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Type of alcohol consumed, changes in intake over time and mortality: the Leisure World Cohort Study

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Abstract

Background—modifiable behavioural risk factors including smoking and alcohol consumption are major contributing or actual causes of mortality.

Objective—to examine the effect of alcohol intake on all-cause mortality in older adults.

Design and Setting—prospective population-based cohort study of residents of a California, United States retirement community.

Subjects—8,877 women and 5,101 men (median age, 74 years) who in the early 1980s completed a postal health survey including details on alcohol consumption.

Methods—participants were followed for 23 years (1981–2004) including two follow-up questionnaires (in 1992 and 1998) asking about current alcohol intake. Age-adjusted and multivariate-adjusted risk ratios of death and 95% confidence intervals were calculated separately for men and women, using proportional hazard regression.

Results—of the 8,644 women and 4,980 men with complete information on the variables of interest and potential confounders, 6,930 women and 4,456 men had died (median age, 87 years). Both men and women who drank alcohol had decreased mortality compared with non-drinkers. Those who drank two or more drinks per day had a 15% reduced risk of death. The reduced risk was not limited to one type of alcohol. Stable drinkers (those who reported drinking both at baseline and follow-up) had a significantly decreased risk of death compared with stable non-drinkers. Those who started drinking at follow-up also had a significantly lower risk. Women who quit drinking were at increased risk of death.

Conclusion—in elderly men and women, moderate alcohol intake exhibits a beneficial effect on mortality. Those who quit may do so for health reasons that affect mortality.

Keywords

alcohol; beer; wine; spirits; mortality; elderly

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Conflicts of interest
No conflicts of interest exist.

Introduction

Although cardiovascular disease and cancer are the two leading causes of death among adults in the United States, modifiable behavioural risk factors are major contributing or actual causes of this mortality [1].While smoking remains the leading cause of death (18% in 2000), alcohol consumption (4%) is also a significant factor.

The consumption of alcohol has both beneficial and adverse effects on morbidity and mortality. Although many conditions and diseases, such as violence, accidents, liver and neurological disease, pancreatitis, hemorrhagic stroke, and cancer are exacerbated by alcohol consumption, moderate drinking has been associated with a reduction in atherosclerotic cardiovascular disease [2–4]. For all-cause mortality the majority of individual studies in numerous countries among various racial/ethnic groups and for both sexes have found J- or U-shaped curves with light to moderate drinkers having a lower mortality risk than non-drinkers or heavy drinkers [5–9].

Studies of the relationship between mortality and alcohol use in the elderly [9–19] are limited by small size (<2, 000 elderly participants) [10, 12, 16], short follow-up period (<10 years) [11, 14–16, 18] or include only males [10, 12, 18]. As part of a prospective study of the effect of modifiable lifestyle practices on longevity and successful aging, we explored the association of alcohol intake on all-cause mortality in a large cohort (nearly 14,000) of elderly (median age 74 years) men and women with information on many potential confounders and followed for 23 years.

Methods

The Leisure World Cohort Study was established in the early 1980s when 13,978 (8,877 female and 5,101 male) residents of a California retirement community (Leisure World Laguna Hills) completed a postal health survey. The population and the cohort are mostly Caucasian, well-educated, upper-middle class and elderly. The baseline health survey asked demographic information (birth date, sex, marital status, number of children, height, weight); brief medical history (high blood pressure, angina, heart attack, stroke, diabetes, rheumatoid arthritis, fractures after age 40, cancer, gallbladder surgery, glaucoma, cataract surgery); medication use (hypertensive medication, digitalis, nonprescription pain medication); personal habits (cigarette smoking, exercise, alcohol, vitamin intake); and beverage consumption (milk, regular coffee, decaffeinated coffee, black or green tea, and soft drinks).

