Alcohol drinking and risks of liver cancer and non-neoplastic chronic liver diseases in China: a 10-year prospective study of 0.5 million adults

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Supplementary Methods

Assessment of alcohol consumption

Detailed questionnaire assessment of alcohol consumption has been described previously. At the baseline questionnaire, participants were asked how often they had drunk alcohol during the past 12 months (never or almost never, occasionally, only at certain seasons, every month but less than weekly, usually at least once a week). Those who had not drunk alcohol at least weekly in the past 12 months were asked if there was a period of at least a year prior to that when they had drunk some alcohol at least once a week. For this report, participants were classified into four main drinking categories based on the frequency of alcohol drinking during the past 12 months and prior to the past year: (1) abstainers – who had no alcohol use in the past 12 months and had never drunk in most weeks in the past; (2) ex-regular drinkers – who had none or occasional (i.e., occasionally, only at certain seasons, every month but less than weekly) alcohol use in the past 12 months but had previously drunk in most weeks; (3) occasional drinkers – who had occasional alcohol use in the past 12 months but had never drunk in most weeks; and (4) current regular drinkers – who had some alcohol use in most weeks (i.e., ≥weekly) in the past 12 months.

Those who had drunk alcohol at least once a week in the past 12 months (i.e., current regular drinkers) were asked further questions about their drinking patterns including: frequency of drinking in the past year (1-2, 3-5, or 6-7 days per week); type of beverage (beer, grape wine, rice wine, weak spirits with <40% alcohol content, strong spirits with ≥40% alcohol content) and amount consumed for the reported beverage type (reported by number of small [250 ml] or large [640 ml] bottles of beer, and number of liang [50g] for wines and spirits) on a typical drinking day; time of drinking in relation to meals on a typical drinking day (usually drinking with meal, usually drinking between or after the meals, no regular patterns); age started drinking in most weeks; and whether the participant
usually experienced hot flushes or dizziness after drinking alcohol (soon after the first mouthful, after
drinking a small amount of alcohol, after drinking a large amount of alcohol, no flushing).

Level of alcohol consumption on a typical drinking day was calculated as grams of pure alcohol,
based on the beverage type and amount drunk on a typical drinking day, assuming the following
alcohol content by volume (v/v) typically seen in China:\textsuperscript{5} beer 4\%, grape wine 12\%, rice wine 15\%,
weak spirits 38\%, and strong spirits 53\%. Total level of weekly alcohol consumption was calculated
as grams per week by multiplying the consumption on a typical drinking day by the frequency of
drinking (taken as the median of the reported frequency intervals, i.e., 1.5 for 1-2 days/week, 4 for 3-
5 days/week, 6.5 for 6-7 days/week). Detailed definitions of the various parameters of alcohol
consumption are shown in Table S1.

**Main analytic models**

Cox regression models were used to estimate the associations of alcohol drinking status (reference
group: abstainers) with incident liver diseases in all men and women separately, and of alcohol
consumption level (in categories [reference group: <140 g/week for men; <70 g/week for women]
and as a continuous variable [per 280 g/week higher alcohol intake, i.e., around four drinks per day])
with incident liver diseases in male current regular drinkers and female current regular drinkers
separately. Cox regression models were stratified by age-at-risk (five-year groups), ten study areas,
and HBsAg sero-status (negative vs. positive), and were adjusted for education (no formal school,
primary school, middle or high school, technical school/college or above), household income
(<10,000, 10,000-19,999, 20,000-34,999, \geq 35,000 yuan/year), smoking (five groups in men: never,
occasional, ever regular <15, ever regular 15-24, ever regular \geq 25 cigarettes equivalent/day; four
groups in women: never, occasional, ex-regular, current), physical activity (<17.8, 17.8-28.7, \geq 28.8
metabolic equivalent of task hours [MET-h] per day), and BMI (<22, 22-24.9, 25-26.9, \geq 27 kg/m\textsuperscript{2}).
The associations of drinking patterns (daily drinking, HED, mealtime habit, spirit drinking, duration
of regular drinking) with liver diseases were assessed among male current regular drinkers, adjusting for the same covariates plus total weekly consumption (as a continuous variable), and additionally for baseline age (as a continuous variable) in the analyses of duration of regular drinking. For daily drinking and HED, the risk estimates were further examined across subgroups defined by total weekly intake (<280 vs. ≥280 g/week). The proportional hazards assumption for the Cox model was checked using scaled Schoenfeld residuals and by examining the HRs for the first 5 years and for subsequent years of follow-up (no strong evidence of departure from the proportional hazard assumption). For two-way comparisons of exposure categories, conventional SEs and CIs were used. For analyses involving more than two exposure categories, floating SEs were used for the log HRs of all categories including the reference group, enabling comparison between any two categories.\(^6\)

**Adjustment for regression dilution bias**

A gradual regression to the mean over time was observed for alcohol consumption in the subset of participants involved in all three CKB surveys (Table S2). Within-person variation of self-reported alcohol intake was addressed using the regression dilution approach,\(^7\) whereby the usual alcohol intake was taken to be the average intake of the two resurveys in 2008 and 2013-2014, assuming that occasional drinkers consumed 5 g/week. To assess the shape of associations between amount of alcohol intake and liver diseases, the HRs of baseline consumption categories were plotted against their corresponding mean usual alcohol intake. The regression dilution ratio (RDR) was calculated using the assumption-free, non-parametric McMahon-Peto method,\(^8\) taken as the ratio of the range (i.e., difference between the mean alcohol intake of the top [i.e., ≥420 g/week for men; ≥140 g/week for women] vs. bottom [i.e., <140 g/week for men; <70 g/week for women] baseline-defined groups) of the usual alcohol intake levels to the range of the baseline alcohol intake levels. The RDRs calculated using the McMahon-Peto method were 0.54 for men and 0.60 for women, broadly similar to the estimates obtained from other methods, e.g., self-correlation\(^7\) and the Rosner’s regression method.\(^9\) Log HR estimates and the corresponding SEs for baseline alcohol intake, modelled as a
continuous variable, were then divided by the RDR calculated from the McMahon-Peto method to obtain estimated HRs per 280 g/week higher usual alcohol intake among current regular drinkers. The HR per 100 g/week is approximately the cube root of the HR per 280 g/week (as log HR per 100 g/week is \([100/280]\) times log HR per 280 g/week).

