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Association between Alcohol Screening with Brief Intervention and Colorectal Cancer Screening Among Alcohol Users in the United States: A Cross-Sectional Study from 2022 BRFSS

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Abstract

Background

Colorectal cancer (CRC) is still a major public health issue on a global scale, being the second leading cause of cancer death and the third most common cancer worldwide. Alcohol screening with brief intervention (ASBI) is recommended to reduce unhealthy alcohol use; however, whether receiving advice to reduce or quit drinking through ASBI is associated with CRC screening participation among current drinkers aged 45–75 years remains unclear. This study aimed to examine whether receiving ASBI advice to reduce or quit drinking was associated with CRC screening participation and whether this association differed by alcohol consumption intensity (moderate versus excessive drinking)

Methods

Data were collected from 17,845 current drinkers aged 45–75 years in 11 states administering the ASBI module of the 2022 Behavioral Risk Factor Surveillance System (BRFSS). The outcome was CRC screening status (up-to-date vs. not). The primary exposure was receipt of advice to reduce or quit drinking. Survey-weighted logistic regression crude and adjusted models estimated the association between ASBI advice and CRC screening. Interaction, stratified, and sensitivity analyses were also conducted.

Results

Overall, 70.8% of 17845 participants had up-to-date CRC screening. After adjustment of sociodemographic, healthcare access, and health behavior ASBI advice was not significantly associated with CRC screening participation (adjusted odds ratio [aOR]: 0.98; 95% CI: 0.74–1.29, p = 0.866). However, excessive drinking was significantly associated with lower odds of CRC screening participation (aOR: 0.78; 95% CI: 0.64–0.95, p = 0.012). The interaction between Alcohol intensity and ASBI advice was statistically significant (aOR: 1.75; 95% CI: 1.04–2.94, p = 0.034). Stratified analyses showed that ASBI advice was associated with lower odds of CRC screening among moderate users (aOR: 0.66; 95% CI: 0.44–0.98, p = 0.041), whereas the association was not significant among excessive users (aOR: 1.30; 95% CI: 0.92–1.85, p = 0.140).

Conclusion

ASBI advice was not significantly associated with CRC screening overall, but alcohol intensity modified this relationship. Among moderate drinkers, ASBI advice was associated with lower odds of CRC screening. Brief alcohol interventions may need additional components addressing preventive cancer screening behaviors to improve preventive screening among people who drink alcohol.

Background

Colorectal cancer (CRC) is still a major public health problem, being the third most common type of cancer and the second leading cause of cancer-related deaths [1]. Recently, there has been a rise in colorectal cancer incidence and mortality reports, particularly among people younger than 65 [2]. The American Cancer Society projected that in the United States, there will be approximately 159,000 new cases, equivalent to 440 diagnoses daily this year (2026) [2]. Unlike in earlier decades, incidence and mortality rates have decreased because of the increased screening services availability which enabled the early detection of precancerous lesions [3, 4]. Nevertheless, even in high-resource settings, with advanced screening services, screening participation rates remain suboptimal [5]. Excessive alcohol intake is a known risk factor for a several health problems, including colorectal cancer [6]. Problematic alcohol use may encompass binge drinking, heavy drinking, alcohol use by people below the age of 21, and drinking while pregnant [7]. Binge drinking is defined for women as four or more drinks during an occasion, or five or more drinks for men, while heavy drinking is categorized for women as eight or more drinks during a week, or 15 or more drinks for men [7]. The genotoxic effect of acetaldehyde, oxidative stress, nutritional deficiency in folate and fiber, and alcohol induced gut dysbiosis have all been posited as mechanisms that link alcohol intake to colorectal cancer occurrence [8].

Evidence suggests an inverse association between excessive alcohol use and utilization of preventive health services such as screening [9–11]. For example, one study showed that women who were heavy alcohol users were more likely to have irregular cancer screening or not participate in cancer screening as compared to moderate alcohol users [12]. Another study showed a 23% decreased likelihood in health seeking behavior among regular drinkers as compared to non-regular drinkers [13]. Therefore, there is need for targeted interventions to improve screening uptake among this population.

To mitigate unhealthy consumption of alcohol and thus decrease the consequential effects it may have on health outcomes and broad utilization of health services, the United States Preventive Services Task Force (USPSTF) recommended alcohol screening with brief intervention (ASBI) in primary care facilities [14]. This cost-effective clinical preventive service utilizes a validated screening questionnaire to identify patients' drinking habits followed by a discussion of around 15 minutes or less to develop a plan aimed at reducing alcohol use if the patient intends on doing so [15].

