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The Association Between Health Changes and Cessation of Alcohol Consumption

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Abstract

Aims: To assess whether health changes affect cessation of alcohol consumption and to compare the health status of former drinkers and abstainers.

Methods: Cohort data from 9001 Korean participants aged 40–69 years old were analyzed. Alcohol consumption was assessed every 2 years for 10 years. Participant age, sex, marital status, education level, employment status, smoking, chronic disease, perceived health and changes in these variables were analyzed to identify factors associated with quitting alcohol drinking. The number of diseases and perceived health of former drinkers and people who at baseline were lifetime abstainers were compared.

Results: Among 4037 drinkers at baseline, 673 (16.7%) were classed as quitters and 3364 (83.3%) were classed as non-quitters. Sex, age and worsened perception of health were significantly associated with cessation of drinking. Women and individuals >60 years were more likely to cease drinking. There was a significant association between disease onset or treatment and alcohol cessation for cancer cases, but not for cardiovascular disease or chronic disease cases. There was no significant difference in number of diseases or perceived health between former drinkers and people who at baseline were lifetime abstainers.

Conclusions: The effect of disease onset or treatment on alcohol consumption cessation depended on disease type. Former drinkers did not show significantly worse health than people who at baseline were lifetime abstainers. Further studies of alcohol consumption and its effects on health are needed to consider disease occurrence and changes in alcohol consumption.

Short summary: Disease onset or treatment significantly affected alcohol consumption cessation for cancer cases, but not for cardiovascular disease or other chronic disease cases. There was no significant difference in health status between former drinkers and lifetime abstainers.

INTRODUCTION

Although alcohol consumption can lead to various adverse conditions and diseases, recent studies have described the beneficial effect of mild alcohol consumption on mortality (Rehm *et al.*, 2003; Di Castelnuovo *et al.*, 2006; Ronksley *et al.*, 2011; Jin *et al.*, 2013; Zheng *et al.*, 2015). Some research findings suggest that the beneficial effect of mild alcohol drinking might be partly attributable to inappropriate selection of the reference group and weak adjustment for confounders (Knott *et al.*, 2015). Several studies have highlighted the bias of the 'sick quitter effect'; that is, the inclusion of former drinkers in the reference group (Wannamethee and Shaper, 1988). Some findings indicate that the use of non-drinkers as a reference group may lead to bias, as many people stop drinking because of health concerns or aging (Stockwell *et al.*, 2012). The poor overall health of former drinkers (Fillmore *et al.*, 1998) may result in overestimation of the protective effect of alcohol consumption (Fillmore *et al.*, 2006).

However, findings from studies assessing the sick quitter effect are conflicting. Although several studies have shown that the beneficial effect of mild alcohol consumption is no longer significant after excluding former drinkers from the non-drinker group (Fillmore *et al.*, 2006; Stockwell *et al.*, 2016), other studies have reported that former drinker misclassification has no effect on alcohol-related health risk (Zeisser *et al.*, 2014; Gémes *et al.*, 2016).

The sick quitter effect is based on the assumption that disease onset and changes in health condition lead to cessation of alcohol consumption, so the risk for former drinkers is higher than that for abstainers. Although several studies have reported no relationship between changes in alcohol consumption and health condition (Zins *et al.*, 1999; Brennan *et al.*, 2010), many studies have reported an association between disease status and reduced drinking (Walton *et al.*, 2000; Perreira and Sloan, 2001; Molander *et al.*, 2010). Zins *et al.* (1999) found that self-perception of poor health and taking sleeping pills were associated with a cessation of alcohol consumption. Similarly, Perreira and Sloan (2001) found that hospitalization and chronic conditions were associated with reduced drinking. Another study found that major medical diagnosis (such as diabetes, stroke, myocardial infarction, cancer and hospitalization during the follow-up period) were associated with fewer drinks per month (Molander *et al.*, 2010).

Previous studies assessing risk among former drinkers have also shown conflicting results. Although some studies have reported high risk among former drinkers (Lazarus *et al.*, 1991; Liang and Chikritzhs, 2013; Chan *et al.*, 2015), others have shown a lower risk for former drinkers than for abstainers (Andrews-Chavez *et al.*, 2015). To confirm the sick quitter effect, both investigation of the relationship between health status changes and quitting alcohol drinking and assessment of the risk to former drinkers are needed.