Consumption of alcoholic beverages was asked separately for wine, beer and hard liquor. Response choices for average weekday consumption were never drink, less than 1, 1, 2, 3, and 4 or more. Intakes of wine, beer and hard liquor were combined to form an overall amount of alcohol consumed. Living cohort members were resurveyed in 1992 and 1998 about their current alcohol drinking. Response choices were never, sometimes, everyday. Using baseline and follow-up surveys, subjects were classified as stable non-drinkers (those who reported not drinking alcohol at baseline and follow-up), stable drinkers (those who reported drinking both at baseline and follow-up), starters (those who reported not drinking at baseline but drinking at either follow-up), and quitters (those who reported drinking at baseline but not drinking at either follow-up).

Cohort members have also been followed by review of local hospital discharge data and determination of vital status by search of national and commercial death indexes and ascertainment of death certificates. Participants were followed to death or 31 December 2004, whichever came first. Forty-two cohort members were lost to follow-up. Previous reports present details of data collection [20, 21].

Proportional hazard regression analyses [22] were carried out separately for men and women. We tested the overall effect of alcohol using likelihood ratio tests (LRTs) comparing age-adjusted models with and without alcohol. Age-adjusted hazard ratios (HRs) and 95% confidence intervals were also obtained using proportional hazard regression. To control for potential confounding factors previously found to be related to mortality in this cohort, we performed multiple proportional hazard regression analysis adjusting for age at entry (continuous), smoking (never, past, current), exercise (0, 0.25, 0.5, 0.75–1.75, 2+ h/day), body mass index (<18.5 (underweight), 18.5–24.9 (normal), 25–29.9 (overweight), 30+ kg/m^2 (obese)), caffeine intake (<50, 50–99, 100–199, 200–399, 400+ mg/day) and histories of hypertension, angina, heart attack, stroke, diabetes, rheumatoid arthritis, and cancer. Statistical analyses were performed using SAS version 9.1 (SAS Institute Inc., Cary, NC). No adjustment in the significance level was made for multiple comparisons.

This study was approved by the Institutional Review Boards of the University of Southern California and the University of California, Irvine and funded by the National Institutes of Health (R01CA32197 and R01AG21055), the Earl Carroll Trust Fund, the Al and Trish Nichols Chair in Clinical Neuroscience, and Wyeth-Ayerst Laboratories.

Results

After excluding 233 women and 121 men with missing information on the variables of interest or potential confounding variables, data on 8,644 women and 4,980 men were analyzed. At study entry, the subjects ranged in age from 44 to 101 years (median, 74 years). By 31 December 2004, 11,386 had died. Age at death ranged from 59 to 110 years (median, 87 years).

Table 1 presents selected characteristics of the study subjects for men and women and for alcohol drinkers and non-drinkers. Three-quarters of the cohort drank alcohol. At baseline, alcohol drinkers had a lower prevalence of stroke, diabetes and rheumatoid arthritis but more were smokers and coffee drinkers. Females consumed alcohol less often and in lower amounts than males. While 51–64% of both males and females drank wine or spirits, fewer women than men drank beer (15% versus 41%).

All alcoholic beverages combined and wine, beer and spirits separately were significantly associated with mortality in both men and women (LRT $P \leq 0.01$). Table 2 shows the age-adjusted and multivariate-adjusted HRs of mortality for these variables. Both men and women showed a decreased risk of death with alcohol intake. Those who drank two or more drinks per day had a 14–16% reduced risk of death compared with non-drinkers. The reduced risk was not limited to one type of alcohol. Both male and female wine drinkers had significantly lower risks of death as did male beer drinkers and female spirit drinkers. Result for analyses excluding the first 5 years of follow-up were essentially unchanged.

Table 3 shows how change in alcohol consumption over time was related to death in the 5,511 cohort members with follow-up information (LRT $P<0.001$). At follow-up a greater proportion of surviving participants in our study reported not drinking (36% versus 26% at baseline). Both men and women who were stable drinkers had significantly reduced risks of death compared with stable non-drinkers. Starters also had a significantly lower risk. Women who quit drinking between baseline and follow-up were at increased risk of death.