The Health Belief Model (HBM) and the Theory of Planned Behavior (TPB) provide theoretical underpinnings for understanding the relationship between excessive alcohol use, ASBI, and CRC screening participation. According to the HBM, people are more likely to adopt preventive health measures if they feel highly susceptible to a health issue, recognize the benefits of taking preventive action, and see fewer obstacles to taking that action [16]. The TPB, on the other hand, focuses on how people's attitudes, social pressures, and perceived control over their behavior influence their health actions [17]. Using these frameworks, we posit that individuals who participate in ASBI will become more aware of the health risks associated with their alcohol consumption, develop more positive attitudes toward colorectal cancer screening, and consequently, show higher rates of participation in screening

programs. Utilizing the 2022 Behavioral Risk Factor Surveillance Survey (BRFSS), the study aims will be to 1. evaluate the association between receiving Alcohol Screening with Brief Intervention (ASBI) and CRC screening participation among current alcohol users aged 45–75years and 2. determine whether the association between receiving ASBI advice to reduce or quit drinking and CRC screening participation varies by alcohol consumption intensity (moderate vs. excessive users).

Method

Study Design and Data Collection

We conducted a cross-sectional analysis of data from the 2022 Behavioral Risk Factor Surveillance System (BRFSS) to examine the association between receipt of advice to reduce or quit drinking through ASBI and colorectal cancer screening participation among current drinkers aged 45–75 years, and to determine whether this association differs by alcohol consumption intensity. The BRFSS is a telephone survey (random-digit–dialed) of the civilian, noninstitutionalized adult population who are aged 18 years and older. This survey is conducted yearly in all states in the US by the state health departments and the Centers for Disease Control and Prevention (CDC). The survey additionally gathers information from all U.S. territories including Puerto Rico, the District of Columbia, Guam, and the U.S. Virgin Islands) on demographic characteristics, health risk behaviors, preventive health practices, and access to health care. Data collected from each state are pooled to provide data from a nationally representative sample. A comprehensive account of the survey methods for 2022 is published elsewhere [18].

Study Population

Our analytical samples were selected based on multiple factors: 1) We included respondents from the 11 states using the BRFSS variable (_STATE) where the optional ASBI module was administered in the 2022 LLCP combined landline and cellular telephone dataset: California, Michigan, Minnesota, Mississippi, Nevada, New Jersey, New Mexico, Oklahoma, Rhode Island, Utah, and West Virginia. 2) We further included only respondents aged 45 to 75 using the continuous age variable (_AGE80), as routine CRC screening is recommended by the USPSTF for individuals in this age range. 3) We further retained only those who were up-to-date with a checkup within the past year or two using CHECKUP1, as ASBI questions were conditional on respondents having had a routine medical checkup. 4) Lastly, our sample was restricted to those who were current users of alcohol as ASBI questions were designed for individuals with alcohol use and those who were past users or non-users were all excluded. Our final analytic sample comprised 17,845 respondents, as indicated in Fig. 1.

Variables

CRC screening Outcome. CRC screening participation was defined using the BRFSS calculated variable(_CRCREC2). Respondents were classified as up-to-date on CRC screening if they reported

receiving screening within the USPSTF-recommended interval: a home stool test (FOBT/ FIT) within 1 year, a multitarget stool DNA test (stool DNA) test within 3 years, a flexible sigmoidoscopy (FSIG) or Computed Tomography (CT) colonography within 5 years, or a colonoscopy within 10 years. Those not up-to-date or never screened were classified as not up-to-date.

Primary Exposure. The ASBI module included a five-item assessment scale, such as whether a healthcare provider had asked about the respondent's alcohol use (ASBIALCH), amount of alcohol consumed (ASBIDRNK), binge drinking (ASBIBING), advised about what level of drinking is harmful or risky for the participant's health (ASBIADVC), and were advised to reduce or quit drinking alcohol (ASBIDUC). For the current study, we used receipt of advice to reduce or quit drinking as the primary exposure, coded as 'yes' vs. 'no'.