In addition, to assess the effect of health condition on alcohol drinking, other factors that affect changes in alcohol consumption should be considered. The stability of alcohol consumption can vary according to participant characteristics such as sex, age and health status.

Sex

Previous studies indicate that men and women exhibit different patterns of change in their alcohol consumption. Molander *et al.* (2010) found that the number of drinks per month was stable among women, but that this measure increased among men. Furthermore, women are more likely to decrease or stop drinking (Perreira and Sloan, 2001). In Park's study, female drinkers were more likely to quit drinking during follow-up monitoring and were also more likely to keep abstaining than men (Park *et al.*, 2009). However, another study reported that male sex was associated with a faster age-related reduction in alcohol consumption (Moore *et al.*, 2005). Brennan *et al.* (2010) conducted a 10-year study of drinking patterns among 55–65 year olds, and found correlations with age of 0.31–0.54 for men and 0.61–0.76 for women.

Age

Previous studies indicate an association between older age and lower alcohol consumption (Kemm, 2003). For example, Eigenbrodt *et al.*'s (2001) cross-sectional study revealed an inverse association between drinking prevalence and age, and a reduction in drinking prevalence during the 6-year follow-up. Longitudinal studies of alcohol consumption also generally show age-related changes (Moore *et al.*, 2005), which often involve reduced consumption or a transition to non-drinker status. However, several studies have reported stable alcohol consumption over multi-year evaluation periods (Benzies *et al.*, 2008; Brennan *et al.*, 2010).

Marriage

Becoming a widow or widower is associated with increased alcohol consumption, but the effect of getting married and divorced is not consistent; these factors are associated with both decreases and increases in alcohol consumption (Perreira and Sloan, 2001). Karlamangla *et al.* (2006) found that getting married was associated with a reduction in the frequency of heavy drinking. Another study reported that predictors of attempts to quit drinking and factors leading to successful quitting varied among individuals with alcohol abuse or dependence; for example, being single increased the likelihood of attempting to quit, while being married increased the odds of success (Chiappetta *et al.*, 2014).

Employment

A study of the effect of employment status on alcohol consumption revealed that retirement increased the likelihood of periodic heavy drinking, compared with working individuals (Bacharach *et al.*, 2004). Other studies show that retirement is associated with increased (Perreira and Sloan, 2001) or frequent alcohol consumption (Molander *et al.*, 2010). Furthermore, employment type can affect alcohol consumption; Syden *et al.* (2014) found that self-employed women exhibited more stable alcohol consumption than women who worked as manual laborers.

Education level

Moore *et al.* (2005) reported that higher education levels predicted greater alcohol consumption at baseline and slower age-related decreases in drinking. Similarly, another study found that higher education levels predicted increased daily drinking (Molander *et al.*, 2010).

Smoking

Smoking status is associated with greater alcohol consumption at baseline (Moore *et al.*, 2005), and Zins *et al.* (1999) found that smoking status is associated with increased alcohol consumption. Other research indicates that quitting smoking is related to a reduction in the incidence of heavy drinking (Karlamangla *et al.*, 2006; Berg *et al.*, 2015) or alcohol use disorder (Cavazos-Rehg *et al.*, 2014). However, Kahler *et al.* (2010) reported that quitting smoking did not lead to significant change in alcohol use.

The aim of this study was (1) to determine whether health changes affect quitting alcohol drinking, and (2) to assess health risks for former drinkers and lifetime abstainers.

MATERIALS AND METHODS

This study used data from KoGES, a community-based cohort study conducted by the Korean Center for Disease Control and Prevention. A total of 9001 participants aged 40–69 years were recruited and followed for 10 years. Demographic characteristics, including age, sex, marital status, education level and employment status, were assessed using a standardized questionnaire. Information on health behaviors, including alcohol consumption and smoking, were obtained. Medical history was also obtained to analyze the onset and type of disease. All data were collected by trained investigators using standardized

methods. The study was approved by the institutional review board of Seoul National University.