Discussion

Our study confirms the beneficial effect of moderate alcohol drinking on all-cause mortality in elderly adults observed in most previous studies. In the Normative Aging Study [10], the Cancer Prevention II Study [11], the Honolulu Heart Study [12], the HALE Project of

European men and women [13], population-based cohorts in East Boston, MA, and New Haven, CT [14], New South Wales [15], Copenhagen, Denmark [9], and Barcelona, Spain [16], adults in a CA health maintenance organization [17], and male veteran patients [18], moderate drinkers had lower mortality rates than non-drinkers. In the health maintenance organization study with 2,594 elderly outpatients, those aged 60–69 who drank more than one drink a month but fewer than two drinks a day had the lowest risk of death; in patients aged 70 and older, those drinking one to two drinks did not have lower mortality than patients who drank less than one drink a month [17]. Likewise, no significant association between drinking and mortality was seen in an Iowa cohort [14] or in the US representative National Health and Nutrition Examination Survey (NHANES I) Epidemiology Follow-up Study of males and females aged 60–75 years [19].

Although definitions of light and moderate alcohol consumption vary among the studies, our results confirmed that these levels decrease risk of death in elderly men and women. The reduced risk (15%) we observed was similar to the 20% lower risks observed in the HALE project of European men and women aged 70 to 90 years and followed for 10 years [13] and in the Cancer Prevention II Study of American men and women aged 60–79 years [11]. For males, the average volume of consumption associated with minimum risk has varied between 6 and 19 g/day of alcohol with relative risks between 0.80 and 0.89; for females it is between 3 and 13 g/day with risks between 0.76 and 0.97, where 1 drink is about 10 g of alcohol [5–8, 23]. Meta-regression analyses of 29 cohort studies including 171,869 deaths estimated reduced mortality at alcohol doses up to 47–60 g/day [7]. We observed a decreased risk in our highest intake category (4+ drinks/per day). Although most studies reveal a protective effect at low doses of alcohol, heterogeneity of results beyond low doses indicate other factors influence the relationship between average volume of consumption and mortality [6]. Such factors may include smoking, dietary factors, and physical activity.

Alcohol consumption, like other human behaviours, varies considerably over time with average intake declining with increasing age [24–26]. The greater proportion of surviving participants in our study who reported not drinking at follow-up compared to baseline is probably due to a combination of the cohort's becoming older and drinking less, secular changes in alcohol consumption with time, and survival selection effects. Decline in consumption is also associated with the development of ill health, particularly cardiovascular disease. This accumulation of ill health and higher mortality risk in 'sick quitters' increases the observed benefit in drinkers if non-drinkers include these ex-drinkers [6, 24, 26]. In addition, regular light drinkers tend to have characteristics advantageous to health [26, 27]. Thus, controlling for baseline disease is important, particularly if alcohol history is unknown. With adjustment for baseline medical history as well as body mass index, exercise, and smoking, the lower risks of death among light and moderate alcohol drinkers observed in our study did not change substantially and remained statistically significant although those associated with heavier drinking were reduced. In addition, analyses excluding the first five years of follow-up and looking at changes in alcohol intake over time confirmed the beneficial effect of alcohol intake on mortality. As expected, stable drinkers had reduced risks of death compared with stable non-drinkers. Previous studies, though generally in younger populations, have found persons with stable patterns of light and moderate alcohol intake to have the lowest mortality risk [25, 28, 29]. In our study those who started drinking acquired the mortality risk associated with moderate drinking. Female quitters were at greater risk, suggesting that those who quit may do so for health reasons that affect mortality.

We found no difference in the effects of wine, beer or hard liquor on mortality. Whereas several studies have not observed any differences between wine, beer and spirits in their association to all-cause mortality [2, 17, 30], others have shown more benefit for wine [31–

34], and/or beer [35], and/or spirits [36]. In many cases, the strongest inverse relation has been observed for the beverage type most often consumed in the population under study.