Alcohol Intensity. We used BRFSS-calculated variables for heavy drinking (_RFDRHV8) and binge drinking (_RFBING6), supplemented by raw alcohol consumption variables (ALCDAY4), to construct a composite measure of alcohol intensity. Respondents were classified into two categories: Moderate drinkers or moderate alcohol users (no heavy or binge drinking) and excessive drinkers or excessive alcohol users (heavy drinking, binge drinking, or both)

Covariates. Sociodemographic characteristics included age (_AGE80), sex (_SEX), race/ethnicity (_RACE1), education (_EDUCAG), annual household income (_INCOMG1), employment status (EMPLOY1), marital status (MARITAL), and urbanicity (URBSTAT) categorized respectively as age 45–54, 55–64, and 65–75; male and female; White, Black, Hispanic, and Other; (< high school, high school graduate, some college and college graduate or higher); <$15,000, $15,000–<$50,000, $50,000–<$100,000 and ≥$100,000); employed, not working and retired/disabled; married/partnered, divorced/widowed/separated and never married and urban and rural. Healthcare access variables included health insurance (_HLTHPLN) categorized as yes or no, number of healthcare providers (PERSDOC3) grouped into more than one, one, and none, and cost barriers to care (MEDCOST1) (could not afford to see a doctor) defined as yes or no. Health-related variables included body mass index (BMI) (_BMI5CAT) sorted into overweight, obese, and underweight/normal, and self-reported general health status (_RFHLTH) grouped as good/very good/excellent vs. fair/poor. All sociodemographic, healthcare access, and health-related variables were included as covariates.

Statistical Analysis.

Survey-weighted descriptive statistics were performed. We performed bivariate analyses using PROC SURVEYFREQ to characterize and examine the distribution of CRC colonoscopy screening status across all demographic, socioeconomic, alcohol use, healthcare access, health-related, and ASBI characteristic variables. Statistical significance was assessed using Rao-Scott chi-square tests accounting for the survey design. We used survey-weighted logistic regression (PROC SURVEYLOGISTIC) to estimate the association between ASBI advice to reduce or quit drinking and CRC screening among respondents who were alcohol users. We fitted three sequential models: (1) a crude model with exposure only; (2) a model

adjusted for alcohol intensity; and (3) a model additionally adjusting for all covariates. We tested the interaction term between ASBI advice to reduce or quit drinking and alcohol intensity to determine whether the association between ASBI advise to reduce or quit drinking and CRC screening differed by levels of alcohol intensity.

We assessed patterns of missing data for all variables. Variables with substantial missingness (> 5%) were identified for multiple imputations. We imputed 25 datasets using fully conditional specification (FCS) logistic regression for categorical variables. All other covariates with minimal missingness were handled using complete-case analysis in the primary model. A sensitivity analysis to evaluate the robustness of the results was conducted by comparing the results from the multiple-imputed dataset with those from the complete-case analysis. To account for the complex sampling design of the BRFSS, we used the final internal domestic weights (_LLCPWT), strata (_STSTR), and primary sampling units (_PSU) in all analyses to produce nationally representative estimates and accurate standard errors. All tests were two-sided, and results were considered statistically significant at $\alpha \leq 0.05$. All data analyses were conducted using version SAS 9.4 (SAS Institute, Cary NC).

Flow chart of participant selection from the full 2022 Behavioral Risk Factor Surveillance System (BRFSS) dataset (N = 445,132) to the final analytic sample of current alcohol users aged 45–75 years (N = 17,845). Exclusions were applied sequentially: non-ASBI participating states (n = 360,432); adults outside the U.S. Preventive Services Task Force recommended screening age range of 45–75 years (n = 47,440); respondents with no routine checkup within the past two years (n = 4,048); those with missing colorectal cancer screening data (n = 1,757); and non-drinkers (n = 13,610). ASBI = Alcohol Screening and Brief Intervention.

Results

The final study sample comprised of 17,845 current alcohol users aged 45–75 years from 11 ASBI participating states in the 2022 BRFSS survey. Among these respondents, the weighted prevalence of participants that were up-to date with colorectal cancer screening was 70.8% (13,441 respondents) while 29.2% were not up-to-date (4,404 respondents) (29.2%) (Table 1).

Screening prevalence varied across sociodemographic, health-care access, and alcohol-related characteristics (Table 1). For instance, colorectal cancer screening prevalence showed an increase, from 47.2% among respondents aged 45–54 years to 85.9% among those aged 65–75 years. Respondents without health insurance had lower screening prevalence compared to respondents with health insurance (34.8% vs. 71.6%, $p < 0.001$). Similarly, respondents with no personal health-care provider showed lower screening prevalence compared to respondents with at least one provider (44.0% vs. 71.0%, $p < 0.001$). Respondents who could not afford to see a doctor showed smaller screening prevalence than those who did not report this barrier (53.0% vs. 71.8%, $p < 0.001$). Concerning lifestyle characteristics, screening prevalence was shown to be lower among excessive drinkers than among

moderate drinkers (62.9% vs. 73.9%, $p < 0.001$) and among participants who were advised to reduce or quit drinking compared to those who did not receive such advice (64.6% vs. 74.2%, $p = 0.005$).

