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Joint effect of cigarette smoking and alcohol consumption on mortality

Wang-Hong Xu, MD, MPH[1], **Xiang-Lan Zhang, MD, MPH**[2], **Yu-Tang Gao, MD**[1], **Yong-Bing Xiang, MD, MPH**[1], **Li-Feng Gao**[1], **Wei Zheng, MD, PhD**[2], and **Xiao-Ou Shu, MD, PhD**[2]

[1] Department of Epidemiology, Cancer Institute of Shanghai Jiaotong University, Shanghai Cancer Institute, Shanghai 200032; People's Republic of China

[2] Department of Medicine, Vanderbilt Epidemiology Center, Vanderbilt University Medical Center and Vanderbilt-Ingram Cancer Center, Nashville TN 37203-1738, USA

Abstract

Objective—To evaluate the joint effect of cigarette smoking and alcohol consumption on mortality.

Methods—A population-based cohort of 66,743 Chinese men aged 30–89 in Shanghai, China recruited from 1996 to 2000. Lifestyle data were collected using structured questionnaires. As of November 2004, follow-up for the vital status of 64,515 men was completed and death information was further confirmed through record linkage with the Shanghai Vital Statistics Registry. Associations were evaluated by Cox regression analyses.

Results—2,514 deaths (982 from cancers, 776 from cardiovascular diseases (CVD)) were identified during 297,396 person-years of follow-up. Compared to never-smokers, both former and current smokers had significantly elevated mortality from any cause, CVD, and cancer; risk increased with amount of smoking. Intake of 1–7 drinks/week was associated with reduced risk of death, particularly CVD death (hazard ratio (HR): 0.7, 95% confidence interval (CI): 0.5, 1.0), whereas intake of >42 drinks/week was related to increased mortality, particularly cancer-related death (HR: 1.7, 95% CI: 1.1, 2.5). The HR for total mortality associated with moderate alcohol consumption increased from 0.8 (95% CI: 0.6, 1.0) for non-smokers to 1.0 (0.9, 1.2) for moderate smokers and 1.4 (95% CI: 1.2, 1.7) for heavy smokers. Heavy drinkers and heavy smokers had the highest mortality (HR: 1.9, 95% CI: 1.6, 2.4).

Conclusions—Light and moderate alcohol consumption reduced mortality from CVD. This beneficial effect, however, was offset by cigarette smoking.

Keywords

cigarette smoking; alcohol consumption; mortality; Chinese men

Correspondence should be addressed to: Xiao-Ou Shu, MD, PhD, Professor, Department of Medicine, Vanderbilt Epidemiology Center, Institute for Medicine & Public Health, Sixth Floor, Suite 600, 2525 West End Avenue, Nashville, TN 37203-1738, Tel: 615-936-0713, Fax: 615-936-8291, Xiao-Ou.Shu@vanderbilt.edu.

INTRODUCTION

Cigarette smoking is a well-established risk factor for coronary heart disease (CHD), stroke and many cancers, the leading causes of death among middle-aged and elderly men. It has been consistently linked to increased mortality worldwide (He et al., 2005; Pavlovic et al., 2004; Prescott et al., 2002; Yuan et al., 1996).

On the other hand, men who drink light to moderate amounts of alcohol have been found to have a lower overall death rate, while heavy drinkers have been shown to have elevated mortality compared to non-drinkers (Hart et al., 1999; Jakovljevic et al., 2004; Makela et al., 2005; Shaper et al., 1988; Tolstrup et al., 2006). Ecological, case-control and cohort studies have suggested that moderate alcohol intake reduces the risk of CHD morbidity and mortality by 10% – 70% (Bovet and Paccaud, 2001; Renaud et al., 1993). In China, light to moderate drinkers (1–14 drinks a week) have been shown to have a 19% reduction in overall mortality, while heavy drinkers had an increased risk of death from cancers (Yuan et al., 1997).

