Reduction in alcohol consumption and health status

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ABSTRACT

Aims   This study investigated the association between alcohol consumption and health status using cross-sectional national survey data. **Measurements and design**   This study relied upon self-report data collected by the 2004 and 2007 Australian National Drug Strategy Household (NDSH) surveys. Households were selected using a multi-stage, stratified-area, random sample design. Both surveys used combinations of the drop-and-collect and computer-assisted telephone interview approaches. Respondents were questioned about their current and past drinking, the presence of formal diagnosis for specific diseases (heart disease, type 2 diabetes, hypertension, cancer, anxiety, depression) and self-perceived general health status. Associations between drinking status, the presence of diagnoses and self-perceptions of general health status among respondents aged 18+ and 45+ were assessed using multivariate logistic regression. **Setting and participants**   Males and females aged 18 years or older and resident in Australia. The sample sizes for the 2004 and 2007 NDSH surveys were 24 109 and 23 356, respectively. **Findings**   Respondents with a diagnosis of diabetes, hypertension and anxiety were more likely to have reduced or stopped alcohol consumption in the past 12 months. The likelihood of having reduced or ceased alcohol consumption in the past 12 months increased as perceived general health status declined from excellent to poor. **Conclusions**   Experience of ill health is associated with subsequent reduction or cessation of alcohol consumption. This may at least partly underlie the observed 'J-shape' function relating alcohol consumption to premature mortality.

Keywords   Alcohol, Australia, chronic disease, epidemiology, general population.

INTRODUCTION

During several decades, many cohort studies from the medical epidemiology literature have observed a 'J-shaped' association between alcohol consumption and risk of coronary heart disease (CHD) and stroke for people aged in their middle years and older [1–4]. Non-drinkers thereby appear to have a higher risk of CHD and stroke compared to those who consume alcohol regularly at moderate levels. The direct implication of the J-shaped curve is that moderate alcohol consumption 'protects' against cardiovascular disease. The veracity of the J-shaped curve has been questioned increasingly in recent years [5–10]. Naimi *et al.* showed that non-drinkers had higher prevalence of risk factors for CHD and stroke, and that the 'protective' effect of moderate alcohol consumption may well be due to residual and unmeasured confounding factors [11]. The association between non-drinkers and poor general health status was

also observed by Baumeister *et al.*, who showed a higher rate of physician visits compared to moderate drinkers [12]. Indeed, the so-called 'sick-quitter' hypothesis proposes that a large proportion of non-drinkers quit drinking as they age and develop chronic disease conditions [13]. There are two Australian studies which have investigated the effect of health status on alcohol consumption behaviours: one among a sample of 45–50-year-old women [14] and another using a sample of 18–59-year-old Canberra residents [15]. Both studies suggested that poor health led to reduction in alcohol consumption [14,15], and their findings need to be confirmed further by a representative national sample study.

The 2004 and 2007 Australian National Drug Strategy Household (NDSH) surveys obtained information on changes in alcohol consumption and disease conditions. Using a validated questionnaire, health status and demographic characteristics were self-reported from a large random sample of the general Australian population

aged 12 years and older. The aim of this study was to investigate the association between changes in alcohol consumption and health status using cross-sectional data drawn from these two national surveys. We included two types of measures of health status: (1) diagnosis of chronic diseases and (2) self-perceived health status.

METHOD

Data source

Data collected during the 2004 and 2007 NDSH surveys were combined and analysed together. Details of sampling strategy and data collection methods have been described in the 2007 NDSH survey [16]. Briefly, the NDSH survey is a national survey targeting the 12+ years Australian population. Both the 2004 ($n = 24\ 109$) and 2007 ($n = 23\ 356$) surveys used combinations of the drop-and-collect and the computer-assisted telephone interview (CATI) approaches to collect information from household respondents. Households were selected by a multi-stage, stratified-area, random sample design. Both surveys asked the same detailed questions about respondent alcohol consumption history and changes to alcohol consumption in the last 12 months. Both survey questionnaires can be obtained from the Australian Institute of Health and Welfare website at http://www.aihw.gov.au.

