult health (SAGE). *Journal of Public Health* 2012;41:1639–49.

29 Saunders JB, Aasland OG, Babor TF, *et al*. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption--II. *Addiction* 1993;88:791–804.

30 Blackburn H, Jacobs D. Commentary: origins and evolution of body mass index (BMI): continuing SAGA. *Int J Epidemiol* 2014;43:665–9.

31 Osei-Bonsu E. Prevalence of alcohol consumption and factors influencing alcohol use among the youth in Tokorni-Hohoe, Volta region of Ghana. *SJPH* 2017;5:205–14.

32 Erol A, Karpyak VM. Sex and gender-related differences in alcohol use and its consequences: contemporary knowledge and future research considerations. *Drug Alcohol Depend* 2015;156:1–13.

33 Tampah-Naah AM, Amoah ST. Consumption and drinking frequency of alcoholic beverage among women in Ghana: a cross-sectional study. *BMC Public Health* 2015;15:317.

34 Addo J, Cook S, Galbete C, *et al*. Differences in alcohol consumption and drinking patterns in Ghanaians in Europe and Africa: the RODAM study. *PLoS One* 2018;13:e0206286.

35 Michalak L, Trocki K, Bond J. Religion and alcohol in the U.S. national alcohol survey: how important is religion for abstention and drinking? *Drug Alcohol Depend* 2007;87:268–80.

36 Ghana Statistical Service. 2010 population and housing census report: Ghana statistical service 2014.

37 Shield KD, Rylett M, Gmel G, *et al*. Global alcohol exposure estimates by country, territory and region for 2005--a contribution to the Comparative Risk Assessment for the 2010 Global Burden of Disease Study. *Addiction* 2013;108:912–22.

38 Oyebode O, Pape UJ, Laverty AA, *et al*. Rural, urban and migrant differences in non-communicable disease risk-factors in middle income countries: a cross-sectional study of WHO-SAGE data. *PLoS One* 2015;10:e0122747.

39 Luginaah I, Dakubo C. Consumption and impacts of local brewed alcohol (akpeteshie) in the upper West region of Ghana: a public health tragedy. *Soc Sci Med* 2003 ;;57:1747–60.

40 Chan AM, von Mühlen D, Kritz-Silverstein D, *et al*. Regular alcohol consumption is associated with increasing quality of life and mood in older men and women: the Rancho bernardo study. *Maturitas* 2009;62:294–300.

41 Droomers M, Schrijvers CT, Stronks K, *et al*. Educational differences in excessive alcohol consumption: the role of psychosocial and material stressors. *Prev Med* 1999;29:1–10.

42 Peltzer K, Phaswana-Mafuya N. Fruit and vegetable intake and associated factors in older adults in South Africa. *Glob Health Action* 2012;5:18668–8.

43 Olatona FA, Sosanya A, Sholeye OO, *et al*. Knowledge of fruits and vegetables, consumption pattern and associated factors among adults in Lagos state, Nigeria. *Research Journal of Health Sciences* 2018;6:50–62.

44 Kabwama SN, Bahendeka SK, Wesonga R, *et al*. Low consumption of fruits and vegetables among adults in Uganda: findings from a countrywide cross-sectional survey. *Arch Public Health* 2019;77:4.

45 Pengpid S, Peltzer K. The prevalence and social determinants of fruit and vegetable consumption among adults in Kenya: a cross-sectional national population-based survey, 2015. *Pan Afr Med J* 2018;31:137.

46 Li Y, Li D, Ma C-yuan, *et al*. Consumption of, and factors influencing consumption of, fruit and vegetables among elderly Chinese people. *Nutrition* 2012;28:504–8.

47 Ma J, Betts NM, Hampl JS. Clustering of lifestyle behaviors: the relationship between cigarette smoking, alcohol consumption, and dietary intake. *Am J Health Promot* 2000;15:107–17.

48 Barefoot JC, Grønbaek M, Feaganes JR, *et al*. Alcoholic beverage preference, diet, and health habits in the unc alumni heart study. *Am J Clin Nutr* 2002;76:466–72.