Analysis of factors associated with quitting drinking

Alcohol consumption was assessed every 2 years. To identify factors associated with quitting alcohol drinking, the drinkers were divided into quitters and non-quitters. Only participants whose alcohol consumption was zero at both 8-year and 10-year assessment were considered to have quit drinking. Participant demographics at baseline and changes in those variables were compared. Analysis of change involved comparison of values at baseline and 8 years later. For participants with missing data at 8 years, the last follow-up data were used to assess variable changes. The baseline covariates were sex, age group, marital status, educational level, employment status, baseline presence of chronic disease and baseline perception of health. In addition, changes in marital status, employment status, smoking and perceived health status were assessed from baseline to the 10-year follow-up.

To analyze the impact of health changes on quitting alcohol consumption, disease onset and disease treatment were evaluated, and diseases were categorized into three groups: cardiovascular disease (CVD), cancer and other chronic diseases. The CVD group included hypertension, myocardial infarction, heart failure, coronary artery disease, hyperlipidemia, peripheral artery disease, stroke, transient ischemic heart disease and arrhythmia. The cancer group included various types of cancer, such as lung cancer, stomach cancer, liver cancer, colon cancer, pancreatic cancer, uterine cancer and breast cancer. The other chronic diseases included diabetes, gastritis, hepatitis, kidney disease, tuberculosis and pulmonary disease.

Only if disease onset occurred before quitting drinking could the disease be considered to have affected the decision to quit. To determine factors associated with quitting alcohol drinking, multiple logistic analysis was conducted.

Comparison of health status among abstainers, former drinkers

To analyze health conditions, the number of diseases for abstainers, former drinkers and current drinkers were compared. Excluding participants with no follow-up data or drinking status data at baseline, 8923 cases were included.

Among the abstainers at baseline, people who did not drink any alcohol for the 10-year follow-up period were considered the abstainer group. For non-abstainers at baseline, those whose alcohol consumption was zero at both the 8-year and 10-year follow-up were considered former drinkers; the rest were considered current drinkers. The number of CVD, cancer and chronic disease occurrences in each group were compared using analysis of variance, and categorical variables were evaluated using the χ^2 test. All analyses were performed using R software (version 3.1), and P values of <0.05 were considered statistically significant.

RESULTS

Factors associated with cessation of alcohol consumption

Of the 9001 participants, 8923 (abstainers: 4116; former drinkers: 572; current drinkers: 4235) reported their drinking status at baseline. Of the current drinkers, 198 reported their alcohol consumption as zero. After these were excluded, only 4037 were considered drinkers at baseline. Of the 4037 drinkers at baseline, 673 were

considered quitters by this definition, and 3364 were considered non-quitters.

The analysis of participants who continued drinking or quit drinking revealed that significantly more men continued drinking than quit drinking ($P < 0.001$). Participants who were 40–49 years old were prominent in both groups, although there were significantly more individuals of this age in the group that continued drinking ($P < 0.001$). Single people were more likely to quit drinking ($P < 0.001$), but the proportion of participants who were unemployed or who had a chronic disease was not significantly different. Many participants in the quit-drinking group reported poor self-perceived health status, whereas the group that continued drinking had a higher proportion of participants with good and average self-perceived health status ($P < 0.001$). The group that quit drinking contained a higher percentage of people who became separated or divorced ($P = 0.02$). The prevalence of losing a job or quitting smoking was not significantly different between participants who continued drinking and those who quit drinking.

The group that quit drinking showed a significantly lower prevalence of worsened perception of health status ($P < 0.001$), and a higher prevalence of CVD ($P = 0.85$), cancer ($P < 0.001$) and other chronic disease onset ($P < 0.51$). The prevalence of CVD ($P = 0.18$), cancer ($P = 0.002$) and other chronic disease treatment ($P = 0.14$) was higher in the group that had quit drinking; however, only cancer onset and cancer treatment were statistically significant (Table 1).

