Published in final edited form as:

J Am Geriatr Soc. 2013 August ; 61(8): . doi:10.1111/jgs.12366.

Changes in Alcohol Intake and their Relation to Health Status over a 24 Year Follow-up Period in Community-Dwelling Older Adults

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Abstract

OBJECTIVES—To determine whether alcohol use changes over time in older adults, and whether alcohol intake is associated with common chronic diseases.

DESIGN—Longitudinal study spanning 24 years.

SETTING—Southern California community

PARTICIPANTS—1076 members of the Rancho Bernardo cohort, aged 50–89 years at baseline.

MEASUREMENTS—Participants completed two to six research visits at approximate four year intervals between 1984 and 2009. At each visit, participants completed standard questionnaires on alcohol use, chronic diseases, and behaviors. Mixed-effects linear models were used to examine changes in average weekly alcohol intake over time and in relation to health status.

RESULTS—Prevalence and frequency of alcohol use was high throughout the study with more than 60% of participants reporting weekly alcohol intake. The average amount consumed declined over time with advancing age, irrespective of the presence of any of the eight most common chronic diseases. Prevalence of drinking in excess of age and sex-specific low risk guidelines was high across all visits and did not vary by disease burden. At the final visit, 29% of participants drank in excess of low risk drinking guidelines; including 28% of those with hypertension and 31% of those with diabetes.

CONCLUSION—Prevalence and frequency of alcohol intake remained stable over a 24 year follow-up in this cohort of White, educated middle class older adults, although average amount consumed decreased over time with advanced age. Despite this decrease, a high proportion of older adults, including those with common chronic health conditions, drank in excess of current

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Conflict of Interest

None of the authors report any financial or personal conflicts of interest

Author Contributions

McEvoy: Obtaining funding, conception and design, analysis and interpretation of data, drafting of paper. Kritz-Silverstein: Conception and design, acquisition of data, interpretation of results, revision of manuscript for intellectual content. Barrett-Connor: Obtaining funding, conception and design, acquisition of data, interpretation of results, revision of manuscript for intellectual content. Bergstrom: Analysis and interpretation of data; revision of manuscript for intellectual content. Laughlin: Conception and design, acquisition of data, interpretation of results, revision of manuscript for intellectual content.

guidelines. Clinicians should provide more education on the importance of moderating alcohol intake in older patients.

Keywords

aging; alcohol trajectories; drinking; hypertension; diabetes

INTRODUCTION

Alcohol use is prevalent among older adults in the U.S.A.^{1–4} Although light to moderate regular alcohol consumption appears to have cardioprotective effects even among older adults^{5–7}, older adults are at higher risk than younger adults for suffering harmful effects from alcohol⁸. Physiological changes in alcohol metabolism with age result in higher blood alcohol concentration in older than younger adults for the same amount of alcohol intake^{9–11} and prevalence of diseases that may be exacerbated by alcohol use increase with age.⁸ Interactions of alcohol with medications are also a concern because even low levels of alcohol use may interact negatively with medications commonly use to treat age-related diseases.⁸

Although alcohol use among older adults has been recognized as an important public health concern¹², patterns of alcohol use among older adults, particularly among the oldest-old, are not well understood. It is often assumed that adults decrease alcohol intake with advancing age, particularly in the presence of illness. Cross-sectional studies uniformly find that older adults drink less than younger adults^{13–15}. However, multiple factors can account for age differences in cross-sectional studies¹⁶, and longitudinal studies have not consistently found a decrease in alcohol intake with age.^{2, 14, 15, 17, 18} Few longitudinal studies have examined changes in alcohol intake over prolonged periods among older adults, or have examined alcohol intake in relation to health status.^{2, 14, 15, 17, 18} With the aging of the population, a better understanding of alcohol use among older adults is necessary to anticipate public health impact of alcohol use in coming years. Here we examined self-reported alcohol intake over a 24 year period in a well-characterized cohort of community-dwelling older adults. We examined frequency and amount of alcohol use over time, and investigated whether alcohol use varied by age, sex or reported morbidity.

METHODS

Participants

Data were obtained from 1076 participants of the Rancho Bernardo study (RBS), a longitudinal study of healthy aging. Of the 2211 participants aged 50 or older at baseline, 49% (1076) completed at least one subsequent research visit. These 614 women and 462 men, aged 50–89 years at baseline, are the focus of this study. This study was approved by the Institutional Review Board, University of California, San Diego; all participants provided written informed consent prior to participation in each visit.

Data collection

The baseline visit for this study occurred in 1984–87. Follow-up research clinic visits occurred at approximate 4 year intervals; the last occurred in 2007–2009.