**Subgroup and sensitivity analyses**

The HRs per 280 g/week were examined across subgroups defined by HBsAg sero-status (negative vs. positive), smoking status (ever-regular [i.e., ex-regular or current regular smokers] vs. never-regular [i.e., never or occasional smokers]), BMI (<23, 23-24.9, \(\geq 25\) kg/m\(^2\)), flushing response (yes vs. no), prevalent diabetes (yes vs. no), physical activity (<17.8, 17.8-28.7, \(\geq 28.8\) MET-h/day), and socio-demographic characteristics including baseline age (<55, 55-64, \(\geq 65\) years), study area (rural vs. urban), education level (primary school or below, middle school, high school or above), and household income (<10,000, 10,000-19,999, \(\geq 20,000\) yuan/year). Chi-squared tests were used to assess heterogeneity across strata. Prevalent diabetes included both self-reported, previously diagnosed diabetes and screen-detected diabetes (defined as having a measured random plasma glucose level \(\geq 7.0\)mmol/L with time since last food intake \(\geq 8\) hours, or \(\geq 11.1\)mmol/L with time since last food intake <8 hours, or a fasting plasma glucose level \(\geq 7.0\)mmol/L on subsequent testing). Analyses on drinking status and usual amount of alcohol intake were repeated with liver disease mortality for comparison with the main analyses with incident liver diseases. Sensitivity analyses included: 1) further covariate adjustments (for family history of cancer, prevalent diabetes, systolic blood pressure, family history of diabetes) in the analyses of usual alcohol intake; 2) simultaneous adjustments for other drinking habits in drinking pattern analyses; and 3) exclusions of participants with other prior major chronic disease (including self-reported coronary heart diseases, stroke, transient ischaemic attack, tuberculosis, rheumatoid arthritis, peptic ulcer, emphysema/bronchitis, gallstone/gallbladder disease, kidney disease, and prevalent diabetes) or poor self-reported health at baseline, or the first three years of follow-up.
Table S1. Definitions of main alcohol drinking patterns

| Parameters                                      | Description                                                                                                                                 |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| **Drinking status**                            |                                                                                                                                            |
| Abstainers                                     | Past 12 months: Never drank alcohol.                                                                                                         |
|                                                | In the past: Had not drunk weekly or more frequently.                                                                                       |
| Ex-regular drinkers                            | Past 12 months: Never drank alcohol; or had drunk alcohol occasionally, at certain seasons, or monthly but less than weekly.               |
|                                                | In the past: Had drunk at least weekly.                                                                                                      |
| Occasional drinkers                            | Past 12 months: Had drunk alcohol occasionally, at certain seasons, or monthly but less than weekly.                                       |
|                                                | In the past: Had not drunk at least weekly.                                                                                                  |
| Current regular drinkers                       | Past 12 months: At least weekly (i.e., drank alcohol in most weeks).                                                                         |
|                                                | In the past: N/A.                                                                                                                              |
| **Amount of alcohol consumed and drinking patterns among current regular drinkers (i.e., drank ≥weekly in the past 12 months)** |                                                                                                                                              |
| Weekly intake (g per typical drinking week)    | Calculated based on the beverage type and amount drunk on a typical drinking day, and drinking frequency in the past year.                 |
|                                                | **In categories:**                                                                                                                           |
|                                                | Men: <140; 140-279; 280-419; ≥420 g/week.                                                                                                   |
|                                                | Women: <70; 70-139; ≥140 g/week.                                                                                                             |
|                                                | **As a continuous variable:** per 280 g/week higher intake.                                                                                 |
| Drinking frequency (in the past year)          | During the past 12 months, on how many days did you drink alcohol in a typical week?                                                         |
|                                                | Daily: 6-7 days/week (i.e., “daily or almost every day”).                                                                                     |
|                                                | Non-daily: “1-2 days/week” or “3-5 days/week”.                                                                                               |
| Types of alcohol (on a typical drinking day)*   | Derived from “On days when you drink, how much alcohol do you usually drink in a day?”, for which participants had to choose one beverage type to report the amount usually drunk on a typical drinking day. |
|                                                | Spirits: “Strong spirit (≥40% alcohol)” or “weak spirit (<40% alcohol)”.                                                                    |
|                                                | Non-spirits: “Rice wine”, “grape wine”, or “beer”.                                                                                           |
| Heavy episodic drinking (on a typical drinking day)* | Derived based on the amount of alcohol consumed on a typical drinking day.                                                                |
|                                                | Men: Consumption of >60 g (i.e., 7.5 UK units or 4.3 US standard drinks) of alcohol on a typical drinking day.                               |
|                                                | Women: Consumption of >40 g (i.e., 5 UK units or 2.9 US standard drinks) of alcohol on a typical drinking day.                                |
| Drinking with/outside of meals (on a typical drinking day) | On a typical day when you drink alcohol, when do you usually take the drink?                                                              |
|                                                | With meals: “Usually drank with meals”.                                                                                                       |
|                                                | Outside of meals: “Usually drank between or after meals” or “no regular patterns”.                                                           |
| Duration of regular drinking                   | Number of years of regular drinking calculated by the difference between baseline age (years) and age started regular drinking (years). |
| Flushing response                               | After drinking alcohol, do you usually experience hot flushes or dizziness?                                                                 |
|                                                | No: “Yes, but only after drinking a large amount of alcohol” or “No”.                                                                       |
|                                                | Yes: “Yes, soon after the first mouthful” or “Yes, after drinking a small amount of alcohol”.                                               |