Although the individual effects of smoking and alcohol consumption on mortality have been well established, the joint effect of these two lifestyle factors on mortality remains unclear (Ebbert et al., 2005; Martelin et al., 2004; Yuan et al., 1997). We took advantage of the data collected in the Shanghai Women's Health Study (SWHS) about the lifestyles and health conditions of husbands of the cohort's married women and prospectively examined the relationship between cigarette smoking, alcohol consumption and mortality of the husbands. In this husband cohort, many participants were both cigarette smokers and alcohol drinkers, providing us with a good opportunity to evaluate the interaction between cigarette smoking and alcohol intake on mortality.

METHODS

Between 1996 and 2000 we invited all 40–70 year old female residents of the Changning district of urban Shanghai, which included seven geographically defined communities, to participate in a prospective, epidemiological study of diet and cancer (Zheng et al., 2005). At recruitment, the husbands of married women were also invited to participate in the study and were administered a brief survey interview which included information on date of birth, education level, tobacco smoking habits, alcohol consumption, tea consumption, usual adult height and weight, exercise habits, and medical history. During the three-year recruitment period, 74,942 women and 66,743 husbands were enrolled in the study. All interviews were tape-recorded and 10% of the tapes were evaluated for quality. The Institutional Review Boards of all participating institutes approved the studies and written, informed consent was obtained from all participants.

We asked each couple whether the husband had ever smoked at least one cigarette per day for 6 months or more. If the answer was yes, they were asked to provide the age at which he started to smoke regularly and the usual number of cigarettes he smoked. If he was a former smoker, we asked for the age at which he stopped smoking. An alcohol drinker was defined as a man drinking alcoholic beverages at least three times a week for 6 months or more. Information was collected on the age the man started or quit drinking, if relevant. For current drinkers, the usual frequency (per week) and amount consumed of beer, grape wine, yellow rice wine, and spirits (per time) were collected separately. A tea drinker was defined as a man drinking tea at least three times a week for 6 months or more.

The SWHS cohort members and their husbands were followed once every two years by in-person interviews. The second follow-up survey was completed by November 2004. The survival status of husbands was obtained for 64,515 subjects, with a response rate of 96.7%.

The 2,228 husbands lost before the first follow-up visit were censored at time 0. They contributed no person-years of observation and thus were excluded from the analyses. Years of follow-up were computed from the date of recruitment to the date of death for husbands who died, or to the date of the last follow-up for those who were still alive. As of November 2004, the cohort had been followed for 297,396 person-years (an average of 4.6 years of follow-up per man). During this period, 2,514 of the 64,515 husbands had died (845.3/100,000 person-years). Demographic information on the deceased subjects was linked to the Shanghai Vital Statistics Registry, a population-based death registry system, to verify cause of death information. In Shanghai, death certificates are typically signed by medical professionals (accounting for about 65% of deaths in urban Shanghai), community health workers (for those died at home), or by legal medical experts (for accidental deaths). There were 982 deaths from cancers (ICD-9: 140–208) and 776 deaths from cardiovascular diseases (CVD) (ICD-9: 390–459), which included 156 deaths from ischemic heart diseases (ICD-9: 410–414).

Statistical Analyses

We used a proportional hazards regression model to examine the relation between cigarette smoking, alcohol consumption at recruitment and subsequent risk of death. The proportional hazards assumption was checked by plotting the survival curves with smoking and drinking variables and no crossovers were evident. We created a variable for the total amount of alcohol consumed by treating 12 ounces of beer (12.6 g of ethanol), 4 ounces of grape wine (12.3 g of ethanol), 4.8 ounces of yellow rice wine (12.6 g of ethanol) or 1 ounce of spirits (12.9 g of ethanol) as one drink. Hazard ratios and their corresponding 95% confidence intervals were calculated for various categories of smokers and drinkers in reference to lifelong non-smokers and non-drinkers. The confounding variables adjusted for in the various regression models were age (as a continuous variable), level of education (no formal education/elementary/junior high school/high school/post-high school/college, as an indicator variable), BMI (<25/25–29/>=30, as an indicator variable), tea consumption (never/former/current, as an incidator variable), and history of stroke (yes/no), coronary heart disease (yes/no), hypertension (yes/no), diabetes (yes/no), chronic bronchitis (yes/no), and chronic gastritis (yes/no). Eight indicator variables were created for comparing the joint effects to the reference category of never smokers/never alcohol drinkers. The multiplicative interaction of smoking and alcohol consumption on mortality was evaluated by using the likelihood ratio test comparing the proportional hazards regression model that included only the main effects with the model that included both the main effects and the interaction terms.