Drinking groups

Respondents who answered 'no' to the question: 'Have you ever had a full serve of alcohol, for example, a glass of wine, a whole nip of spirits, a glass of beer, etc.', were classified as 'life-long abstainers'.

In keeping with the most recent Australian National Health and Medical Research Council drinking guidelines [17], current 'moderate drinkers' were defined as respondents who reported usually drinking one to two standard drinks (10 g pure alcohol) per day in the quantity/frequency component of the survey over the past 12 months. Current drinkers who exceeded one to two standard drinks per day were referred to as 'non-moderate drinkers'. Moderate and non-moderate drinkers combined were referred to as 'current drinkers'.

Respondents who reduced their alcohol consumption in the last 12 months were identified as those who answered 'yes' to having had a drink in the past 12 months but who also answered 'yes' to any of the following options: 'In the last 12 months have you . . . reduced the amount of alcohol you drink at any one time and/or reduced the number of times you drink and/or switched to drinking more low-alcoholic drinks than you used to and/or stopped drinking alcohol?'. Respondents who were currently drinking but who had reduced their

consumption in the past 12 months were referred to as 'recent reducers'. Current drinkers who had not reduced their consumption in the past 12 months were referred to as 'stable current drinkers'.

Respondents who answered 'no' to the question: 'Have you had an alcoholic drink of any kind in the last twelve months?' but who answered 'yes' to: 'Have you ever had a full serve of alcohol?' were classified as 'ex-drinkers (1 year +)'. Although currently non-drinkers, these respondents were not life-time abstainers; they may, however, have stopped consumption more than 12 months ago. The NDSH survey questions do not allow estimation of the length of non-drinking time beyond 12 months.

Health status

Questions in the 2004 and 2007 NDSH surveys about current health status included: (i) whether or not the respondent had received a diagnosis and/or treatment for one or more (i.e. multiple positive responses were possible) specifically listed chronic diseases in the 12 months prior to the survey; and (ii) self-ranked general health status (excellent, very good, good, fair, poor) for health status at the time of the survey. The specific chronic diseases (prevalence among 18 years+ sample) included: diabetes (5.4%); heart disease (5.8%); hypertension (17.8%); cancer (3.1%); depression (9.0%); and anxiety (4.6%).

Data analysis

Multivariate analysis included subjects older than 18+ years with analysis repeated for the 45+ years population (reporting of J-shaped curves have typically been limited to the 45+-year age group). Separate logistic regression models were employed to:

1 investigate whether there was an association between reduced alcohol consumption and health status in the last 12 months prior to survey;

2 investigate whether there was an association between non-life-time alcohol abstention (recent reducers) and health status in the last 12 months; and

3 compare the association between self-reported health status and volume of usual alcohol consumption over the last 12 months prior to the survey among the 45 years+ subjects to the 'J-shaped' association observed in epidemiology studies.

All models adjusted for a range of potential cofounders including: age, sex, state of residency, income level, highest level of education attained, indigenous status, tobacco use (ever) and marital status. These confounders were measured and related to the time of the survey. We note that few cohort studies which have concluded protective effects of moderate alcohol on various types of chronic disease have controlled for marital status as a

potential confounder [18]. Only respondents who answered all questions relating to all variables in the respective models were included in analyses.

RESULTS

Recent reducers versus non-reducers

Table 1 shows logistic regression results testing the association between chronic disease and whether or not alcohol consumption was reduced during the last 12 months. Respondents aged 18 years+ with a diagnosis of diabetes were 40% more likely to report having reduced their alcohol consumption. Similarly, significant positive associations were observed between reduced alcohol consumption and diagnoses of hypertension and anxiety. The observed associations were similar when limited to those aged 45 years or older. Although the odds ratios (OR) failed to reach significance, respondents aged 45 years or older who had received a diagnosis of heart disease were less likely to reduce alcohol consumption in the last 12 months.