*Data was available on a typical drinking day, on special occasions, and the last time the participants drank. For this study, alcohol data reported on a typical drinking day was used in the analyses to reflect the usual drinking habits of the participants.
Table S2. Estimated regression dilution ratio of alcohol consumption in men and women

| Baseline-defined groups                     | Mean consumption, g/week | Regression dilution ratio<sup>a</sup> |  |
|--------------------------------------------|--------------------------|--------------------------------------|---|
|                                            |                          | MacMahon-Peto method  | Pearson’s correlation | Spearman’s correlation | Rosner’s regression |
|                                            |                          |                        |                           |                           |                       |
| **Men**                                    |                          |                        |                           |                           |                       |
| Abstainers & ex-regular drinkers           | 1206                     | 0.0                    | 8.5                       | 13.2                      | 10.9                   |
| Occasional drinkers                        | 2400                     | 5.0                    | 22.5                      | 39.6                      | 31.0                   |
| Current regular drinkers                   |                          |                        |                           |                           |                       |
| <140 g/week                                | 672                      | 77.4                   | 96.2                      | 119.1                     | 107.6                  |
| 140-279 g/week                             | 464                      | 223.5                  | 183.5                     | 243.7                     | 213.6                  |
| 280-419 g/week                             | 322                      | 367.4                  | 292.1                     | 301.0                     | 296.5                  |
| 420+ g/week                                | 364                      | 685.6                  | 440.7                     | 437.1                     | 438.9                  |
| Regression dilution ratio<sup>a</sup>      |                          |                        |                           |                           |                       |
|                                            |                          | 0.54                   | 0.52                      | 0.55                      | 0.55                   |
| **Women**                                  |                          |                        |                           |                           |                       |
| Abstainers & ex-regular drinkers           | 5732                     | 0.0                    | 0.9                       | 0.8                       | 0.9                    |
| Occasional drinkers                        | 3012                     | 5.0                    | 4.4                       | 3.7                       | 4.0                    |
| Current regular drinkers                   |                          |                        |                           |                           |                       |
| <70 g/week                                 | 79                       | 33.8                   | 29.9                      | 19.9                      | 24.9                   |
| 70-139 g/week                              | 49                       | 115.1                  | 90.8                      | 56.8                      | 73.8                   |
| 140+ g/week                                | 49                       | 324.9                  | 215.5                     | 181.5                     | 198.5                  |
| Regression dilution ratio<sup>a</sup>      |                          |                        |                           |                           |                       |
|                                            |                          | 0.60                   | 0.62                      | 0.53                      | 0.71                   |

HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
Usual consumption is the average alcohol intake of the two resurveys.

<sup>a</sup>Regression dilution ratio is estimated among baseline current regular drinkers using baseline and usual alcohol intakes. The regression dilution ratios calculated using the MacMahon-Peto method based on baseline survey and first resurvey are 0.57 for men and 0.64 for women, and those based on baseline and second resurvey are 0.52 for men and 0.56 for women.
Table S3. Baseline drinking characteristics of participants by level of alcohol consumption, in male current regular drinkers

| Alcohol drinking characteristics | All current regular | <140 g/week | 140-279 g/week | 280-419 g/week | ≥420 g/week |
|---------------------------------|---------------------|-------------|----------------|----------------|-------------|
| Number of participants          | 66977               | 24171       | 18182          | 12306          | 12318       |
| Mean alcohol consumption, g/week (SD) | 283.9 (244.0) | 80.4 (38.8) | 221.2 (44.9) | 372.9 (47.1) | 682.4 (237.2) |
| Daily drinking, %               | 61.7                | 31.2        | 64.9           | 81.9           | 94.6        |
| Heavy episodic drinking on typical day, % | 37.1 | 10.0        | 14.7           | 63.4           | 100.0       |
| Drinking spirits on typical day, % | 69.6 | 53.7        | 71.1           | 82.4           | 87.3        |
| Drinking with meals, %          | 85.7                | 86.1        | 86.3           | 85.7           | 83.0        |
| Flushing response, %            | 17.8                | 26.5        | 17.4           | 14.4           | 9.2         |
| Mean years of regular drinking, year (SD) | 22.9 (12.4) | 21.0 (12.7) | 23.0 (12.3) | 24.2 (11.7) | 25.8 (11.4) |
| Mean age started regular drinking, year (SD) | 28.7 (11.0) | 30.5 (12.2) | 28.7 (10.5) | 27.3 (9.7) | 25.7 (8.9) |

SD, standard deviation; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
Prevalences and means are directly standardised to the age and study area structure of male current regular drinkers in the study population.
# Table S4. Baseline characteristics of participants by alcohol drinking categories, in women