The evaluation of the curvilinear relation between alcohol intake and total mortality was performed using the proportional hazards regression method (linear and quadratic terms for the number of drinks per week were included in the regression model) (Cox DR, 1972). All p values were two-sided. Hazard ratios with two-sided p values under 0.05 were considered to be significantly different from 1.0.

RESULTS

Shown in Table 1 are the baseline characteristics of the 64,515 husbands. The age of these subjects ranged from 30 to 89 years, and the vast majority (92.2%) were between the ages of 40 and 69 years. At recruitment, 61.7% (39,806) of husbands had ever smoked, 34.3% (22,148) had ever drunk alcohol regularly, and 27.5% (17,759) were both regular smokers and drinkers (Table 1). Of 39,806 smokers, 55.1% were moderate smokers (<20 cigarettes/day) and 44.9% were heavy smokers (=20 cigarettes/days), while among 19,893 current drinkers, 85.4% were moderate drinkers (1–21 drinks/week) and 14.6% were heavy drinkers (=22 drinks/week) (data not shown in Table 1).

Presented in Table 2 are the hazard ratios of total, cancer-related, and CVD-related mortality according to cigarette smoking and alcohol consumption status. Compared to lifelong non-smokers, both former and current smokers had a significantly elevated risk of death from any cause, CVD, and cancer. The more cigarettes smoked, the higher the mortality rate, particularly for cancer-related deaths. Those who smoked =40 cigarettes per day had an HR of 1.9 (95% confidence interval (CI): 1.6, 2.4) for total mortality and an HR of 2.8 (95% CI: 2.0, 3.8) for cancer-related death compared with non-smokers. The mortality rate also increased the earlier the age in life that men started smoking and with increased duration of smoking, with p values for trend less than 0.01 (data not shown).

Compared to lifelong non-drinkers, former drinkers had a higher risk of overall mortality, while current drinkers had a significantly lower risk (Table 2). Among current alcohol drinkers, the association between alcohol consumption and mortality varied by the amount consumed. Weekly intake of 1–7 drinks was associated with a significantly reduced risk of death, particularly CVD death, with an HR of 0.7 (95% CI: 0.5, 1.0), whereas intake of >42 drinks per week was associated with an increased risk of death, particularly cancer-related death (HR=1.7; 95 % CI: 1.1, 2.5). The association of alcohol consumption with cancer-related death was in a positive linear relationship (P for trend = 0.04), while the association of alcohol consumption with overall and CVD-related death followed a U shape (P for quadratic effect <0.01).

Further analyses of CHD alone were conducted. Compared to non-smokers, both former (HR: 1.7, 95% CI: 1.0, 2.7) and current smokers (HR: 1.7, 95% CI: 1.1, 2.6) had a significantly elevated risk of death from CHD. The HRs increased from 1.5, 1.3 to 2.0 and 2.3 as cigarettes smoked per day increased from 1–9, 10–19 to 20–39 and =40, respectively (data not shown in tables).

Of 156 deaths from ischemic heart diseases, 108 were non-drinkers, 16 were former drinkers and 32 were current drinkers. Compared to lifelong non-drinkers, HRs for CHD mortality did not reach significance for either former (HR: 1.1, 95% CI: 0.6, 1.9) or current drinkers (HR: 0.7, 95% CI: 0.4, 1.0) (data not shown in tables). There were too few deaths from CHD to further evaluate the effect of alcohol consumption by the amount consumed or interactions between alcohol consumption and cigarette smoking.