Health Status—At each clinic visit, a standardized questionnaire was used to obtain information on medical history and lifestyle. Participants completed a checklist of common chronic medical conditions that had been diagnosed by a physician. We assessed chronic conditions with at least 5% prevalence at baseline in the cohort: osteoporosis, arthritis, cancer (including melanoma but excluding other skin cancers), diabetes, pulmonary disease,

myocardial infarction, angina and hypertension. Once a condition was reported, it was recorded as present for all subsequent follow-up visits for that participant. We computed the chronic disease burden as the total number of these diseases present at each visit.

Self-Reported Alcohol Intake—Alcohol intake was queried using a standard set of questions. Participants were asked if they ever consumed an alcoholic beverage, and if so, whether they drank in the past year, and the frequency of alcohol consumption (daily/almost daily; 3–4 times/week, 1–2 times/week, 1–2 times/month, < once/month). Participants were queried about the number of bottles or cans of beer, glasses of wine; mixed drinks, and liqueurs or other drinks consumed during an average week. Average weekly alcohol consumption was calculated using the formula: grams of ethanol = [(number of bottles or cans of beer)(12 oz.) (0.045 oz. ethanol/oz. beer) + (number of glasses of wine)(3.5 oz.) (0.122 oz. ethanol/oz. wine) + (number of mixed drinks)(1.5 oz.) (0.41 oz. ethanol/oz. spirits) + (number of liqueurs)(1 oz.) (0.362 oz. ethanol/oz. liqueurs) × (29.6 ml/oz.)] × 0.7893 g/ml²⁰. One drink is equivalent to 12g. This formula may underestimate amount consumed because assumed serving sizes may be smaller than actual serving sizes²¹. For example, the formula assumes that a glass of wine is 3.5 oz. Current standard serving size for wine is 5.0 oz, and actual servings may contain even more than that.

We categorized participants into consistent non-drinkers – those reporting no past-year alcohol use at each visit; consistent drinkers, those reporting some past-year alcohol use at each visit; inconsistent drinkers, those reporting past-year alcohol use at some visits but not at others, and quitters – those who stopped drinking at some point during the follow-up. We determined the proportion of individuals at each visit, and with each disease, who drank in excess of the National Institute on Alcohol Abuse and Alcoholism (NIAAA) age- and sex-specific low-risk guidelines, which recommend no more than 1 drink/day for women of any age, no more than 2 drinks/day for men under the age of 65, and no more than 1 drink/day for men aged 65 years or older.²²

Statistical analyses

Differences between groups (sex, participants and non-participants, study completers and non-completers) were assessed with univariate analyses of variance (for continuous measures) or chi-square analyses for categorical measures.

Changes in average weekly alcohol intake over time were examined with mixed-effects models (SAS, PROC-MIXED). Sex and baseline age and were entered as fixed effects; follow-up time, measured in years since baseline, was included as a random effect and interaction terms with time were included to allow the influence of sex and age to change over time. Separate models examined whether education (some college, yes/no, included as a fixed effect) and marital status (married yes/no; included as a time-varying effect) were associated with alcohol intake or change in intake over time, including the interaction terms of each covariate with time to allow the influence of each covariate to change over time. In separate analyses, adjusted for age, sex and education, we examined whether each chronic disease or the chronic disease burden was associated with alcohol intake or change in intake over time, with disease status or burden included as time-varying covariates.

All statistical tests were two-tailed; $p < 0.05$ was considered statistically significant. Data were analyzed using SAS v9.1 (SAS Institute, Cary, NC) and SPSS v15.0 (SPSS Inc, Chicago, IL).

RESULTS

All participants attended at least two visits; 18.3% participated in three visits, 16.4% in four, 11.9% in five, and 18.3% in six visits. Mean follow-up time was 15.1 ($\pm$ 5.6) years, range 5.9–24.3 years. Men and women did not differ in number of clinic visits or years of follow-up. Characteristics of the cohort at baseline and at the final visit are shown in Table 1. Prevalence of drinking was high across all visits: 76% of women and 83% of men were consistent drinkers; 3% of women and 4% of men were inconsistent drinkers; 6% of women and 5% of men were consistent non-drinkers; and 14% of women and 16% of men quit drinking. The majority of participants at all visits reported drinking at least weekly. Prevalence of drinking in excess of age and gender specific guidelines was high across visits, with 40% of men and 37% of women drinking in excess guidelines at baseline, and 35% of men and 24% of women drinking in excess of guidelines at the final visit (Table 1).