| Socio-demographic characteristics | Overall | Abstainers | Ex-regular drinkers | Occasional drinkers | Current regular drinkers | <70 g/week | 70-139 g/week | ≥140 g/week |
|-----------------------------------|---------|------------|---------------------|---------------------|--------------------------|------------|---------------|-------------|
| Number of participants            | 291604  | 185024     | 2412                | 98272               | 5896                     | 3094       | 1494          | 1308        |
| Mean age, years (SD)              | 51.4 (10.5) | 52.7 (10.7) | 55.4 (9.4)         | 49.3 (9.9)          | 52.8 (10.3)              | 52.9 (10.7) | 52.9 (10.1)  | 51.6 (9.5)  |
| Urban area, %                     | 45.0    | 43.1       | 31.6                | 48.3                | 48.0                     | 62.5       | 37.3          | 27.2        |
| Educational attainment >6 years, %| 43.6    | 41.4       | 46.4                | 49.4                | 48.7                     | 50.6       | 45.0          | 47.9        |
| Income >20000 yuan/year, %        | 40.6    | 37.9       | 45.7                | 44.3                | 46.9                     | 49.5       | 44.3          | 46.4        |
| Married, %                        | 89.0    | 88.8       | 84.0                | 89.3                | 87.6                     | 88.0       | 87.7          | 85.7        |
| Lifestyle factors                 |         |            |                     |                     |                          |            |               |             |
| Regular smoking, %                | 2.3     | 1.8        | 5.4                 | 2.8                 | 7.8                      | 5.5        | 8.1           | 15.8        |
| Daily fresh fruit consumption, %  | 31.6    | 29.8       | 42.3                | 36.8                | 38.9                     | 42.4       | 34.0          | 32.6        |
| Physical activity, mean MET-h/d (SD) | 20.4 (12.7) | 20.1 (13.3) | 20.6 (11.0)        | 20.5 (11.6)         | 20.4 (11.5)              | 20.2 (11.4)| 20.6 (11.7)  | 19.4 (11.2) |
| Daily tea drinking, %             | 16.0    | 14.9       | 26.0                | 19.0                | 30.9                     | 29.4       | 34.4          | 32.9        |
| Physical measurements, mean (SD)  |         |            |                     |                     |                          |            |               |             |
| SBP, mmHg                          | 129.9 (22.0) | 130.9 (22.5) | 130.8 (23.1)       | 128.0 (20.5)        | 127.9 (21.4)             | 127.7 (20.9)| 128.1 (21.5)  | 130.9 (21.8) |
| DBP, mmHg                          | 76.8 (10.9) | 77.1 (11.0) | 77.6 (11.2)        | 76.1 (10.6)         | 76.5 (10.9)              | 76.2 (10.7)| 77.1 (10.9)  | 77.6 (11.1) |
| BMI, kg/m²                         | 23.8 (3.5) | 23.9 (3.5) | 24.2 (3.5)         | 23.8 (3.4)          | 23.7 (3.4)               | 23.7 (3.4) | 23.8 (3.3)   | 24.3 (3.4)  |
| Health and medical history, %*    |         |            |                     |                     |                          |            |               |             |
| Poor health                        | 11.1    | 12.3       | 21.1                | 9.4                 | 7.8                      | 7.5        | 7.9           | 8.4         |
| Any chronic diseaseb               | 21.0    | 21.9       | 31.0                | 19.8                | 18.5                     | 19.6       | 17.9          | 16.7        |
| Coronary heart diseases            | 3.2     | 3.5        | 5.6                 | 2.7                 | 2.5                      | 2.5        | 2.7           | 1.6         |
| Stroke or transient ischaemic attack | 1.3     | 1.6        | 2.6                 | 1.0                 | 0.7                      | 0.7        | 0.6           | 1.1         |
| Prevalent diabetes                 | 6.2     | 7.1        | 8.4                 | 5.0                 | 3.5                      | 3.7        | 2.9           | 4.3         |
| Family history of cancer           | 16.3    | 15.6       | 21.4                | 17.5                | 18.6                     | 18.7       | 16.7          | 18.9        |
| Family history of diabetes         | 7.2     | 6.6        | 10.1                | 8.2                 | 8.4                      | 7.7        | 10.1          | 7.8         |
| HBsAg test positive                | 2.6     | 2.7        | 2.1                 | 2.4                 | 2.3                      | 2.3        | 4.1           | 1.8         |

SD, standard deviation; MET-h/d, metabolic equivalents of task per hours per day; SBP, systolic blood pressure; DBP, diastolic blood pressure; BMI, body mass index; HBsAg, hepatitis B surface antigen.

Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.

Prevalences and means are directly standardised to the age and study area structure of the female study population as appropriate.

*a*All self-reported except for prevalent diabetes which included both self-reported and screen-detected diabetes.

*b*Chronic diseases included self-reported history of coronary heart disease, stroke, transient ischaemic attack, diabetes, tuberculosis, rheumatoid arthritis, peptic ulcer, emphysema/chronic bronchitis, gallstone/gallbladder disease, and kidney disease.
Table S5. Baseline drinking characteristics of participants by level of alcohol consumption, in female current regular drinkers

| Alcohol drinking characteristics                  | All current regular | <70 g/week | 70-139 g/week | ≥140 g/week |
|--------------------------------------------------|---------------------|------------|---------------|-------------|
| Number of participants                           | 5896                | 3094       | 1494          | 1308        |
| Mean alcohol consumption, g/week (SD)            | 112.5 (123.5)       | 35.6 (19.2)| 110.1 (23.8)  | 276.9 (134.9) |
| Daily drinking, %                                | 44.6                | 22.8       | 59.3          | 69.5        |
| Heavy episodic drinking on typical day, %        | 25.9                | 9.5        | 10.1          | 79.7        |
| Drinking spirits on typical day, %               | 61.0                | 55.8       | 65.7          | 81.3        |
| Drinking with meals, %                           | 85.8                | 86.1       | 84.9          | 87.6        |
| Flushing response, %                             | 23.5                | 26.3       | 22.6          | 19.5        |
| Mean years of regular drinking, year (SD)        | 15.2 (12.8)         | 13.5 (11.7)| 16.1 (12.6)   | 19.1 (12.9) |
| Mean age started regular drinking, year (SD)     | 37.8 (13.5)         | 39.5 (13.6)| 37.1 (13.1)   | 33.9 (11.8) |

SD, standard deviation; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
Prevalences and means are directly standardised to the age and study area structure of female regular drinkers in the study population.
Table S6. Adjusted HRs for total and major chronic liver diseases associated with drinking status, in women