Missingness was concentrated in ASBI-related variables. Missing counts were 4,996 for being asked about binge drinking, 4,083 for being advised to reduce or quit drinking, 2,469 for being asked about amount of alcohol use, 2,284 for being asked if the respondent drinks alcohol, and 2,238 for advice about risky drinking. Annual household income was missing for 2,372 respondents. Missing counts for other variables were smaller and are shown in Table 1.

Table 1
Weighted Sociodemographic, Alcohol Use, and ASBI Characteristics by Colorectal Cancer Screening Status Among Adult Drinkers Aged 45–75, BRFSS (ASBI Module States, N = 17,845)

Characteristic	Total n	Up to Date n (row %)	Not Up to Date n (row %)	Rao-Scott p-value
Overall	17,845	13,441 (70.8%)	4,404 (29.2%)	
Age Group				**< 0.001**
45–54	4,917	2,472 (47.2%)	2,445 (52.8%)	
55–64	6,209	5,045 (79.0%)	1,164 (21.0%)	
65–75	6,719	5,924 (85.9%)	795 (14.1%)	
Sex				*0.405*
Male	8,919	6,749 (70.2%)	2,170 (29.8%)	
Female	8,926	6,692 (71.5%)	2,234 (28.5%)	
Race/Ethnicity				**< 0.001**
White	14,669	11,438 (75.6%)	3,231 (24.4%)	
Black	880	564 (63.8%)	316 (36.2%)	
Hispanic	1,208	725 (60.4%)	483 (39.6%)	
Other	690	422 (64.4%)	268 (35.6%)	
Missing = 398				
Education				< **0.001**
< High School	494	276 (54.7%)	218 (45.3%)	
High School	2,909	2,028 (66.8%)	881 (33.2%)	
Some College	4,735	3,567 (71.9%)	1,168 (28.1%)	
College Graduate+	9,677	7,550 (74.8%)	2,127 (25.2%)	
Missing = 30				
Missing = 4,083				

Characteristic	Total n	Up to Date n (row %)	Not Up to Date n (row %)	Rao-Scott p-value
Annual Household Income				**< 0.001**
< $15,000	440	257 (59.5%)	183 (40.5%)	
$15,000–<$50,000	3,570	2,559 (64.3%)	1,011 (35.7%)	
$50,000–<$100,000	4,984	3,887 (74.8%)	1,097 (25.2%)	
≥ $100,000	6,479	4,899 (71.4%)	1,580 (28.6%)	
Missing = 2,372				
Employment Status				**< 0.001**
Employed	10,060	6,995 (66.1%)	3,065 (33.9%)	
Not Working	880	561 (58.5%)	319 (41.5%)	
Retired/Disabled	6,828	5,829 (81.8%)	999 (18.2%)	
Missing = 77				
Marital Status				**< 0.001**
Married/Partnered	12,175	9,412 (72.5%)	2,763 (27.5%)	
Divorced/Widowed/Sep.	4,216	3,106 (70.5%)	1,110 (29.5%)	
Never Married	1,381	872 (57.3%)	509 (42.7%)	
Missing = 73				
Urbanicity				*0.873*
Urban	16,409	12,401 (70.8%)	4,008 (29.2%)	
Rural	1,436	1,040 (70.5%)	396 (29.5%)	
Health Insurance				**< 0.001**
Yes	17,203	13,078 (71.6%)	4,125 (28.4%)	
No	307	116 (34.8%)	191 (65.2%)	
Missing = 4,083				

Characteristic	Total n	Up to Date n (row %)	Not Up to Date n (row %)	Rao-Scott p-value
Missing = 335				
Personal Healthcare Provider				**< 0.001**
One Provider	10,918	8,198 (71.0%)	2,720 (29.0%)	
More than one	5,958	4,733 (75.8%)	1,225 (24.2%)	
No Provider	898	458 (44.0%)	440 (56.0%)	
Missing = 71				
Could not afford to see a doctor				**< 0.001**
Yes	814	461 (53.0%)	353 (47.0%)	
No	17,012	12,969 (71.8%)	4,043 (28.2%)	
Missing = 19				
BMI Category				**< 0.001**
Underweight/Normal	4,689	3,545 (72.7%)	1,144 (27.3%)	
Overweight	6,612	5,107 (75.1%)	1,505 (24.9%)	
Obese	5,768	4,232 (66.1%)	1,536 (33.9%)	
Missing = 776				
General Health Status				**0.024**
Good/Very Good/Excellent	15,465	11,743 (71.5%)	3,722 (28.5%)	
Fair/Poor	2,359	1,682 (66.7%)	677 (33.3%)	
Missing = 21				
Alcohol Intensity				**< 0.001**
Moderate Drinker	13,226	10,253 (73.9%)	2,973 (26.1%)	
Missing = 4,083				