Participants were relatively healthy at baseline with low prevalence of common chronic diseases. Prevalence of all diseases increased over time (Figure 1). Prevalence of high risk drinking did not vary substantially by disease status. For example, at baseline, 38% of the cohort drank in excess of guidelines, with 33–46% of those with each chronic disease drinking in excess of guidelines. At the final visit, 29% of the full cohort reported drinking above guidelines, including 31% of those with diabetes, 28% of those with hypertension, and 28% of those with 3 or more chronic diseases.

Analysis of average weekly consumption showed that, controlling for age, education, and marital status, men consumed an average of 36 g/week more alcohol than women ($P < .001$). Amount of alcohol consumed per week decreased over time among participants who were older at baseline (significant baseline age by time interaction, $P < 0.001$; see Figure 2). Men showed a slightly steeper decline in alcohol intake over time than women (sex by time interaction; $P = .047$). Alcohol intake did not vary by education or marital status.

Average weekly alcohol intake varied by disease status: individuals with angina, myocardial infarction or diabetes drank, on average 21.0, 19.2, and 20.6 g/week less, respectively, than individuals without these conditions (P 's $< .05$). The association of angina and myocardial infarction with alcohol intake did not vary over time, but diabetes showed a significant disease by time interaction ($P < .05$). Although individuals with diabetes drank less overall than those without diabetes, their alcohol consumption increased on average by 1 g/week per year. None of the other individual diseases, or the disease burden, was associated with any significant differences in average weekly alcohol intake, or rate of change in weekly alcohol intake over time.

Non-participant and non-completer characteristics

Non-participants, defined as those who completed the baseline visit but who did not return for any follow-up visits were older (75.1 versus 66.4 years, $P < .01$), more likely to be men (48% versus 43%, $P < .05$) and to report higher rates of common chronic diseases than participants. However, controlling for sex and age, participants and non-participants did not differ in average weekly alcohol intake (93 versus 80 g/wk) or in prevalence of drinking in excess of guidelines (38% of participants, 37% of nonparticipants).

Participants who did not complete all visits were older than those who did (baseline age 69 versus 59 years; $P < .001$), and reported higher rates of common diseases. However, controlling for sex and age, study completers and non-completers did not differ in baseline average weekly alcohol intake (94 versus 93 g/week) or prevalence of drinking in excess of guidelines (40% completers, versus 34% of non-completers).

CONCLUSION

In this community-dwelling cohort of older, educated, middle-class White adults, patterns of alcohol consumption remained stable as the cohort transitioned from late middle-age into late older-age. Prevalence and frequency of alcohol intake were high across the 24-year follow-up period, with the majority of the cohort consuming alcohol at least weekly. Although the average amount of alcohol consumed per week decreased with advancing age irrespective of health status, a substantial proportion of the cohort drank in excess of age and sex-specific low-risk guidelines at each follow-up visit. This proportion did not differ among those with or without one or more common chronic diseases.

These results extend prior observations that drinking patterns remain stable during the transition from middle- to older-age^{2, 17, 23}, showing that stability in drinking patterns persists into advanced aging. The decline in average amount consumed over time among older members of the cohort is consistent with cross-sectional studies showing lower levels of alcohol intake among older than younger adults^{13–15, 24} and with a recent 20-year follow-up study that reported stable alcohol consumption in early older-age, with steeper decline in later older-age.¹⁸ Our finding that men consumed more alcohol than women, and showed greater decline in alcohol intake over time is also consistent with prior reports.^{17, 18}

Our findings that the decrease in alcohol intake over time among older adults occurred irrespective of disease status or disease burden, and that the prevalence of drinking in excess of guidelines did not differ in the presence of common chronic diseases conflicts with prior findings that older adults decrease alcohol intake in response to decreases in health^{18, 19, 25}. We found that the presence of some diseases (myocardial infarction, angina, diabetes) was associated with lower average weekly alcohol intake, but the proportion of individuals with these diseases who drank in excess of guidelines was similar to that of individuals without these diseases. Another longitudinal study,¹⁹ reported that the decline in alcohol consumption with decreased health was modest and that the relation of alcohol intake to health was complex. The authors noted that although some individuals appeared to drink more to counteract the effects of illness, the directionality of the relation between illness and alcohol intake is uncertain.¹⁹ Here, prevalence of drinking in excess of guidelines was high across all of the common diseases examined. This is of concern because guidelines for preventing and managing some of these diseases (e.g. diabetes, hypertension) stress the importance of adhering to low-risk drinking guidelines^{26, 27}.

It should be noted that the prevalence of alcohol use in this cohort was higher than that in the general US population, as previously reported.²⁸ For example, in the 2000 National Health Interview Survey 49% of men and 63% of women aged 65 years and older reported not drinking.¹ The non-drinking rate in the current study was less than 7%. In nationally representative samples of older adults, 10% of men and 2% of women reported drinking in excess of low-risk guidelines.¹ Here, 40% of men and 37% of women drank in excess of guidelines at baseline, and 35% of men and 24% of women drank in excess of guidelines at the final visit, in 2007–2009.