Experimental, clinical and epidemiological studies have shown that alcohol (not specific to drink type) increases high density lipoprotein cholesterol concentrations, effects tissue plasminogen activator and other components of clotting and fibrinolysis, and decreases platelet aggregation [2, 37]. These mechanisms provide a biological basis for a causal relation between alcohol consumption and lower rates of coronary heart disease and death.

Strengths and limitations

Like most previous studies reporting on the association of potential risk factors and mortality, our investigation is an observational study. In such studies unrecognized confounders or bias may account for the observed results. In general populations, health-promoting habits tend to cluster. For example, alcohol drinkers may differ from non-drinkers in their smoking, exercise habits, body mass index, and medical history. Indeed, we observed these differences in our cohort. They may also differ from non-drinkers in unmeasured ways that influence longevity and so uncontrolled confounding cannot be ruled out in this or any observational study. In addition, our data on alcohol consumption were self-reported through the use of a mailed questionnaire. Self-report of alcohol use is affected not only by selection, but also by culturally determined socially desirable answers. The lack of objective confirmation of actual amount of alcohol consumed, lack of information concerning alcohol intake before baseline, and inclusion of ex-drinkers with never drinkers in the non-drinker category, as well as lack of assessment of drinking patterns place reservations on the observed findings. The subjects in our study were also healthier and better educated than the general population. However, this cohort has the advantages of large size, long follow-up as well as details on the type of alcohol consumed, changes in intake over time, and the ability to adjust for many potential confounders.

Conclusions

We found a small beneficial effect of alcohol intake (15% reduction in risk) on mortality in both elderly men and women. As a beneficial effect was seen for wine, beer and spirits, a substantial proportion of the benefit is likely due to the alcohol content rather than to other components of each drink. We also found that those who quit drinking have increased mortality compared to stable non-drinkers.

References

1. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. JAMA. 2004; 291:1238–1245. [PubMed: 15010446]
2. Vogel RA. Alcohol, heart disease, and mortality: a review. Rev Cardiovasc Med. 2002; 3:7–13. [PubMed: 12439349]
3. US Department of Health and Human Services. Rockville, MD: US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute on Alcohol Abuse and Alcoholism; 2000. Tenth Special Report to the US Congress on Alcohol and Health from the Secretary of Health and Human Services.
4. Corrao G, Bagnardi V, Zambon A, Arico A. Exploring the dose-response relationship between alcohol consumption and the risk of several alcohol-related conditions: a meta-analysis. Addiction. 1999; 94:1551–1573. [PubMed: 10790907]
5. White IR. The level of alcohol consumption at which all-cause mortality is least. J Clin Epidemiol. 1999; 52:967–975. [PubMed: 10513760]