Of 19,893 regular drinkers, 9,471 (47.6%) reported regularly having drunk yellow rice wine, 4,892 (24.6%) beer, 4,898 (24.6%) spirits, and 629 (3.2%) grape wine. Analyses by amount and type of alcoholic beverage showed that moderate drinking was, in general, associated with lower mortality, particularly CVD-related mortality (Table 3). On the other hand, moderate and heavy spirits consumption was associated with a higher risk of cancer death, with respective HRs of 1.4 (95 % CI: 1.0, 1.9) and 1.4 (95 % CI: 1.1, 1.9).

Presented in Table 4 is the combined effect of alcohol consumption and cigarette smoking on risk of mortality from all causes, cancers, and CVDs. A significant inverse association was observed between moderate alcohol consumption and risk of overall death among non-smokers. The protective effect, however, was diminished among cigarette smokers. The HR for total mortality associated with moderate alcohol consumption increased from 0.8 (95% CI: 0.6, 1.0) for non-smokers to 1.0 (95% CI: 0.9, 1.2) for moderate smokers and 1.4 (95% CI: 1.2, 1.7) for heavy smokers. Smoking also strengthened the positive association between heavy drinking and mortality, with the highest mortality risk observed among those who were both heavy drinkers and heavy smokers (HR: 1.9, 95 % CI: 1.6, 2.4). However, a test for interaction was not significant (P=0.87).

A more pronounced protective effect of moderate alcohol consumption was observed for CVD-related death among non-smokers (HR: 0.6, 95 % CI: 0.4, 0.9), and the protective

effect of moderate alcohol consumption was diminished among cigarette smokers. The higher CVD mortality risk was observed among those who drank heavily and smoked moderately (HR: 1.8, 95% CI; 1.1, 3.0). On the other hand, moderate alcohol consumption was not related to lower cancer mortality even among non-smokers. Conversely, heavy drinking appeared to be associated with increased cancer mortality. A 2.9-fold increase in cancer mortality was observed among those who were both heavy drinkers and heavy smokers (Table 4).

We repeated all analyses of cause-specific mortality excluding men with pre-existing chronic serious illnesses and found no material change in the results described above (data not shown).

DISCUSSION

In this large cohort study, we found that cigarette smokers had a significantly increased risk of overall, cancer-, and CVD-specific mortality relative to non-smokers. The association between alcohol consumption and mortality varied by the amount consumed. That is, light to moderate drinking was related to lower mortality, particularly CVD mortality, while heavy drinking was associated with increased mortality, especially cancer mortality. Cigarette smoking was observed not only to offset the protective effect of moderate drinking but also to strengthen the harmful effect of heavy drinking. Cigarette smoking has consistently been linked to increased incidence of mortality from cancers, stroke, and heart disease in both men and women across the world (Baba et al., 2006; Danaei et al., 2005; Kuller et al., 1991). Smoking alone is estimated to have caused 21% of deaths from cancer worldwide. Chinese men have a higher proportion of cigarette smokers compared with their Western counterparts (Centers of Disease Control and Prevention, 2004). In this population, 61.7% of men had ever smoked regularly and 52.7% were current smokers. We found a 1.9-fold excess risk of overall mortality in heavy smokers compared with lifelong non-smokers. We also found that smoking was associated with a higher risk of death from cancers and CVDs, the leading causes of death among Chinese men (He et al., 2005). Our findings are consistent with a previous study conducted in the same population, in which a 2.3-fold excess risk of death from cancers and a 2- to 3-fold excess risk of death from heart disease among smokers was observed (Yuan et al., 1996).