Table 1 also shows the association between self-reported general health status and reduced alcohol consumption in the last 12 months. A positive linear trend was observed, suggesting that people with worse general health status were more likely to reduce their alcohol consumption. Moreover, the ORs increased by about 20% after limiting the analysis to the population aged 45 years and older, i.e. those in middle age or older appeared to have greater odds of reducing their alcohol consumption with declining general health status (although the confidence intervals for 18+ and 45+ overlap).

Ex-drinkers (1 year +) versus current drinkers

Evidence for significant associations between diagnoses of specific chronic disease and the likelihood of having stopped drinking in the last 12 months was limited to diabetes (Table 1). However, a positive linear association was found for self-reported general health status and the likelihood of being an ex-drinker for 1 year or longer. That is, people with worse perceived general health status were more likely to have ceased alcohol consumption at some time before the last 12 months (Table 1).

Level of alcohol consumed and perceived general health status

Table 2 shows that being a recent abstainer, a life-long abstainer or drinking five or more drinks per day was associated with worse perceived general health status over the last 12 months. This is in keeping with the observation from other studies that people with poor health and health problems are likely to reduce or stop their alcohol consumption [18].

DISCUSSION

In this study, it was observed that people with a diagnosis of diabetes, hypertension and anxiety were more likely to reduce or stop alcohol consumption in the past 12 months. Similarly, the likelihood of having reduced or ceased alcohol consumption in the past 12 months increased as perceived general health status declined from excellent to poor. Our results are consistent with previous findings by Power *et al.* [14] and Rodgers *et al.* [15].

Self-perceptions of health status may be related more strongly to changes in drinking status than the presence or absence of formal diagnosis. For example, prior to onset of obvious symptoms, a person with an undiagnosed chronic condition (e.g. diabetes, liver cirrhosis, cancer—not necessarily illness related directly to alcohol use) may subjectively 'feel well' and be unlikely to alter their drinking status on this basis. However, when symptoms begin to appear, the physical manifestations of ill-health may precipitate behaviour change, including reduced alcohol consumption [13]. Furthermore, having been prescribed medication or treated for chronic disease may influence an individual's perception of their own health status. This would concur with our observation that there was a significant association between having received treatment for at least one health condition over the last 12 months and self-perceived health status.

The potential effects of mental health disorders on alcohol use should also not be overlooked, as they have been found to be a contributing cause for many types of chronic diseases including hypertension, heart diseases and cancers [19]. It has been suggested by previous studies that self-perception of health is linked to symptoms of mental health disorders and other chronic illnesses [20,21]. A large proportion of mental health disorders remain undiagnosed, and therefore using self-perception of health status may be more useful for predicting changes in drinking status or accounting for potential health-status-related confounding than the presence of formal diagnosis.

These results are in keeping with other research evidence, which suggests that drinkers tend to reduce or stop their alcohol consumption when faced with declining health status [6,22]. Although reverse causality cannot be entirely ruled out, given the cross-sectional design of this study, it is unlikely that having reduced or ceased alcohol consumption in the past 12 months leads to the development of declining general heath, hypertension or anxiety.

Table 1 Association between diagnosed chronic disease conditions/general health status and whether alcohol consumption was reduced or stopped within the last 12 months.