Table 2 shows the factors that were associated with cessation of alcohol consumption. Model 1 analyzed the effect of baseline characteristics on cessation of alcohol consumption. Age and sex affected cessation of alcohol consumption; women were more likely to quit drinking (odds ratio [OR]: 3.95; 95% confidence interval [CI]: 3.19, 4.91) and older people (OR: 1.7 for 50–59 years; OR: 2.08 for 60–69 years) were more likely to quit drinking. Marital status, educational level, employment status, current smoking and having a chronic disease did not significantly affect the likelihood of quitting drinking. Participants with good perceived health were less likely to quit drinking than participants with poor perceived health ($P = 0.002$). In Model 2, which included the significant baseline characteristics and changes in baseline characteristics, becoming single was not significant. Individuals who lost a job (OR: 1.47; 95% CI: 1.01, 2.12) or quit smoking (OR: 1.3; 95% CI: 0.99, 1.71) had greater odds of quitting drinking, whereas worsening perceptions of health (OR: 0.77; 95% CI: 0.63, 0.93) had the opposite effect. Those with cancer onset (OR: 3.9; 95% CI: 2.34, 6.46) had greater odds of quitting drinking, although this was not significant for those with CVD (OR: 0.88; 95% CI: 0.7, 1.1) or other chronic disease (OR: 1.05; 95% CI: 0.83, 1.33). Model 3 analyzed the effect of receiving disease treatment on cessation of alcohol consumption. The likelihood of quitting drinking was significantly higher in individuals receiving cancer treatment (OR: 3.48; 95% CI: 1.07, 10.63) than in those not receiving treatment, although there was no significant effect for CVD (OR: 0.99; 95% CI: 0.61, 1.58) and other chronic disease (OR: 1.63; 95% CI: 0.93, 2.8) (Table 2).

Comparison of health status among abstainers, former drinkers and current drinkers

In the comparison of health status, the 8923 participants (excluding those without drink status data) were categorized as abstainers, former drinkers or current drinkers based on their drinking status at baseline and their alcohol consumption during the follow-up period. Among the 4116 abstainers at baseline, 3139 remained non-drinkers

Table 1. Comparison of demographic data between participants who continued drinking and those who quit drinking

	Drinking status, N (%)		Total ($n = 4037$)	P value
	Kept drinking ($n = 3364$)	Quit drinking ($n = 673$)		
Baseline				
Male	2595 (77.1)	315 (46.8)	2910 (72.1)	<0.001
Age				
40–49	1928 (57.3)	295 (43.8)	2223 (55.1)	<0.001
50–59	805 (23.9)	196 (29.1)	1001 (24.8)	
60–69	631 (18.8)	182 (27.0)	813 (20.1)	
Separated or divorced	185 (5.5)	65 (9.7)	250 (6.2)	<0.001
Low education level	1482 (44.2)	378 (56.3)	1860 (46.2)	<0.001
Unemployed	604 (18.0)	108 (16.1)	712 (17.7)	0.26
Chronic disease	1526 (45.4)	309 (45.9)	1835 (45.5)	0.83
Perceived health				
Poor	802 (23.9)	231 (34.4)	1033 (25.6)	<0.001
Average	1319 (39.3)	246 (36.6)	1565 (38.8)	
good	1237 (36.8)	195 (29.0)	1432 (35.5)	
Change of baseline				
Separated or divorced	124 (3.7)	39 (5.8)	163 (4.0)	0.02
Became unemployed	167 (5.0)	46 (6.9)	213 (5.3)	0.06
Smoking				
Maintained	2887 (86.1)	584 (87.3)	3471 (86.3)	0.43
Quit	468 (13.9)	85 (12.7)	553 (13.7)	
Worsened perceived health	1548 (46.0)	259 (38.5)	1807 (44.8)	<0.001
Disease onset				
Cardiovascular	676 (21.8)	142 (22.2)	818 (21.9)	0.85
Cancer	39 (1.3)	33 (5.2)	72 (1.9)	<0.001
Other chronic disease	565 (18.2)	124 (19.4)	689 (18.4)	0.51
Disease treatment				
Cardiovascular	209 (21.2)	59 (25.5)	268 (22.1)	0.18
Cancer	9 (0.9)	9 (4.0)	18 (1.5)	0.002
Other chronic disease	88 (12.2)	24 (17.3)	112 (13.0)	0.14

during the follow-up period and were considered abstainers in this analysis. Taking into account the baseline and follow-up data, 3139 participants were abstainers, 1470 were former drinkers and 4314 were drinkers (Table 3).

Although there were fewer cases of CVD (0.59 former drinkers, 0.61 abstainers) and chronic disease (0.67 former drinkers, 0.68 abstainers) in former drinkers than in abstainers, the number of cancers was significantly higher in former drinkers (0.076 former drinkers, 0.047 abstainers). The difference in the number of disease variables between abstainers and former drinkers was not significant for CVD ($P = 0.74$), chronic disease ($P = 0.92$) or total disease ($P = 0.99$), but was for cancer ($P < 0.001$). Individuals reporting good perceived health were most prevalent in current drinkers, whereas individuals reporting poor perceived health were most prevalent in abstainers. Poor perceived health tended to be commoner in abstainers than former drinkers ($P = 0.051$) (Table 4).