Characteristic	Total n	Up to Date n (row %)	Not Up to Date n (row %)	Rao-Scott p-value
Excessive Drinker	4,619	3,188 (62.9%)	1,431 (37.1%)	
ASBI				
Asked if drinks alcohol				**0.005**
No	2,084	1,460 (64.3%)	624 (35.7%)	
Yes	13,477	10,345 (72.9%)	3,132 (27.1%)	
Missing = 2,284				
Asked about the amount of alcohol use				**< 0.001**
No	2,928	2,030 (62.2)	898 (37.8)	
Yes	12,448	9,616 (74.2)	2,832 (25.8)	
Missing = 2,469				
Asked about binge drinking				*0.606*
NO	8,513	6,478 (70.8)	2,035 (29.2)	
Yes	4,336	3,285 (71.8)	1,051 (28.2)	
Missing = 4,996				
Advice about risky drinking				*0.510*
No	12,134	9,194 (71.8%)	2,940 (28.2%)	
Yes	3,473	2,646 (70.6%)	827 (29.4%)	
Missing = 2,238				
Advised to reduce /quit drinking (ASBI Reduce)				**0.005**
No	12,538	9,706 (74.2%)	2,832 (25.8%)	
Yes	1,224	859 (64.6%)	365 (35.4%)	
Missing = 4,083				

Note

n = unweighted frequency; weighted % = population-representative proportion. Row % indicates the percentage within each subgroup that was/was not up-to-date on CRC screening. Rao-Scott chi-square p-values account for complex survey design (stratification, clustering, weighting); **Bolded** *p values are statistically significant at p < 0.05. ASBI = Alcohol Screening and Brief Intervention. Data source: BRFSS ASBI Module States. CRC screening up-to-date status based on _CRCREC2 calculated variable.*

In the fully adjusted model, excessive drinking was associated with lower odds of being up-to-date with CRC screening compared with moderate drinking (adjusted odds ratio [aOR]: 0.78; 95% CI: 0.64–0.95, p = 0.012) (Table 2). In the alcohol-intensity adjusted model, ASBI advise reduce or quit drinking was not associated with CRC screening (aOR: 0.79; 95% CI: 0.60–1.05, p = 0.102), although the crude association showed a statistically significant association (OR: 0.66; 95% CI: 0.51–0.85, p = 0.001). ASBI advice to reduce or quit drinking was also not associated with CRC screening in the fully adjusted model (aOR: 0.98; 95% CI: 0.74–1.29, p = 0.866).

Several covariates retained associations with CRC screening in the fully adjusted model. Respondents aged 65–75 years old demonstrated higher odds of screening than respondents aged 45–54 years (aOR: 4.61; 95% CI: 3.75–5.65 and those aged 55–64 years; aOR: 7.75; 95% CI: 5.64–10.65) for ages 65–75 years; both p < 0.001). Respondents with Less than high school education, high school education, annual household income of $15,000 to less than $50,000, never-married status, no personal health-care provider, and inability to afford seeing a doctor revealed lower odds of colorectal cancer screening, whereas respondents with at least one personal health-care provider demonstrated higher odds of screening compared to their peers. (Table 2).

Table 2
Crude and Adjusted Associations Between Receiving ASBI Advice to Reduce or Quit Drinking and Being Up-To-Date on Colorectal Cancer Screening, BRFSS 2022 (N = 17,845)

Variables	Crude OR (95% CI)	P-values	Alcohol-intensity adjusted OR (95% CI)	P-value	Fully adjusted OR (95% CI)	P-value
Age group	—	—	—	—	Reference	**< 0.001**
45–54					4.61 (3.75–5.65)	**< 0.001**
55–64					7.75 (5.64–10.65	
65–75						
Sex	—	—	—	—	Reference	0.703
Male					1.04 (0.86–1.25)	
Female						
Race/Ethnicity	—	—	—	—	Reference	0.072
White					0.76 (0.56–1.03)	0.721
Black					0.95 (0.71–1.3)	0.166
Hispanic					0.76 (0.52–1.12)	
Other						
Education	—	—	—	—	0.57 (0.35–0.95)	**0.031**
< High School					0.70 (0.55–0.88)	**0.003**
High School					0.91 (0.73–1.12)	0.357
Some College					Reference	
College Graduate+						
Annual Household Income	—	—	—	—	0.83 (0.48–1.44)	0.501
< $15,000						**0.017**