| Disease                      | All N | N         | HR (95% CI) | N         | HR (95% CI) | N         | HR (95% CI) | P value* |
|------------------------------|-------|-----------|-------------|-----------|-------------|-----------|-------------|----------|
| Liver cancer                 | 939   | 679       | 1.00 (0.90-1.11) | 13       | 1.04 (0.59-1.81) | 227       | 0.78 (0.68-0.90) | 20       | 0.84 (0.54-1.31) | 0.452 |
| Liver cirrhosis              | 942   | 664       | 1.00 (0.90-1.11) | 16       | 1.31 (0.78-2.19) | 242       | 0.84 (0.73-0.96) | 20       | 0.86 (0.55-1.35) | 0.519 |
| Alcoholic liver disease      | 21    | 16        | 1.00 (0.56-1.79) | 1        | 4.19 (0.58-30.24) | 2         | 0.55 (0.14-2.26) | 2        | 6.22 (1.45-26.74) | 0.023 |
| Non-alcoholic fatty liver disease | 822  | 492       | 1.00 (0.89-1.12) | 18       | 0.78 (0.49-1.24) | 265       | 0.98 (0.87-1.11) | 47       | 1.13 (0.84-1.52) | 0.440 |
| Chronic viral hepatitis      | 689   | 419       | 1.00 (0.88-1.13) | 10       | 1.64 (0.87-3.10) | 246       | 1.11 (0.97-1.27) | 14       | 1.00 (0.58-1.71) | 0.996 |
| Total liver disease          | 4498  | 3044      | 1.00 (0.95-1.05) | 72       | 1.00 (0.79-1.26) | 1259      | 0.91 (0.86-0.97) | 123      | 0.86 (0.72-1.03) | 0.123 |

HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
Figure S1. Spline curves of adjusted HRs for total and major chronic liver diseases associated with alcohol intake over the range of 0-1500 g/week, in male current regular drinkers. 

(A) Liver cancer
(B) Liver cirrhosis
(C) Alcoholic liver disease
(D) Non-alcoholic fatty liver disease
(E) Chronic viral hepatitis
(F) Total liver disease

Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, physical activity, and body mass index.
Figure S2. Association of alcohol consumption with total liver disease, in female current regular drinkers

Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, physical activity, and body mass index. Each solid square represents an HR. The size of each box is inversely proportional to the “floated” variance of the log hazard in each group and the error bars indicate the group-specific 95% CIs. Group-specific 95% CIs are plotted using floating standard errors to allow for comparison between any two categories. The numbers above the error bars are point estimates for HRs, and the numbers below are number of events. Usual alcohol intake is calculated by the average of the self-reported alcohol intake at the two resurveys in each group. HR per 280 g/week increment in usual alcohol intake = 1.34 (95% CI 0.73-2.46). HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
| Disease                         | All current regular N | <70 g/week | ≥70 g/week |
|--------------------------------|-----------------------|------------|------------|
|                                 | N                     | N          | HR (95% CI) | N          | HR (95% CI) | P value    |
| Liver cancer                    | 20                    | 8          | 1.00 (Reference) | 12         | 1.10 (0.35-3.47) | 0.869      |
| Liver cirrhosis                 | 20                    | 11         | 1.00 (Reference) | 9          | 0.60 (0.21-1.67) | 0.326      |
| Non-alcoholic fatty liver disease | 47                    | 15         | 1.00 (Reference) | 32         | 1.08 (0.54-2.14) | 0.835      |
| Total liver disease             | 123                   | 48         | 1.00 (Reference) | 75         | 0.94 (0.63-1.42) | 0.776      |

HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
Alcoholic liver disease (n=2) and chronic viral hepatitis (n=14) are not shown due to the extremely small numbers of events.
Figure S3. Adjusted HRs per 280g/week higher usual alcohol intake for liver cancer, liver cirrhosis and non-alcoholic fatty liver disease, by population subgroups in male current regular drinkers

| Baseline age (years) | No. of events | (A) Liver cancer | (B) Liver cirrhosis | (C) Non-alcoholic fatty liver disease |
|----------------------|---------------|------------------|---------------------|-------------------------------------|
| <65                  | 218           | 1.54 (1.23, 1.93) | 1.92 (1.66, 2.23)  | 1.73 (1.30, 2.29)                   |
| 65-69                | 195           | 1.35 (1.02, 1.79) | 1.49 (1.05, 2.10)  | 1.72 (1.02, 2.92)                   |
| ≥70                  | 134           | 1.38 (0.96, 2.00) | 1.43 (0.87, 2.35)  | 1.67 (0.64, 4.39)                   |

| Study area           | No. of events | (A) Liver cancer | (B) Liver cirrhosis | (C) Non-alcoholic fatty liver disease |
|----------------------|---------------|------------------|---------------------|-------------------------------------|
| Rural                | 281           | 1.37 (1.11, 1.69) | 1.68 (1.42, 2.00)  | 1.69 (1.30, 2.18)                   |
| Urban                | 266           | 1.54 (1.22, 1.96) | 2.05 (1.65, 2.55)  | 1.93 (1.08, 3.46)                   |

| Education            | No. of events | (A) Liver cancer | (B) Liver cirrhosis | (C) Non-alcoholic fatty liver disease |
|----------------------|---------------|------------------|---------------------|-------------------------------------|
| Never/regular        | 61            | 0.71 (0.32, 1.58) | 1.33 (0.72, 2.48)  | 3.32 (1.79, 6.17)                   |
| Ever/regular         | 486           | 1.48 (1.25, 1.75) | 1.84 (1.61, 2.11)  | 1.56 (1.18, 2.05)                   |

| BMI (kg/m²)          | No. of events | (A) Liver cancer | (B) Liver cirrhosis | (C) Non-alcoholic fatty liver disease |
|----------------------|---------------|------------------|---------------------|-------------------------------------|
| <23                  | 267           | 1.50 (1.20, 1.88) | 1.80 (1.53, 2.12)  | 2.99 (2.03, 4.40)                   |
| 23-24.9              | 120           | 1.29 (0.88, 1.90) | 1.83 (1.18, 2.85)  | 0.53 (0.22, 1.28)                   |
| ≥25                  | 160           | 1.43 (1.02, 2.00) | 1.99 (1.41, 2.81)  | 1.67 (1.17, 2.38)                   |

| Physical activity    | No. of events | (A) Liver cancer | (B) Liver cirrhosis | (C) Non-alcoholic fatty liver disease |
|----------------------|---------------|------------------|---------------------|-------------------------------------|
| Low                  | 285           | 1.58 (1.27, 1.98) | 2.09 (1.69, 2.58)  | 1.35 (0.86, 2.11)                   |
| Moderate             | 119           | 1.52 (1.05, 2.21) | 1.49 (1.07, 2.07)  | 2.19 (1.21, 3.93)                   |
| High                 | 143           | 1.21 (0.86, 1.71) | 1.96 (1.53, 2.52)  | 1.90 (1.24, 2.92)                   |