	Recent reducers (1) versus stable current drinkers (0)				Ex-drinkers (1 years+) (1) versus recent reducers and stable current drinkers combined (0)			
	>18 years		≥45 years		>18 years		≥45 years	
Diagnosis	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
	n = 16 390[C3]		n = 7817[C2]		n = 21 047[C5]		n = 10 535[C6]	
Diabetes[a]	1.42	1.21 1.68	1.41	1.17 1.69	1.68	1.34 2.10	1.61	1.27 2.05
Heart disease[a]	1.20	1.04 1.37	0.82	0.65 1.02	1.33	1.06 1.68	1.19	0.86 1.64
Hypertension[a]	1.26	1.14 1.38	1.21	1.09 1.35	0.85	0.72 1.00	0.87	0.73 1.04
Cancer[a]	1.00	0.83 1.21	0.98	0.80 1.22	1.12	0.83 1.51	1.24	0.91 1.68
Anxiety[a]	1.23	1.04 1.46	1.27	0.99 1.63	1.24	0.93 1.64	1.31	0.93 1.86
Depression[a]	1.09	0.96 1.23	1.15	0.96 1.37	1.11	0.90 1.38	1.07	0.81 1.41
General health status[b]	n = 16 390[C3]		n = 7920[C4]		n = 21 263[C7]		n = 10 646[C8]	
	P for trend <0.001		P for trend <0.001		P for trend <0.001		P for trend <0.001	
Excellent	1.00		1.00		1.00		1.00	
Very good	1.11	1.01 1.22	1.31	1.13 1.53	0.8	0.67 0.96	0.87	0.67 1.12
Good	1.18	1.07 1.3	1.42	1.22 1.65	0.86	0.72 1.04	0.99	0.77 1.27
Fair	1.32	1.15 1.51	1.69	1.40 2.04	1.20	0.96 1.49	1.31	0.98 1.74
Poor	1.54	1.16 2.04	1.81	1.28 2.55	2.10	1.52 2.9	2.42	1.66 3.53

[a]Model adjusted for diagnosis of diabetes, heart disease, hypertension, cancer, depression, anxiety, age, gender, state, income, highest qualification, marriage status, indigenous status, year of survey, smoking (ever). [b]Model adjusted for general health status, age, gender, state, income, highest qualification, marriage status, indigenous status, year of survey, smoking (ever). [c]Sample size does not equal due to excluding subjects with missing values in the adjusted models, the number of excluded subjects are 1: 15 529; 2: 8546; 3: 15 582; 4: 8739; 5: 20 448; 6: 11 855; 7: 20 818; 8: 12 108.

Table 2 Alcohol consumption level and health status having fair and poor health as positive (1) outcome versus having good, very good and excellent health (0) among subjects 45 years+[a].

Usual alcohol consumption	Odds ratio	95% confidence interval	
13 or more drinks	3.77	2.48	5.74
11–12 drinks	3.03	2.01	4.57
7–10 drinks	1.49	1.20	1.86
5–6 drinks	1.33	1.14	1.56
3–4 drinks	1.03	0.92	1.15
1–2 drinks	1.00		
Abstainer last 12 months	1.85	1.63	2.09
Life-long abstainer	1.33	1.07	1.66

[a]Adjusted for age, gender, state, income, highest qualification, marriage status, indigenous status, year of survey, smoking (ever).

The development of hypertension, for instance, is an ongoing long-term process which may start in childhood [23], and reduced alcohol consumption in the past 12 months is very unlikely to 'cause' hypertension in respondents. Moreover, despite the fact that the prevalence of undiagnosed type 2 diabetes mellitus is likely to be high in Australia, screening studies suggest that the average latency period for diagnosis is at least 1.5 years [24]. Thus, in the vast majority of cases considered here, it is reasonable to assume that the development of type 2 diabetes and its eventual diagnosis occurred well in advance of changes to alcohol consumption which may have occurred in the past 12 months.

Both diabetes and hypertension are well-recognized risk factors for CHD and stroke [25], and there is strong evidence to suggest that anxiety is associated with an increased risk of CHD [26]. Thus, the results presented here support the hypothesis that drinkers 'quit' or reduce drinking because of chronic disease conditions which increase in frequency throughout the life-span [6,22] and concur with the observations made by others that 'non-drinkers' have a higher prevalence of risk factors for CHD and stroke [11].