6. Gmel G, Gutjahr E, Rehm J. How stable is the risk curve between alcohol and all-cause mortality and what factors influence the shape? A precision-weighted hierarchical meta-analysis. Eur J Epidemiol. 2003; 18:631–642. [PubMed: 12952136]
7. Bagnardi V, Zambon A, Quatto P, Corrao G. Flexible meta-regression functions for modeling aggregate dose-response data, with an application to alcohol and mortality. Am J Epidemiol. 2004; 159:1077–1086. [PubMed: 15155292]
8. Burger M, Brönstrup A, Pietrzik K. Derivation of tolerable upper alcohol levels in Germany: a systematic review of risks and benefits of moderate alcohol consumption. Prev Med. 2004; 39:111–127. [PubMed: 15207992]
9. Grønbæk M, Deis A, Becker U, et al. Alcohol and mortality: is there a U-shaped relation in elderly people? Age Ageing. 1998; 27:739–744. [PubMed: 10408669]
10. de Labry LO, Glyn RJ, Levenson MR, Hermos JA, LoCastro JS, Vokonas PS. Alchohol consumption and mortality in an American male population: recovering the U-shaped curve—findings from the Normative Aging Study. J Stud Alcohol. 1992; 53:25–32. [PubMed: 1556854]
11. Thun MJ, Peto R, Lopez AD, et al. Alcohol consumption and mortality among middle-aged and elderly U.S. adults. N Engl J Med. 1997; 337:1705–1714. [PubMed: 9392695]
12. Goldberg RJ, Burchfiel CM, Reed DM, Wergowske G, Chiu D. The Honolulu Heart Study. A prospective study of the health effects of alcohol consumption in middle-aged and elderly men. Circulation. 1994; 89:651–659. [PubMed: 8313554]
13. Knoops KTB, de Groot LCPGM, Kromhout D, et al. Mediterranean diet, lifestyle factofs, and 10-year mortality in elderly European men and women. The HALE Project. JAMA. 2004; 292:1433–1439. [PubMed: 15383513]
14. Scherr PA, LaCroix AZ, Wallace RB, et al. Light to moderate alcohol consumption and mortality in the elderly. J Am Geriatr Soc. 1992; 40:651–657. [PubMed: 1607579]
15. Simons LA, McCallum J, Friedlander Y, Ortiz M, Simons J. Moderate alcohol intake is associated with survival in the elderly: the Dubbo Study. Med J Aust 200. 173:121–124.
16. Ruigomez A, Alonso J, Anto JM. Relationship of health behaviors to five-year mortality in an elderly cohort. Age Ageing. 1995; 24:113–119. [PubMed: 7793332]
17. Klatsky AL, Armstron MA, Friedman GD. Alcohol and mortality. Ann Intern Med. 1992; 117:646–654. [PubMed: 1530196]
18. Bridevaux IP, Bradley KA, Bryson CL, McDonelll MB, Fihn SD. Alcohol screening results in elderly male veterans: association with health status and mortality. J Am Geriatr Soc. 2004; 52:1510–1517. [PubMed: 15341553]
19. Rehm J, Sempos CT. Alcohol consumption and all-cause mortality. Addiction. 1995; 90:471–480. [PubMed: 7773106]
20. Paganini-Hill A. Risk factors for Parkinson's Disease: the Leisure World Cohort Study. Neuroepidemiology. 2001; 20:118–124. [PubMed: 11359079]
21. Paganini-Hill A, Hsu G, Chao A, Ross RK. Comparison of early and late respondents to a postal health survey questionnaire. Epidemiology. 1993; 4:375–379. [PubMed: 8347749]
22. Cox DR. Regression models and life tables (with discussion). J R Stat Soc B. 1972; 34:187–220.
23. White IR, Altmann DR, Nanchahal K. Alcohol consumption and mortality: modelling risks for men and women at different ages. BMJ. 2002; 325:191–197. [PubMed: 12142306]
24. Wannamethee SG, Shaper AG. Alcohol, coronary heart disease and stroke: an examination of the J-shaped curve. Neuroepidemiology. 1998; 17:288–295. [PubMed: 9778595]
25. Emberson JR, Shaper AG, Wannamethee SG, Morris RW, Whincup PH. Alcohol intake in middle age and risk of cardiovascular disease and mortality: accounting for intake variation over time. Am J Epidemiol. 2005; 161:856–863. [PubMed: 15840618]
26. Shaper AG, Wannamethee SG. The J-shaped curve and changes in drinking habit. Novartis Found Symp. 1998; 216:173–188. [PubMed: 9949793]
27. Liao Y, McGee DL, Cao G, Cooper RS. Alcohol intake and mortality: findings from the National Health Interview Surveys (1988 and 1990). Am J Epidemiol. 2000; 151:651–659. [PubMed: 10752792]

28. Grønbæk M, Johansen D, Becker U, et al. Changes in alcohol intake and mortality. A longitudinal population-based study. Epidemiology. 2004; 15:222–228. [PubMed: 15127916]

29. Wellmann J, Heidrich J, Berger K, Doring A, Heuschmann PU, Keil U. Changes in alcohol intake and risk of coronary heart disease and all-cause mortality in the MONICA/KORA-Augsburg cohort 1987–97. Eur J Cardiovasc Prev Rehabil. 2004; 11:48–55. [PubMed: 15167206]