| Prevalent diabetes   | No. of events | (A) Liver cancer | (B) Liver cirrhosis | (C) Non-alcoholic fatty liver disease |
|----------------------|---------------|------------------|---------------------|-------------------------------------|
| No                   | 497           | 1.40 (1.18, 1.66) | 1.81 (1.57, 2.08)  | 1.70 (1.31, 2.20)                   |
| Yes                  | 50            | 1.56 (0.86, 2.85) | 2.44 (1.19, 5.02)  | 2.04 (0.81, 5.15)                   |

| Flushing response    | No. of events | (A) Liver cancer | (B) Liver cirrhosis | (C) Non-alcoholic fatty liver disease |
|----------------------|---------------|------------------|---------------------|-------------------------------------|
| No                   | 471           | 1.43 (1.21, 1.69) | 1.88 (1.64, 2.16)  | 1.79 (1.39, 2.29)                   |
| Yes                  | 76            | 1.32 (0.69, 2.50) | 1.54 (0.79, 2.98)  | 1.46 (0.78, 2.74)                   |

| Overall              | 547           | 1.44 (1.23, 1.69) | 1.93 (1.60, 2.09)  | 1.71 (1.35, 2.16)                   |

Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, physical activity, and body mass index, where appropriate. Each solid square represents an HR. The size of each box is inversely proportional to the variance of the log HR and the error bars indicate the 95% CIs. HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Figure S4. Associations of the joint effects of alcohol consumption and body mass index with total and major chronic liver diseases, in male current regular drinkers

Conventions are as in Figure S2.
Figure S5. Associations of the joint effects of alcohol consumption and HBsAg seropositivity with total and major chronic liver diseases, in male current regular drinkers

HBsAg (-) included negative, unclear, or missing test results. Non-alcoholic fatty liver disease is not shown here due to low number of events in HBsAg positive participants (n=4). Conventions are as in Figure S2.
Figure S6. Adjusted HRs per 280 g/week higher usual alcohol intake for total and major chronic liver diseases, by HBsAg seroprevalence in male current regular drinkers.

|                  | No. of events | HR (95% CI) per 280 g/week |
|------------------|---------------|----------------------------|
| **Liver cancer** |               |                            |
| HBsAg (-)        | 413           | 1.37 (1.14, 1.65)          |
| HBsAg (+)        | 134           | 1.75 (1.22, 2.51)          |
|                  |               | Heterogeneity: $\chi^2=1.4$ (p=0.24) |
| **Liver cirrhosis** |             |                            |
| HBsAg (-)        | 292           | 1.86 (1.61, 2.15)          |
| HBsAg (+)        | 96            | 1.70 (1.14, 2.55)          |
|                  |               | Heterogeneity: $\chi^2=0.2$ (p=0.68) |
| **Alcoholic liver disease** |         |                            |
| HBsAg (-)        | 189           | 1.98 (1.74, 2.25)          |
| HBsAg (+)        | 11            | 2.58 (0.85, 7.84)          |
|                  |               | Heterogeneity: $\chi^2=0.2$ (p=0.65) |
| **Total liver disease** |            |                            |
| HBsAg (-)        | 1486          | 1.53 (1.40, 1.66)          |
| HBsAg (+)        | 289           | 1.46 (1.14, 1.86)          |
|                  |               | Heterogeneity: $\chi^2=0.1$ (p=0.73) |

Non-alcoholic fatty liver disease is not shown here due to low number of events in HBsAg positive participants (n=4). Conventions are as in Figure S3.
Table S8. Adjusted HRs for total and major chronic liver diseases associated with daily drinking, by weekly alcohol intake level in male current regular drinkers

| Disease                        | <280 g/week | ≥280 g/week | 1-5 days/week | 6-7 days/week | Full model<sup>a</sup> | Further adjusted for total alcohol intake |
|--------------------------------|-------------|-------------|---------------|---------------|-------------------------|------------------------------------------|
|                                | N | HR (95% CI) | N | HR (95% CI) | P value | N | HR (95% CI) | P value |
| Liver cancer                   | 288 | 118 | 1.00 (Reference) | 170 | 1.22 (0.94-1.57) | 0.136 | 1.19 (0.87-1.62) | 0.270 |
| Liver cirrhosis                | 259 | 14 | 1.00 (Reference) | 245 | 1.19 (0.67-2.14) | 0.555 | 1.13 (0.63-2.03) | 0.690 |
| Alcoholic liver disease        | 190 | 79 | 1.00 (Reference) | 111 | 1.39 (1.02-1.91) | 0.040 | 1.01 (0.69-1.49) | 0.944 |
| Non-alcoholic fatty liver disease | 198 | 13 | 1.00 (Reference) | 185 | 1.49 (0.78-2.85) | 0.225 | 1.24 (0.64-2.38) | 0.524 |
| Chronic viral hepatitis        | 133 | 6  | 1.00 (Reference) | 127 | 2.04 (0.87-4.76) | 0.099 | 1.63 (0.69-3.83) | 0.264 |
| Total liver disease            | 97  | 63 | 1.00 (Reference) | 34  | 0.68 (0.44-1.07) | 0.097 | 0.55 (0.32-0.93) | 0.027 |

HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
<sup>a</sup>Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
Table S9. Adjusted HRs for total and major chronic liver diseases associated with heavy episodic drinking, by weekly alcohol intake level in male current regular drinkers

| Disease                          | <280 g/week | ≥280 g/week | All current regular | N | N | HR (95% CI) | N | N | HR (95% CI) | P value | HR (95% CI) | P value |
|----------------------------------|-------------|-------------|--------------------|---|---|------------|---|---|------------|---------|------------|---------|
| Liver cancer                     | <280 g/week | 288         | 261                | 1.00 (Reference) | 27 | 1.06 (0.69-1.62) | 0.806 | 1.04 (0.67-1.60) | 0.870 |
|                                  | ≥280 g/week | 259         | 56                 | 1.00 (Reference) | 203 | 1.05 (0.74-1.48) | 0.790 | 0.93 (0.63-1.36) | 0.701 |
| Liver cirrhosis                  | <280 g/week | 190         | 168                | 1.00 (Reference) | 22 | 1.13 (0.70-1.83) | 0.609 | 1.07 (0.66-1.72) | 0.794 |
|                                  | ≥280 g/week | 198         | 24                 | 1.00 (Reference) | 174 | 1.57 (0.95-2.59) | 0.077 | 1.12 (0.67-1.87) | 0.673 |
| Alcoholic liver disease          | <280 g/week | 67          | 61                 | 1.00 (Reference) | 6 | 0.78 (0.32-1.91) | 0.592 | 0.72 (0.30-1.76) | 0.473 |
|                                  | ≥280 g/week | 133         | 11                 | 1.00 (Reference) | 122 | 1.59 (0.80-3.15) | 0.188 | 1.15 (0.57-2.31) | 0.692 |
| Non-alcoholic fatty liver disease| <280 g/week | 97          | 80                 | 1.00 (Reference) | 17 | 1.18 (0.67-2.07) | 0.563 | 1.17 (0.66-2.07) | 0.588 |
|                                  | ≥280 g/week | 101         | 15                 | 1.00 (Reference) | 86 | 0.93 (0.49-1.78) | 0.831 | 0.67 (0.34-1.32) | 0.241 |
| Chronic viral hepatitis          | <280 g/week | 129         | 105                | 1.00 (Reference) | 24 | 1.29 (0.79-2.10) | 0.316 | 1.30 (0.79-2.13) | 0.294 |
|                                  | ≥280 g/week | 97          | 13                 | 1.00 (Reference) | 84 | 1.50 (0.77-2.95) | 0.235 | 1.47 (0.72-3.00) | 0.289 |
| Total liver disease              | <280 g/week | 905         | 799                | 1.00 (Reference) | 106 | 1.14 (0.91-1.41) | 0.257 | 1.10 (0.88-1.37) | 0.388 |
|                                  | ≥280 g/week | 870         | 169                | 1.00 (Reference) | 701 | 1.05 (0.87-1.28) | 0.609 | 0.86 (0.69-1.05) | 0.143 |

HED, heavy episodic drinking; HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
* Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
Figure S7. Associations of the joint effects of alcohol consumption and mealtime drinking habits with total and major chronic liver diseases, in male current regular drinkers

Non-alcoholic fatty liver disease is not shown here due to the low number of events among men usually drinking without meals (n=12). Conventions are as in Figure S2.
Figure S8. Adjusted HRs per 280 g/week higher usual alcohol intake for total and major chronic liver diseases, by beverage type in male current regular drinkers

![Chart showing adjusted HRs per 280 g/week higher usual alcohol intake for total and major chronic liver diseases by beverage type in male current regular drinkers.](chart.png)

| Liver cancer | No. of events | HR (95% CI) per 280 g/week |
|--------------|---------------|---------------------------|
| Beer         | 61            | 2.25 (1.05, 4.82)         |
| Rice wine or grape wine | 75    | 1.73 (0.92, 3.23)         |
| Spirits      | 411           | 1.34 (1.11, 1.62)         |

Heterogeneity: $\chi^2=2.2$ (p=0.33)

| Liver cirrhosis | No. of events | HR (95% CI) per 280 g/week |
|-----------------|---------------|---------------------------|
| Beer            | 46            | 1.97 (0.82, 4.76)         |
| Rice wine or grape wine | 51    | 2.55 (1.18, 5.51)         |
| Spirits         | 291           | 1.84 (1.59, 2.13)         |

Heterogeneity: $\chi^2=0.7$ (p=0.70)

| Alcoholic liver disease | No. of events | HR (95% CI) per 280 g/week |
|-------------------------|---------------|---------------------------|
| Beer                    | 14            | 4.41 (1.29, 15.07)        |
| Rice wine or grape wine | 15            | 2.13 (0.54, 8.36)         |
| Spirits                 | 171           | 2.00 (1.75, 2.29)         |

Heterogeneity: $\chi^2=1.6$ (p=0.44)

| Non-alcoholic fatty liver disease | No. of events | HR (95% CI) per 280 g/week |
|----------------------------------|---------------|---------------------------|
| Beer                             | 41            | 2.75 (1.11, 6.79)         |
| Rice wine or grape wine          | 12            | 1.93 (0.40, 9.32)         |
| Spirits                          | 145           | 1.63 (1.24, 2.14)         |

Heterogeneity: $\chi^2=1.3$ (p=0.53)

| Chronic viral hepatitis | No. of events | HR (95% CI) per 280 g/week |
|-------------------------|---------------|---------------------------|
| Beer                    | 45            | 0.88 (0.27, 2.80)         |
| Rice wine or grape wine | 18            | 2.96 (0.66, 13.21)        |
| Spirits                 | 163           | 1.28 (0.95, 1.72)         |

Heterogeneity: $\chi^2=1.7$ (p=0.43)

| Total liver disease | No. of events | HR (95% CI) per 280 g/week |
|---------------------|---------------|---------------------------|
| Beer                | 233           | 1.73 (1.12, 2.67)         |
| Rice wine or grape wine | 220    | 1.54 (1.06, 2.25)         |
| Spirits             | 1322          | 1.50 (1.37, 1.64)         |

Heterogeneity: $\chi^2=0.4$ (p=0.81)