The higher levels of alcohol use in RBS relative to nationally representative samples are consistent with the demographic characteristics of the cohort. The RBS cohort is White, well-educated, and middle class. Results from the National Health and Nutrition Examination Survey showed that Whites consume more alcohol than other races, and that education and socioeconomic status are positively associated with alcohol intake.¹⁷ The prevalence and amount of alcohol intake in RBS is similar to that reported for a community sample of older adults in Western US with similar demographic characteristics.³

In addition to the non-representativeness of the study cohort, other limitations of the study are its reliance on self-reported alcohol intake and health status, and potential survivor bias. Self-report measures of alcohol use have been shown to have reasonable levels of reliability and validity^{29, 30}, but as mentioned, our estimated weekly average alcohol intake is likely to underestimate actual intake. Self-reported health status in RBS has been validated for most of the diseases considered here for subsets of the cohort using medical records, or by clinical or laboratory assessment in the research clinic. Survivor bias might have influenced the results, although those who completed all visits did not differ in baseline average alcohol intake or in prevalence of drinking in excess of guidelines from non-participants or non-completers. Strengths of the study include the broad upper age range, length of follow-up, frequent and detailed assessments of alcohol intake, health and lifestyle variables, and the resulting ability to describe the relation between changes in alcohol intake and changes in health status over time.

In conclusion, this study shows that alcohol use remains high with advanced age in some segments of the population, and that drinking in excess of low risk guidelines is prevalent even among a cohort with good health care, including among those with diseases for which drinking in excess of guidelines poses health hazards. This suggests that primary care physicians should monitor alcohol intake in patients and provide regular education on the importance of limiting alcohol intake, particularly for patients with medical conditions that may be exacerbated by excess alcohol consumption.

Acknowledgments

Funding Sources: Supported by ABMRF, the Foundation for Alcohol Research, and NIA (K01AG029218). Data collection for the Rancho Bernardo Study was funded by NIDDK (DK31801), and NIA (AG07181; AG028507).

Linda K. McEvoy, Donna Kritz-Silverstein, Jaclyn Bergstrom all received salary support from a grant awarded by the ABMRF, the Foundation for Alcohol Research. This foundation approved our proposal to study alcohol use in relation to health in members of the Rancho Bernardo Cohort but played no role in study design, data interpretation or manuscript preparation.

Sponsor's Role: Funding agencies had no role in study design, methods, subject recruitment, data collection, analysis of data, or preparation of the paper.

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Figure 1.

Prevalence of common chronic diseases at each visit (top) and prevalence of high risk drinking by disease at each visit (bottom). HBP = high blood pressure; OP = osteoporosis; COPD = chronic obstructive pulmonary disorder; MI = myocardial infarction; >2 = presence of 3 or more common chronic diseases.

Figure 2.

Change in average weekly alcohol intake over time. Predicted change in alcohol intake for men and women, aged 50 and 75 years, from the mixed effect linear model (age by time interaction, $P < 0.001$; sex by time interaction; $P = .047$). Avg Alc (g) = average weekly alcohol intake in grams.

Table 1**Cohort Characteristics at Baseline and at Final Visit**

	1984–88 N = 1076	2007–09 N=288
Age (mean, $\pm$ SD)	66.4 (8.7)	81.6 (5.5)
Male (%)	42.9	47.2
White (%)	100	100
Some College (%)	71.3	73.9
Married (%)	79.1	66.7
Non-drinkers (%)	7.5	16.7
Weekly Alcohol Intake (%)	68.4	65.2
Near Daily Alcohol Intake (%)	46.7	42.7
Alcohol, g/week (mean, $\pm$ SD)	93.0 (110.2)	62.9 (75.2)
Drinking in excess of guidelines (%)	38.2	29.2
BMI (mean, $\pm$ SD)	25.0 (3.6)	26.1 (4.3)
WHR (mean, $\pm$ SD)	0.84 (.09)	0.89 (0.09)
Physically Active (%)	83.8	65.0
Smoking (% never/former/current)	42/47/12	47/50/3

BMI = body mass index; WHR = waist to hip ratio; SD = standard deviation. Physical activity shows percentage of those reporting engaging in strenuous physical activity three or more times per week. Drinking in excess of guidelines was defined according to sex and age-specific guidelines of no more than 1 drink per day for women of any age and for men aged 65 years or older, and no more than 2 drinks per day for men under 65 years ²²