Bolded *p values are statistically significant at p < 0.05; "—" indicates no estimate*

Variables	Crude OR (95% CI)	P-values	Alcohol-intensity adjusted OR (95% CI)	P-value	Fully adjusted OR (95% CI)	P-value
$15,000–<$50,000					0.69 (0.51–0.93)	0.301
$50,000–<$100,000					0.88 (0.69–1.12)	
≥ $100,000					Reference	
Employment Status	—	—	—	—	Reference	0.662
Employed					1.10 (0.72–1.69)	0.267
Not working					1.17 (0.89–1.53)	
Retired/Disabled						
Marital Status	—	—	—	—	Reference	0.599
Married/Partnered					0.94 (0.76–1.17)	**0.032**
Divorced/Widowed/Separated					0.71 (0.52–0.97)	
Never married						
Urbanicity	—	—	—	—	Reference	0.674
Urban					0.95 (0.74–1.21)	
Rural						
Health Insurance	—	—	—	—	Reference	0.937
No					1.02 (0.574–1.83)	
Yes						
Personal Healthcare Provider	—	—	—	—	Reference	**0.030**
One Provider					1.22 (1.02–1.48)	**< 0.001**
More than One					0.44 (0.30–0.65)	
No Provider						

Bolded *p values are statistically significant at p < 0.05; "—" indicates no estimate*

Variables	Crude OR (95% CI)	P-values	Alcohol-intensity adjusted OR (95% CI)	P-value	Fully adjusted OR (95% CI)	P-value
Could not afford to see a doctor No Yes	—	—	—	—	Reference 0.62 (0.42–0.93)	**0.020**
BMI Category Underweight/Normal Overweight Obese	—	—	—	—	Reference 1.02 (0.80–1.31) 0.86 (0.67–1.10)	0.868 0.222
General Health Status Good/Very Good/Excellent Fair/--	—	—	—	—	Reference 1.02 (0.76–1.37)	0.894
Alcohol intensity Moderate Excessive	—	—	Reference 0.63 (0.52–0.76)	< 0.001	Reference 0.78 (0.64–0.95)	**0.012**
Alcohol Screening & Brief Intervention (ASBI)						
Advised to reduce/quit drinking (ASBI Reduce) No Yes	Reference 0.66 (0.51–0.85)	0.001	Reference 0.79 (0.60–1.05)	0.102	Reference 0.98 (0.74–1.29)	0.866
Excessive drinking * Advice to reduce/quit drinking	—	—	—	—	1.75 (1.04–2.94)	**0.034**
Bolded *p values are statistically significant at p < 0.05; "—" indicates no estimate*						

In the fully adjusted model, the interaction between ASBI advise to reduce or quit drinking and Alcohol intensity (ASBI advise*alcohol intensity) was shown to be statistically significant (aOR: 1.75; 95% CI: 1.04–2.94, p = 0.034) (Table 2). Upon stratifying by alcohol intensity, moderate drinkers who received ASBI advice to reduce or quit drinking reported lower odds of colorectal cancer screening (OR: 0.66; 95% CI: 0.44–0.98, p = 0.041). However, among excessive drinkers, we found the association between

receiving ASBI advice to reduce or quit drinking and CRC screening not statistically significant (OR: 1.30; 95% CI: 0.92–1.85, p = 0.140) (Table 3). Further, the sensitivity analysis revealed that the association between ASBI advice to reduce or quit drinking and CRC screening in either the multiple-imputation analysis (aOR: 0.98; 95% CI: 0.74–1.29, p = 0.866) or the complete-case analysis (aOR: 1.10; 95% CI: 0.82–1.49, p = 0.521) was not statistically significant (Table 4).