DISCUSSION

Previous studies have verified the sick quitter effect, which attributes cessation of alcohol drinking to health problems. Although Brennan *et al.* (2010) have reported that baseline health condition is not related to changes in drinking, several studies have found that health status and disease at baseline are associated with cessation of alcohol consumption (Zins *et al.*, 1999; Perreira and Sloan, 2001). Furthermore, a medical diagnosis during follow-up has also been associated with decreased alcohol consumption (Molander *et al.*, 2010). The present

results indicate that disease onset significantly increased the likelihood of quitting drinking; however, the effect of this factor varied according to disease type. Cancer significantly increased the likelihood of quitting drinking, but CVD and other chronic diseases (e.g. diabetes or pulmonary disease) did not have a significant effect. Although one study has shown that colorectal cancer survivors are more likely than a matched population group to be heavy drinkers (Hawkes *et al.*, 2008), the present study showed that cancer onset and cancer treatment were positively associated with quitting drinking. Therefore, future studies of disease effects on health behavior need to consider the type of disease, rather than simply the presence of disease.

The present study did not demonstrate a higher health risk among former drinkers compared with lifetime abstainers. Several studies have investigated the purported high risk among former drinkers, which is another factor in the sick quitter effect. In a study comparing self-reported health among abstainers and former and current drinkers, health status was worst in former drinkers, followed by abstainers and best in current drinkers (Liang and Chikritzhs, 2013). Other studies have reported that poor self-reported health is positively associated with former drinking (Chan *et al.*, 2015), and former drinkers had a higher prevalence of poor health among abstainers, former drinkers and current drinkers (Liang and Chikritzhs, 2013). However, in Andrews-Chavez *et al.*'s (2015) study, fair/poor perceived health status was more prevalent in former drinkers (58%) than in moderate drinkers (55%), but lower than in lifetime abstainers (83%). Similarly, in this study, prevalence of poor perceived health was greatest in abstainers, and the difference between abstainers and former

Table 2. Multiple logistic regression analyses of factors associated with cessation of alcohol consumption

	Cessation of alcohol consumption					
	Model 1[a]		Model 2[b]		Model 3[c]	
	Exp (B) (CI)	P value	Exp (B) (CI)	P value	Exp (B) (CI)	P value
Baseline character						
Sex (ref: male)	3.95 (3.19, 4.91)	<0.001	4.45 (3.67, 5.41)	<0.001	4.27 (2.78, 6.64)	<0.001
Age, years (ref: 40–49)						
50–59	1.7 (1.36, 2.12)	<0.001	1.71 (1.37, 2.13)	<0.001	1.87 (1.17, 2.98)	<0.01
60–69	2.08 (1.62, 2.68)	<0.001	2.0 (1.59, 2.53)	<0.001	1.26 (0.65, 2.35)	0.49
Marriage status (ref: single)	1.02 (0.74, 1.44)	0.89	–	–	–	
Education level (ref: low)	1.06 (0.86, 1.3)	0.58	–	–	–	
Employment status (ref: employed)	1.15 (0.91, 1.46)	0.24	–	–	–	
Current smoking	0.87 (0.7, 1.08)	0.19	–	–	–	
Having chronic disease	0.96 (0.8, 1.15)	0.64	1.02 (0.85, 1.23)	0.82	1.02 (0.68, 1.55)	0.92
Perceived health (ref: poor)						
Average	0.81 (0.65, 1.0)	0.05	0.85 (0.68, 1.07)	0.17	0.78 (0.49, 1.24)	0.29
Good	0.7 (0.55, 0.88)	0.002	0.79 (0.62, 1.02)	0.07	0.83 (0.48, 1.42)	0.49
Change from baseline						
Separated/divorced/widowed	–		0.97 (0.63, 1.45)	0.89	0.84 (0.29, 2.11)	0.72
Become unemployed	–		1.47 (1.01, 2.12)	0.04	0.8 (0.26, 1.99)	0.65
Quit smoking (ref: maintained)	–		1.3 (0.99, 1.71)	0.056	0.89 (0.44, 1.7)	0.73
Worsened perceived health	–		0.77 (0.63, 0.93)	<0.01	0.38 (0.25, 0.57)	<0.001
Disease onset (ref: none)						
Cardiovascular	–		0.88 (0.7, 1.1)	0.26	–	–
Cancer	–		3.9 (2.34, 6.46)	<0.001	–	–
Other chronic	–		1.05 (0.83, 1.33)	0.66	–	–
Disease treatment (ref: none)						
Cardiovascular	–			–	0.99 (0.61, 1.58)	0.97
Cancer	–			–	3.48 (1.07, 10.63)	0.03
Other chronic	–			–	1.63 (0.93, 2.8)	0.08
Intercept	0.03 (0.01, 0.06)	<0.001	0.02 (0.02, 0.03)	<0.001	0.03 (0.01, 0.08)	<0.001
Pseudo R^2	0.1569		0.237		0.8185	
Akaike information criteria	3270.3		3072.2		688.29	