The effect of alcohol consumption on mortality is generally found to depend on the amount consumed. That is, light to moderate drinking has been associated with the lowest overall mortality, while heavy drinking is linked to the highest rate of death from all causes (Hart et al., 1999; Jakovljevic et al., 2004; Laatikainen et al., 2003; Makela et al., 2005; Shaper et al., 1988; Tolstrup et al., 2006). A prospective study conducted in Copenhagen has shown that wine drinkers had a 50% reduction in mortality relative to non-drinkers (Gronbaek et al., 1995). Yuan et al reported a 19% reduction in overall mortality for light drinking in middle-aged men in Shanghai, China (Yuan et al., 1997). Consistent with these studies, we observed a U-shaped relation between alcohol intake and mortality, particularly for CVD mortality. In addition, the alcohol-CVD mortality association pattern did not differ by type of alcoholic beverage in this study, which is in agreement with most previous studies (Rimm et al., 1996; Gronbaek et al., 2000). It has been suggested that the cardioprotective effects of alcoholic beverages, particularly moderate consumption, include increased high-density lipoprotein cholesterol, inhibition of platelet aggregation, and improved fibrinolysis (Renaud et al., 1999; Rimm et al., 1999). All of these effects are explained not only by ethanol but also by the polyphenol components of alcoholic beverages (Parks et al., 2002; Ruf, 2004). Our findings support the notion that the benefit may derive from both the alcohol content and other components of each type of alcoholic beverage.

While evidence suggests that alcohol consumption is associated with a decreased risk of CHD mortality, alcohol is associated with an increased risk for cancer (Boffetta et al., 2006). It is estimated that 4.1% of total cancer deaths among men and 2.1% among women could be attributable to alcohol consumption (Boffetta et al., 2006). Alcohol has been classified as a Group 1 carcinogen by the International Agency for Research on Cancer (International Agency for Research on Cancer, 1988). It is consistently reported to increase the risk of cancers of oral cavity, pharynx, larynx, esophagus, and liver (International Agency for Research on Cancer, 1988). In our study, we found that light to moderate alcohol consumption was unrelated to cancer mortality. For alcohol consumption beyond 6 drinks per day, a significantly positive relationship between alcohol consumption and cancer-related mortality was observed, and the association appeared to follow a linear dose-response pattern.

It is noteworthy that the adverse association of alcohol consumption with cancer mortality reached significance for both moderate and heavy spirits intake, but not for other types of alcohols. The higher alcohol intake level among spirits drinkers may partly account for our findings. In this population, spirits consumers were more likely to drink heavily (=22 drinks/week) (54.9%) compared with drinkers of beer (5.6%), grape wine (2.1%), and yellow rice wine (12.3%). On the other hands, spirits drinkers were also more likely to be heavy smokers and have low education and high BMI. The residual confounding effect of these factors may be an alterative explanation for our findings, particularly for the positive association between moderate spirits drinking and cancer mortality. Grape wine is the only alcoholic beverage that has been suggested to have a protective effect on cancer (Gronbaek et al., 2000; Ruf, 2003) due to its nonalcoholic components, such as grape-derived antioxidant polyphenols (Burns et al., 2001; Ebeler et al., 2005). In our population, however, few men drank grape wine regularly, which prevented a meaningful assessment on the potential anti-cancer properties of grape wine.

In our population, 27.5% of men were both cigarette smokers and alcohol drinkers. This provided us with an opportunity to evaluate the joint effect of smoking and drinking on mortality. Within each category of alcohol intake, the risk of overall death increased with an increasing number of cigarettes smoked per day. On the other hand, among non-smokers, light to moderate drinkers (those consuming 1–21 drinks per week) experienced a lower risk of overall death, particularly CVD death, than lifelong non-drinkers or heavy drinkers (22 drinks or above per week). The apparent protective effect of moderate drinking, however, disappeared in smokers. On the other hand, we found that alcohol consumption was not related to cancer mortality among non-smokers and that both moderate and heavy alcohol consumption were associated with an increased risk among smokers. The highest risk of cancer-related mortality, with a nearly 3-fold elevated risk, was seen among those who drank heavily and smoked heavily, although no multiplicative interaction was observed. Our findings are supported by some earlier publications (Ebbert et al., 2005; Femia et al., 2006) and suggest that smoking may diminish the protective effect of moderate alcohol consumption on CVD mortality and potentiate the deleterious effect that alcohol consumption has on cancer-related death.