Table 3
Stratified Association between ASBI Advise to Reduce or Quit Drinking and Colorectal Cancer Screening by Alcohol Intensity

Alcohol intensity	**aOR**	**95% CI**	**P-value**
Moderate drinkers			
Advice to reduce/quit drinking (Yes vs No)	0.66	0.44–0.98	**0.041**
Excessive drinkers			
Advice to reduce/quit drinking (Yes vs No)	1.30	0.92–1.85	0.140

Table 4
Sensitivity analysis

Exposure	**Complete case aOR (95% CI)**	**p-value**	**MI aOR (95%CI)**	**P-value**
Advised to reduce/quit drinking (ASBI Reduce)	Reference	0.5209	Reference	0.866
No	1.10 (0.82–1.49)		0.98 (0.74–1.29)	
Yes				

Note: MI=Multiple imputation

Discussion

Among the study sample comprising 17,845 U.S. adults aged 45–75 years who consume alcohol, respondents in the older age group (65–75 years) were more likely to be up-to-date with colorectal cancer (CRC) screening compared to respondents aged 45–55 years. Respondents with a high school education or less were less likely to be up-to-date with CRC screening compared with college-level education respondents. Similarly, never-married individuals had a lower likelihood be up-to-date with CRC screening compared to married individuals. In addition, respondents who had at least one personal healthcare provider and able to afford to see a doctor had higher odds of CRC screening in the fully adjusted models compared to respondents who did not have at least one healthcare provider and were not able to see a doctor, respectively. These findings demonstrate the presence of disparities in CRC screening among certain subpopulations and identify the need for tailored interventions to improve CRC screening uptake, in line with previous studies [19, 20].

Excessive drinkers were less likely to be up-to-date with CRC screening as compared to moderate drinkers (OR: 0.68; 95% CI: 0.64–0.95, p = 0.012) in the fully adjusted model. This finding may partially explain prior literature demonstrating increased CRC risk among heavy alcohol users, as lower participation in preventive screening could contribute to delayed diagnosis and poorer outcomes in this population [21, 22]. Our results are, therefore, concordant with previous studies reporting reduced preventive healthcare engagement among individuals with excessive alcohol consumption [22, 23].

This study did not suggest a statistically significant association between ASBI advice and CRC screening in either the alcohol intensity-adjusted analysis (OR: 0.79; 95% CI: 0.60–1.05, p = 0.102) or the fully adjusted analysis (OR: 0.98; 95% CI: 0.74–1.29, p = 0.866). Our findings are concordant with a previous systematic review revealing that ASBI did not significantly affect inpatient or outpatient healthcare utilization [24]. The lack of association may suggest that ASBI alone is not enough to affect additional preventive health behaviors such as CRC screening. CRC screening often depends on multiple factors such as patient awareness of CRC, provider recommendation for screening, healthcare access, and may also be hindered by psychosocial barriers such as fear or perceived invasiveness of screening procedures [19]. Furthermore, behavioral changes following brief interventions may occur gradually and may not immediately translate into increased participation in preventive cancer screening. Therefore, the lack of statistical significance between ASBI advice and CRC screening suggests that ASBI alone may be inadequate to improve CRC screening uptake among alcohol drinkers without additional components addressing other preventive cancer screening measures.

Drinking intensity significantly modified the association between ASBI and CRC screening participation (p = 0.034), with a statistically significant inverse association between ASBI and CRC screening found among moderate drinkers (OR = 0.66, 95% CI: 0.44–0.98, p = 0.014), whereas the association remained non-significant among excessive drinkers. Our findings differ from prior literature, which revealed that moderate alcohol users had a higher prevalence of CRC screening compared with non-drinkers [25]. One possible explanation for this distinction may be due to differences in the categorization of alcohol consumption patterns and CRC screening assessment timing. As CRC screening data in our study were collected immediately following the COVID-19 pandemic period, when many preventive health services were delayed, moderate drinkers may have been less likely to seek or receive screening if they were not perceived as being at high immediate health risk. Additionally, ASBI has previously been shown to produce smaller effects on drinking cessation outcomes among individuals with lower baseline alcohol consumption, which may partly explain the weaker impact of the intervention on preventive health behaviors in moderate drinkers [26, 27]. Therefore, drinking intensity may play an important role in determining the effectiveness of ASBIs and should be considered when designing interventions aimed at improving preventive healthcare utilization among alcohol users.

Limitations and strengths

This study has several limitations. First, both exposure and outcome measures were self-reported, which may introduce recall bias and social desirability bias. Second, the cross-sectional design limits the ability

to establish temporality or infer causality between receiving alcohol ASBI advice and CRC screening. The cross-sectional nature of the data does not allow us to determine whether ASBI advice preceded CRC screening or to evaluate the long-term influence of ASBI on CRC screening in this population. In addition, as alcohol consumption patterns were assessed based on the previous 30 days, these measures may not accurately reflect long-term alcohol use behaviors. The prevalence of ASBI exposure in our sample was relatively low (approximately 9%), which may have limited the statistical power to detect statistically significant associations in certain analyses.