[a]Model 1 included only the baseline variables.
[b]Model 2 included changes in variables and disease onset.
[c]Model 3 included changes in variables and disease treatment.

Table 3. Changes in drinking status based on follow-up data

Drinking status at baseline	Change of drinking	Drinking status at 8–10 years' follow-up	N (%)
Abstainer (n = 4116)	Keeping non-drinking	Abstainer	3139 (76.2)
	Start drinking and quitting again	Former drinker	411 (10)
	Start drinking	Current drinker	566 (13.8)
Former drinker (n = 572)	Keeping non-drinking	Former drinker	270 (47.2)
	Start drinking and quitting again	Former drinker	66 (11.5)
	Start drinking	Current drinker	236 (41.3)
Current drinker (n = 4235)	Quit drinking	Former drinker	723 (17)
	Keeping drinking	Current drinker	3512 (83)

drinkers was not significant. In addition, we found that the number of disease variables was greater in abstainers than in former drinkers, which poses problems for assumptions that the health status of former drinkers is worse than that of abstainers. There is a need for further studies assessing the health status of former drinkers and abstainers using objective indexes.

In this study, only 76.2% of abstainers at baseline remained non-drinkers throughout the follow-up period. Analysis of the effect of alcohol consumption based only on the amount of consumed alcohol at baseline may bias estimates of the risk of alcohol

consumption. It is therefore important to properly define groups of drinkers based on follow-up data rather than one-time measurement and to consider changes in consumption when analyzing the effect of alcohol consumption.

CONCLUSION

These findings do not support the assumption that former drinkers have a greater health risk than abstainers. Only cancer was associated with cessation of alcohol consumption, and there was no

Table 4. Number of disease variables for abstainers, former drinkers and current drinkers at 10-year follow-up

	Abstainer (*n* = 3139)	Former (*n* = 1470)	Current (*n* = 4314)	*P* value between groups	
Number of CVD	0.61 ± 0.9	0.59 ± 0.89	0.52 ± 0.87	Abstainer–former	0.74
				Abstainer–current	<0.001
				Former–current	0.035
Number of cancer	0.047 ± 0.23	0.076 ± 0.29	0.029 ± 0.18	Abstainer–former	<0.001
				Abstainer–current	0.0012
				Former–current	<0.001
Number of chronic disease	0.68 ± 0.92	0.67 ± 0.91	0.66 ± 0.91	Abstainer–former	0.92
				Abstainer–current	0.59
				Former–current	0.94
Number of total disease	1.33 ± 1.41	1.33 ± 1.38	1.21 ± 1.35	Abstainer–former	0.99
				Abstainer–current	<0.001
				Former–current	0.01
Perceived health					
Poor	1148 (36.6)	496 (33.8)	972 (22.5)	Abstainer–former	0.051
Average	1149 (36.6)	591 (40.2)	1862 (43.2)	Abstainer–current	<0.001
Good	842 (26.8)	382 (26.0)	1480 (34.3)	Former–current	<0.001

significant difference in health status between former drinkers and lifetime abstainers. Further studies of alcohol consumption and its effects on health need to consider disease occurrence and change of alcohol consumption.

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CONFLICT OF INTEREST STATEMENT

None declared.

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