Study limitations and strengths

Several limitations of the study should be mentioned. First, the follow-up period (average 4.6 years) is relatively short. Thus, the statistical power is limited for the evaluation of cause-specific mortality. Second, the cohort was recruited through the SWHS. Unmarried men were not included in the study. Given that more than 97 % of men between age 40 and 74 in Shanghai were currently married (data from Shanghai Men's Health Study), the generalizibility of the results may not be a major concern. However, of 8,134 women who were not married at the time of recruitment, 5,600 (7.5 %) were widows. Therefore, a

survival bias may have been introduced in this cohort and may have biased the results towards the null. Third, we did not run a record linkage for all cohort subjects with the Shanghai Vital Statistics Registry data, but only for those who died in order to obtain a confirmation of death. This may have resulted in uncertainty about the vital status of some subjects and thus lead our results towards or away from the null. Fourth, information on the cause of death is always a concern for epidemiological studies. Although we used record linkage with the Vital Statistics Registry data to verify this information, the misclassification of cause of death is not avoidable. Fifth, stroke is the second leading cause of death next to cancers in Chinese men, while the CHD mortality rate is much lower than in Western countries (He et al., 2005). It has been suggested that alcohol consumption has a different effect on hemorrhagic and ischemic stroke. However, information on specific type of stroke was not available in the current study. We conducted analyses for CHD mortality alone and found the association of smoking with CHD mortality was similar to that of total CVD mortality. However, the number of deaths from CHD was insufficient to evaluate the effect of alcohol consumption and the joint effect of alcohol consumption and smoking on CHD mortality. Finally, due to the short follow-up period, our study, even with its large sample size, still has insufficient power to evaluate moderate interactions of smoking and alcohol consumption on mortality.

Our study also has many notable strengths. The prospective study design minimized recall bias. The structured questionnaire, standardized interview process, and strict quality control procedures improved our ability to gather accurate information. The large sample size, high response rate, and negligible loss to follow-up minimized selection bias. In this study, 39.6% of former drinkers were also former smokers. Both former smokers and drinkers had a much higher risk of overall mortality compared with non- and current smokers and drinkers. One possible explanation is that these men gave up smoking or drinking due to poor health. We did not include former drinkers in the analysis and thus eliminated this potential bias. Moreover, neither adjusting for history of potentially life-threatening illnesses nor excluding those with such diseases substantially changed the observed results.

CONCLUSIONS

In summary, cigarette smoking and heavy alcohol consumption pose a major threat to human health. Light and moderate alcohol consumption may reduce mortality from CVD. Such a beneficial effect, however, could be offset by cigarette smoking. We estimate that 9.3% and 1.5% of deaths in this population can be attributed to cigarette smoking and heavy alcohol consumption. Our findings suggest that avoiding smoking and limiting alcohol consumption to light to moderate amounts of non-spirits beverages may help to lower the risk of mortality from CVD.

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TABLE 1

Characteristics of subjects in the husband cohort, Shanghai, China, 1996–2000.

	Number	%
Age		
30–39	616	0.95
40–49	26317	40.79
50–59	17125	26.54
60–69	16065	24.90
70–79	4289	6.65
80–89	103	0.16
Education		
No formal education	1236	1.92
Primary school	5055	7.84
Middle school	21868	33.90
High school	17697	27.43
Career education	10086	15.63
College or above	8562	13.27
Unknown	11	0.02
Body mass index		
=25	48331	74.91
=30	15279	23.68
>30	778	1.21
Unknown	127	0.20
Lifestyle		
Cigarette smoking	39806	61.70
Alcohol consumption	22148	34.33
Cigarettes + alcohol	17759	27.53

TABLE 2

Hazard ratios of mortality according to cigarette smoking and alcohol consumption in the husband cohort, Shanghai, China, 1996–2000.