30. Poikolainen K. Alcohol and mortality: a review. J Clin Epidemiol. 1995; 48:455–465. [PubMed: 7722599]

31. Grønbæk M. Alcohol, type of alcohol, and all-cause and coronary heart disease mortality. Ann N Y Acad Sci. 2002; 957:16–20. [PubMed: 12074958]

32. Grønbæk M, Becker U, Johansen D, et al. Type of alcohol consumed and mortality from all causes, coronary heart disease, and cancer. Ann Intern Med. 2000; 133:411–419. [PubMed: 10975958]

33. Grønbæk M, Deis A, Sorensen TI, et al. Mortality associated with moderate intakes of wine, beer, or spirits. BMJ. 1995; 310:1165–1169. [PubMed: 7767150]

34. Theobald H, Bygren LO, Carstensen J, Engfeldt P. A moderate intake of wine is associated with reduced total mortality and reduces mortality from cardiovascu. J Stud Alcohol. 2000; 61:652–656. [PubMed: 11022802]

35. Keil U, Chambless LE, Döring A, Filipiak B, Stieber J. The relation of alcohol intake to coronary heart disease and all-cause mortality in a beer-drinking population. Epidemiology. 1997; 338:464–468.

36. Klatsky AL, Armstrong MA. Alcoholic beverage choice and risk of coronary artery disease mortality: do read wine drinkers fare best? Am J Cardiol. 1993; 71:467–469. [PubMed: 8430646]

37. Rimm EB, Williams P, Fosher K, Criqui M, Stampfer MJ. Moderate alcohol intake and lower risk of coronary heart disease: meta-analysis of effects on lipids and haemostatic factors. BMJ. 1999; 319:1523–1528. [PubMed: 10591709]

Key points

- Elderly men and women who drank alcohol had decreased mortality compared with non-drinkers.
- Those who consumed two or more drinks per day had a 15% reduced risk of death.
- The lower risk of death was not limited to one type of alcohol.
- Starters (non-drinkers at baseline who reported drinking at follow-up) acquired the mortality risk associated with moderate drinking.
- Quitters (baseline drinkers who reported not drinking at follow-up) were at increased risk of death.

Table 1

Characteristics of the Leisure World Cohort at baseline

	Sex		Alcohol drinker	
	Male	**Female**	**No**	**Yes**
Number	4980	8644	3485	3485
	Mean ± Standard deviation			
Age at baseline (years)	74.3 ± 7.2	73.2 ± 7.4	74.5 ± 7.6	73.3 ± 7.2
Age at follow-up (years)	85.6 ± 6.9	87.5 ± 7.0	86.7 ± 7.3	86.8 ± 6.9
Follow-up years	11.2 ± 6.8	14.3 ± 6.8	12.2 ± 6.9	13.5 ± 6.9
Body mass index (kg/m^2)	24.2 ± 2.9	23.1 ± 3.5	23.5 ± 3.6	23.5 ± 3.2
Exercise (h/day)	1.1 ± 1.3	0.9 ± 1.1	0.9 ± 1.1	1.0 ± 1.2
Caffeine (mg/day)	177 ± 172	168 ± 165	138 ± 159	182 ± 169
	%			
Alive	11	20	14	17
Female sex	0	100	69	62
History of disease				
High blood pressure	36	41	39	39
Angina	15	9.5	13	11
Heart attack	16	6.6	11	9.9
Stroke	7.1	3.7	5.9	4.6
Cancer	9.3	13	12	11
Diabetes	8.2	4.9	9.3	5.1
Rheumatoid arthritis	4.4	6.7	7.1	5.5
Cigarette use				
Never	33	55	64	42
Past	58	33	29	46
Current	9	12	7	12
Alcohol drinker	78	72	0	100
Regular coffee drinker	63	58	48	64
Decaffeinated coffee drinker	61	62	59	62
Black or green tea drinker	46	53	47	51

Table 2

Alcoholic beverage consumption and hazard ratio (HR) of death: The Leisure World Cohort Study, 1981–2004