The phenomenon of the 'sick quitter' may be viewed as similar to the loss of subjects to clinic trials. Subjects who begin as 'drinkers' but who ultimately stop drinking while participating in a cohort study are analogous to subjects in clinical trials who drop out of treatment for reasons which are related to the prognosis itself. In clinical trials, subject dropout potentially introduces a bias, because people who complete a particular treatment may, at the outset, be predisposed to have a better outcome [27,28]. In the same way, people who do not become ex-drinkers may be predisposed to have better health outcomes.

In order to reduce bias in clinical trials, 'intention-to-treat' analysis is recommended [28]. This essentially involves 'returning' any subjects who had withdrawn from the trial along with their health outcomes back into the group to which they had originally been assigned. This mitigates any false impression of low morbidity or mortality which may arise from not including adverse outcomes for subjects who withdrew from a treatment group, and thereby maintains the integrity of the randomization process. In the same way, the health profiles of people who cease drinking (i.e. treatment) at some point in a cohort study should not be considered to form a new group of 'ex-drinkers', but should be 'returned' to the drinker group to which they were originally assigned on the basis of their alcohol consumption.

Limitations

This study relies upon a cross-sectional design and measures self-reported alcohol consumption and health status. It has been well documented that surveys almost always underestimate total alcohol consumption [29]. It has been estimated that, on average, the level of under-estimation across the national Australian population is about 28%. This implies that in reality, the proportion of drinkers who consume at low risk levels in relation to the NDSH survey guidelines is an overestimate, as a proportion of such respondents actually drink at risky levels [29]. How this underestimation would influence, if at all, the relation between alcohol consumption and health status demonstrated here is not clear and requires further investigation.

The response rates were 49.3% for the 2007 survey and 46% for the 2004 survey. Despite the large national samples attained and the representativeness of the sampling frame, with surveys of this nature it is possible that the proportion of the approached sample which agrees to participate in a health study is different from the population which refuses. This study therefore provides evidence of an association between change of alcohol consumption and health status within a self-referred health study population. Arguably, populations with similar propensities or characteristics are also more likely to participate in and respond to other survey-based studies. A large number of subjects with missing values in controlled variables were excluded in the multivariate logistic regression, and this may have introduced systematic error. Logistic models controlling only for diagnosis of disease/general health status, sex and age were, however, compared with the full models. Similar estimations were observed, suggesting that systematic error due to exclusion of subjects with missing values was unlikely.

These surveys were conducted on an Australian sample, and human behaviours may vary by country and culture. Nevertheless, findings drawn from these surveys are consistent with those from studies conducted in at least two other western nations: Germany [12] and the United States [11,13].

NDSH survey respondents self-reported their diagnoses of chronic disease. As there is no medical examination to confirm these self-reports their accuracy is unknown; however, there is no reason to suspect that substantial numbers of respondents would have cause to falsify or be mistaken about their diagnoses.

CONCLUSION

Respondents with a diagnosis of diabetes, hypertension and anxiety were more likely to have reduced or stopped alcohol consumption in the past 12 months. The likelihood of having reduced or ceased alcohol consumption in the past 12 months increased as perceived general health status declined from excellent to poor. Experience of ill health is associated with subsequent reduction or cessation of alcohol consumption. This may at least partly underlie the observed J-shaped function relating alcohol consumption to premature mortality.

In addition to questions regarding the presence of formal diagnoses for major health conditions, cohort studies which seek to examine the relation between alcohol and chronic disease should question participants on their perceived level of general physical and mental health at outset and follow-up.

Declarations of interest

None.

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Supporting information

Additional Supporting Information may be found in the online version of this article:

Table S1 Estimations on key dependent variables by samples from combined sample, sample from 2007 survey and sample from 2004 survey.

Table S2 Estimations from full model excluding subjects with missing values and estimations from full sample controlling for diagnosis of disease/general health status, sex and age.

Table S3 Comparison results from logistic regression model, Poisson model and multinominal logistic regression model.

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