Lifestyle factors	Person years	Overall mortality		Cancer-related death		CVD-related death	
		Number of deaths	Hazard Ratios (95% confidence intervals)	Number of deaths	Hazard Ratios (95% confidence intervals)	Number of deaths	Hazard Ratios (95% confidence intervals)
Cigarette smoking [a]							
Non-smokers	116605	881	1.0	292	1.0	304	1.0
Former smokers	26289	629	1.6(1.4, 1.8)	222	1.8(1.5, 2.2)	200	1.3(1.1, 1.7)
Current smokers	159207	1005	1.4(1.3, 1.6)	468	1.7(1.5, 2.1)	272	1.3(1.1, 1.5)
Number of cigarettes smoked per day							
Never	116605	881	1.0	292	1.0	304	1.0
1–9	39393	274	1.2(1.1, 1.4)	110	1.5(1.1, 1.8)	83	1.0(0.8, 1.4)
10–19	63605	464	1.3(1.2, 1.5)	179	1.4(1.2, 1.8)	147	1.3(1.0, 1.6)
20–39	76527	789	1.7(1.5, 1.9)	349	2.1(1.8, 2.5)	220	1.5(1.2, 1.8)
=40	5954	106	1.9(1.6, 2.4)	51	2.8(2.0, 3.8)	22	1.0(0.6, 1.6)
		P for trend	<0.0001		<0.0001		0.0002
Alcohol consumption [b]							
Non-drinkers	198506	1610	1.0	600	1.0	509	1.0
Former drinkers	9991	286	1.3(1.1, 1.5)	87	1.1(0.8, 1.4)	110	1.4(1.1, 1.8)
Current drinkers	93605	619	0.9(0.8, 1.0)	295	1.0(0.9, 1.2)	157	0.8(0.6, 0.9)
Number of drinks per week (Excluding former drinkers)							
Never	198506	1610	1.0	600	1.0	509	1.0
1–7	30268	165	0.7(0.6, 0.9)	75	0.8(0.6, 1.0)	49	0.7(0.5, 1.0)
8–14	38757	234	0.9(0.7, 1.0)	114	1.0(0.8, 1.3)	51	0.7(0.5, 0.9)
15–21	5359	43	1.0(0.7, 1.4)	22	1.2(0.8, 1.9)	13	1.0(0.6, 1.8)
22–28	11716	84	1.0(0.8, 1.2)	43	1.1(0.8, 1.6)	22	0.9(0.6, 1.4)
29–42	4102	30	1.1(0.8, 1.6)	14	1.2(0.7, 2.1)	5	0.7(0.3, 1.8)
>42	3388	63	1.6(1.3, 2.1)	27	1.7(1.1, 2.5)	17	1.5(0.9, 2.6)
		P for trend	0.28		0.04		0.50

Adjusted for age, education, body mass index, and history of any cancer, chronic bronchitis, diabetes, hypertension, coronary heart disease and stroke.

[a] Additionally adjusted for alcohol consumption and tea consumption.

[b] Additionally adjusted for number of cigarettes smoked per day and tea consumption.

CVD: cardiovascular disease.

TABLE 3

Hazard ratios of mortality by consumption status on specific types of alcoholic beverages in the husband cohort, Shanghai, China, 1996–2000.

	Overall mortality			Cancer-related death			CVD-related death		
Type of drink	**Non-drinkers**	**Moderate (1–21 drinks per week)**	**Heavy (=22 drinks per week)**	**Non- drinkers**	**Moderate (1–21 drinks per week)**	**Heavy (=22 drinks per week)**	**Non- drinkers**	**Moderate (1–21 drinks per week)**	**Heavy (=22 drinks per week)**
Yellow rice wine									
Number of deaths	1610	273	55	600	121	21	509	80	18
Person-years	198506	38853	5340	198506	38853	5340	198506	38853	5340
Hazard ratios	1.0	0.8(0.7, 1.0)	1.1(0.9, 1.5)	1.0	0.9(0.7, 1.1)	1.0(0.6, 1.6)	1.0	0.8(0.6, 1.1)	1.4(0.9, 2.3)
Beer									
Number of deaths	1610	77	9	600	37	4	509	13	2
Person-years	198506	22199	1288	198506	22199	1288	198506	22199	1288
Hazard ratios	1.0	0.7(0.5, 0.9)	1.1(0.6, 2.2)	1.0	0.7(0.5, 1.1)	1.3(0.5, 3.4)	1.0	0.5(0.3, 0.8)	0.9(0.2, 3.5)
Spirits									
Number of deaths	1610	78	112	600	45	59	509	18	24
Person-years	198506	10411	12519	198506	10411	12519	198506	10411	12519
Hazard ratios	1.0	0.9(0.7, 1.2)	1.2(0.9, 1.4)	1.0	1.4(1.0, 1.9)	1.4(1.1, 1.9)	1.0	0.7(0.4, 1.2)	0.9(0.6, 1.4)
Grape wine									
Number of deaths	1610	14	1	600	8	0	509	2	0
Person-years	198506	2922	61	198506	2922	61	198506	2922	61
Hazard ratios	1.0	0.7(0.4, 1.2)	1.8(0.3, 13.3)	1.0	1.0(0.5, 2.0)	--	1.0	0.3(0.1, 1.4)	--