	Male				Female			
	Number of subjects	**Number of deaths**	**Model 1: HR (95% CI)**	**Model 2: HR (95% CI)**	**Number of subjects**	**Number of deaths**	**Model 1: HR (95% CI)**	**Model 2: HR (95% CI)**
Alcohol (drinks/day)								
None	1076	988	1.0	1.0	2409	2009	1.0	1.0
≤ 1	1242	1117	0.88 (0.81–0.96)	0.90 (0.82–0.98)	3070	2466	0.89 (0.84–0.94)	0.91 (0.86–0.97)
2	1348	1182	0.85 (0.78–0.92)	0.86 (0.79–0.94)	1819	1424	0.86 (0.80–0.92)	0.84 (0.79–0.91)
3	652	581	0.86 (0.78–0.96)	0.86 (0.77–0.95)	769	598	0.92 (0.84–1.01)	0.84 (0.76–0.92)
4+	662	588	0.91 (0.82–1.01)	0.84 (0.76–0.93)	577	433	0.92 (0.83–1.02)	0.85 (0.76–0.94)
Wine (drinks/day)								
None	2326	2135	1.0	1.0	4201	3543	1.0	1.0
<1	1764	1543	0.83 (0.78–0.89)	0.87 (0.81–0.93)	2887	2218	0.84 (0.80–0.89)	0.87 (0.82–0.92)
≥ 1	890	778	0.86 (0.78–0.93)	0.89 (0.82–0.97)	1556	1169	0.83 (0.78–0.89)	0.86 (0.80–0.92)
Beer (drinks/day)								
None	2942	2682	1.0	1.0	7347	5995	1.0	1.0
<1	1529	1334	0.89 (0.83–0.95)	0.90 (0.84–0.96)	1069	762	0.82 (0.77–0.89)	0.83 (0.77–0.90)
≥ 1	509	440	0.89 (0.81–0.99)	0.87 (0.78–0.96)	228	173	0.91 (0.78–1.05)	0.93 (0.80–1.05)
Spirits (drinks/day)								
None	1770	1591	1.0	1.0	3789	3086	1.0	1.0
<1	1391	1208	0.85 (0.78–0.91)	0.87 (0.80–0.94)	2402	1845	0.92 (0.87–0.97)	0.93 (0.88–0.99)
≥1	1819	1657	0.95 (0.89–1.02)	0.93 (0.87–1.00)	2453	1999	0.98 (0.92–1.03)	0.92 (0.87–0.97)

Model 1: adjusted for age.

Model 2: adjusted for age, smoking, exercise, body mass index, caffeine consumption, and histories of hypertension, angina, heart attack, stroke, diabetes, rheumatoid arthritis, and cancer.

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Table 3

Change in alcoholic beverage consumption and hazard ratio (HR) of death: the Leisure World Cohort Study, 1981–2004

	Male				Female			
	Number of subjects	**Number of deaths**	**Model 1: HR (95% CI)**	**Model 2: HR (95% CI)**	**Number of subjects**	**Number of deaths**	**Model 1: HR (95% CI)**	**Model 2: HR (95% CI)**
Change in consumption								
Stable non-drinkers	260	212	1.0	1.0	652	442	1.0	1.0
Quitters	316	254	0.82 (0.68–0.99)	0.84 (0.70–1.02)	783	577	1.16 (1.03–1.32)	1.17 (1.03–1.33)
Starters	72	47	0.70 (0.51–0.96)	0.69 (0.50–0.96)	158	74	0.74 (0.58–0.95)	0.76 (0.59–0.98)
Stable drinkers	1124	805	0.71 (0.61–0.83)	0.67 (0.57–0.78)	2146	1255	0.87 (0.78–0.97)	0.85 (0.76–0.95)

Model 1: adjusted for age.

Model 2: adjusted for age, smoking, exercise, body mass index, caffeine consumption, and histories of hypertension, angina, heart attack, stroke, diabetes, rheumatoid arthritis, and cancer.

Age Ageing. Author manuscript; available in PMC 2012 June 18.