Despite these limitations, this study has several notable strengths. We used data from the BRFSS, a large nationally representative survey, which enhances the generalizability of our findings to the non-institutionalized U.S. adult population. The use of weighted estimates allowed for more accurate population-level inference. We adjusted for multiple potential confounders and examined CRC screening across different drinking patterns. In addition, multiple imputations were made to address missing data, and sensitivity analyses comparing imputed and complete-case analyses demonstrated consistency in the findings. Finally, we included adults aged 45–75 years, a population eligible for recommended CRC screening, thereby increasing the clinical relevance of the study.

Conclusion

The current study suggests that ASBI was not significantly associated with CRC screening in the overall study population, however, drinking intensity modified this relationship. Among moderate drinkers, ASBI was associated with lower rates of participation in CRC screening, while no statistically significant association was observed among excessive drinkers. These findings suggest that the influence of ASBI on preventive health behaviors may vary according to alcohol consumption patterns and that brief alcohol-focused interventions alone may not be enough to promote engagement in CRC screening. Future longitudinal studies integrating patient and clinician-based factors are needed to further evaluate the long-term effect of ASBI on preventive health behaviors and to identify mechanisms through which alcohol-related counseling may affect CRC screening uptake.

Abbreviations

CRC
Colorectal cancer
USPSTF
United States Preventive Services Task Force
HBM
Health Belief Model
TPB
Theory of Planned Behavior
BRFSS
Behavioral Risk Factor Surveillance Survey

ASBI
Alcohol Screening with Brief Intervention
CDC
Centers for Disease Control and Prevention
FSIG
Flexible sigmoidoscopy
CT
Computed Tomography

Declarations

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Consent for publication

Not applicable

Competing interests

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Author Contribution

NMM: Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing. PT: Writing – original draft, Writing – review & editing. NE: Writing – original draft, Writing – review & editing. DB: Writing – original draft, Writing – review & editing. MJB: Conceptualization, Writing – review & editing, Methodology, Supervision

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Availability of data and materials

The datasets analyzed during the current study are available in the Centers for Disease Control and Prevention (CDC) BRFSS repository, https://www.cdc.gov/brfss/index.html

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Figures

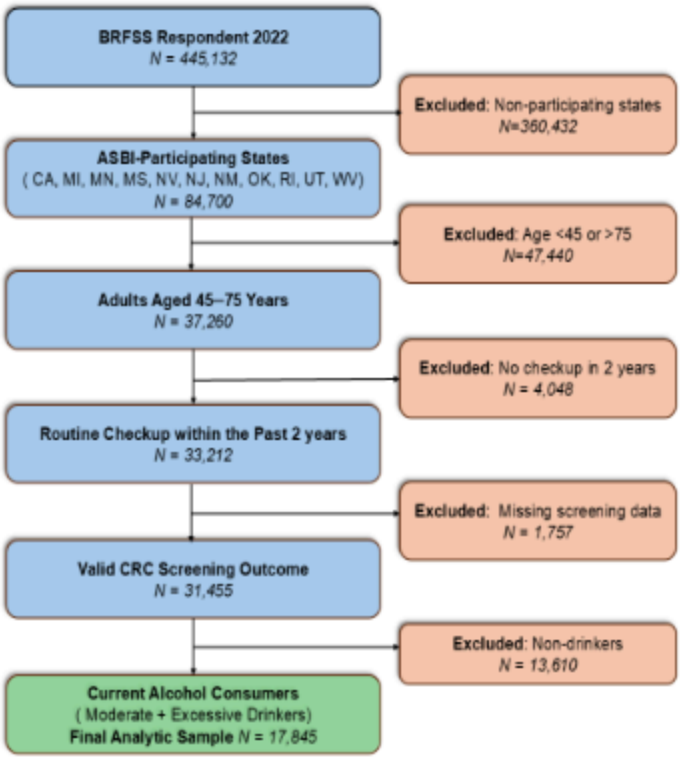


Figure 1

Participant Flow Diagram for Analytic Sample Selection, BRFSS 2022 ASBI Module States**.**

Flow chart of participant selection from the full 2022 Behavioral Risk Factor Surveillance System (BRFSS) dataset (N = 445,132) to the final analytic sample of current alcohol users aged 45–75 years (N = 17,845). Exclusions were applied sequentially: non-ASBI participating states (n = 360,432); adults outside the U.S. Preventive Services Task Force recommended screening age range of 45–75 years (n = 47,440); respondents with no routine checkup within the past two years (n = 4,048); those with missing colorectal cancer screening data (n = 1,757); and non-drinkers (n = 13,610). ASBI = Alcohol Screening and Brief Intervention.