Adjusted for age, education, body mass index, number of cigarettes smoked per day, tea consumption, and history of any cancer, chronic bronchitis, diabetes, hypertension, coronary heart disease and stroke.

CVD: cardiovascular disease.

TABLE 4

Joint effect of cigarette smoking with alcohol consumption on mortality in the husband cohort, Shanghai, China, 1996–2000.

	Alcohol consumption		
Cigarette smoking	**Never**	**Moderate (1–21 drinks per week)**	**Heavy (=22 drinks per week)**
	Overall mortality		
Never			
Number of deaths	739	95	16
Person-years of follow-up	95789	17097	2086
Multivariate hazard ratios	1.0	0.8(0.6, 1.0)	1.0(0.6, 1.6)
Moderate (<20 cigarettes per day)			
Number of deaths	427	163	49
Person-years of follow-up	60518	32316	5988
Multivariate hazard ratios	1.3 (1.1, 1.4)	1.0(0.9, 1.2)	1.7(1.2, 2.2)
Heavy (=20 cigarettes per day)			
Number of deaths	443	184	112
Person-years of follow-up	42191	24966	11134
Multivariate hazard ratios	1.7(1.5, 2.0)	1.4(1.2, 1.7)	1.9(1.6, 2.4)
	Cancer-related death		
Never			
Number of deaths	235	42	7
Person-years of follow-up	95789	17097	2086
Multivariate hazard ratios	1.0	1.0(0.7, 1.4)	1.2(0.6, 2.6)
Moderate (<20 cigarettes per day)			
Number of deaths	165	81	17
Person-years of follow-up	60518	32316	5988
Multivariate hazard ratios	1.5(1.2, 1.8)	1.5(1.2, 2.0)	1.7(1.0, 2.7)
Heavy (=20 cigarettes per day)			
Number of deaths	199	88	60
Person-years of follow-up	42191	24966	11134
Multivariate hazard ratios	2.2(1.8, 2.8)	1.9(1.4, 2.5)	2.9(2.2, 4.0)
	CVD-related death		
Never			
Number of deaths	261	23	5
Person-years of follow-up	95789	17097	2086
Multivariate hazard ratios	1.0	0.6(0.4, 0.9)	0.9(0.4, 2.2)
Moderate (<20 cigarettes per day)			
Number of deaths	130	42	18
Person-years of follow-up	60518	32316	5988
Multivariate hazard ratios	1.1(0.9, 1.4)	0.8(0.6, 1.2)	1.8(1.1, 3.0)
Heavy (=20 cigarettes per day)			
Number of deaths	118	48	21

	Alcohol consumption		
Cigarette smoking	**Never**	**Moderate (1–21 drinks per week)**	**Heavy (=22 drinks per week)**
Person-years of follow-up	42191	24966	11134
Multivariate hazard ratios	1.4(1.1, 1.8)	1.2(0.8, 1.6)	1.1(0.7, 1.9)

Adjusted for age, education, body mass index, tea consumption, and history of any cancer, chronic bronchitis, diabetes, hypertension, coronary heart disease and stroke.

CVD: cardiovascular disease.