Conventions are as in Figure S3.
Table S10. Adjusted HRs for total and major chronic liver diseases associated with the flushing response, in male current regular drinkers

| Condition                        | No flushing response | Flushing response |                 | + Total alcohol intake |                 |
|----------------------------------|----------------------|-------------------|----------------|------------------------|----------------|
|                                  | All current regular  |                   | Full model<sup>a</sup> |                        |                 |
| Liver cancer                     | 547                  | 471               | 76             | 0.78 (0.61-1.00)       | 0.84 (0.66-1.08) |
| Liver cirrhosis                  | 388                  | 326               | 62             | 0.85 (0.64-1.12)       | 0.98 (0.74-1.30) |
| Alcoholic liver disease          | 200                  | 177               | 23             | 0.55 (0.35-0.85)       | 0.66 (0.43-1.03) |
| Non-alcoholic fatty liver disease| 198                  | 157               | 41             | 1.06 (0.75-1.51)       | 1.19 (0.84-1.70) |
| Chronic viral hepatitis          | 226                  | 180               | 46             | 1.21 (0.87-1.69)       | 1.27 (0.90-1.77) |
| Total liver disease              | 1775                 | 1479              | 296            | 0.92 (0.81-1.05)       | 1.01 (0.89-1.15) |

HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
<sup>a</sup>Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
Table S11. Adjusted HRs per 280 g/week higher usual alcohol intake for total and major chronic liver diseases, in male current regular drinkers – in sequentially adjusted models

|                                | Basic model | Gradual adjustment for major confounding factors | Further adjustment |
|--------------------------------|-------------|-------------------------------------------------|--------------------|
|                                | N           | Age, study area | + Education | + Income | + HBsAg | + Smoking | + BMI | + Physical activity | + Family history of cancer | + Prevalent diabetes | + Systolic blood pressure | + Family history of diabetes |
| Liver cancer                   | 547         | HR (95% CI) | 1.51 (1.30-1.76) | 1.51 (1.30-1.75) | 1.51 (1.30-1.75) | 1.49 (1.27-1.74) | 1.44 (1.23-1.69) | 1.44 (1.23-1.69) | 1.44 (1.23-1.69) | 1.44 (1.23-1.69) | 1.44 (1.23-1.69) | 1.44 (1.22-1.69) | 1.44 (1.22-1.69) |
| Liver cirrhosis                | 388         | HR (95% CI) | 1.84 (1.62-2.09) | 1.82 (1.60-2.07) | 1.82 (1.60-2.06) | 1.81 (1.59-2.07) | 1.83 (1.60-2.09) | 1.83 (1.60-2.09) | 1.83 (1.60-2.09) | 1.83 (1.60-2.09) | 1.83 (1.60-2.09) | 1.81 (1.58-2.08) | 1.81 (1.58-2.08) |
| Alcoholic liver disease        | 200         | HR (95% CI) | 1.98 (1.77-2.21) | 1.96 (1.75-2.19) | 2.00 (1.78-2.24) | 2.01 (1.79-2.25) | 1.96 (1.73-2.21) | 1.99 (1.76-2.26) | 2.01 (1.77-2.28) | 2.01 (1.77-2.28) | 1.96 (1.73-2.23) | 1.96 (1.72-2.23) | 1.96 (1.72-2.23) |
| Non-alcoholic fatty liver disease | 198     | HR (95% CI) | 1.67 (1.33-2.10) | 1.73 (1.37-2.18) | 1.73 (1.38-2.18) | 1.73 (1.37-2.17) | 1.71 (1.35-2.16) | 1.71 (1.35-2.16) | 1.71 (1.35-2.16) | 1.71 (1.35-2.16) | 1.70 (1.34-2.16) | 1.69 (1.33-2.14) | 1.69 (1.33-2.15) |
| Chronic viral hepatitis        | 226         | HR (95% CI) | 1.29 (1.00-1.66) | 1.27 (0.98-1.64) | 1.27 (0.98-1.64) | 1.23 (0.95-1.60) | 1.24 (0.95-1.61) | 1.24 (0.95-1.62) | 1.23 (0.94-1.60) | 1.23 (0.94-1.61) | 1.22 (0.94-1.60) | 1.23 (0.94-1.61) | 1.24 (0.95-1.62) |
| Total liver disease            | 1775        | HR (95% CI) | 1.55 (1.44-1.67) | 1.54 (1.43-1.66) | 1.54 (1.43-1.66) | 1.53 (1.42-1.65) | 1.52 (1.40-1.64) | 1.52 (1.40-1.64) | 1.52 (1.40-1.64) | 1.52 (1.40-1.64) | 1.51 (1.40-1.64) | 1.51 (1.39-1.63) | 1.51 (1.39-1.63) |

HBsAg, hepatitis B surface antigen; HR, hazard ratio; CI, confidence interval.
Participants with unclear or missing HBsAg test result, or with self-reported prior self-reported cancer, liver cirrhosis, or chronic hepatitis were excluded.
Table S12. Adjusted HRs for total and major chronic liver diseases associated with daily drinking, in male current regular drinkers - in sequentially adjusted models

| Condition                      | All current regular N | 1-5 days/week | 6-7 days/week |
|-------------------------------|-----------------------|---------------|---------------|
|                               |                       | N             | HR (95% CI)   | P value | N         | HR (95% CI)   | P value | N         | HR (95% CI)   | P value | N         | HR (95% CI)   | P value |
| Liver cancer                  | 547                   | 132           | 1.00 (Reference) |         | 415       | 1.41 (1.14-1.74) | 0.002   | 415       | 1.22 (0.97-1.54) | 0.088   | 415       | 1.23 (0.97-1.54) | 0.084   |
| Liver cirrhosis               | 388                   | 92            | 1.00 (Reference) |         | 296       | 1.66 (1.29-2.14) | <0.001  | 296       | 1.24 (0.94-1.62) | 0.122   | 296       | 1.24 (0.95-1.63) | 0.112   |
| Alcoholic liver disease       | 200                   | 30            | 1.00 (Reference) |         | 170       | 3.15 (2.10-4.72) | <0.001  | 170       | 2.15 (1.41-3.28) | <0.001  | 170       | 2.14 (1.41-3.26) | <0.001  |
| Non-alcoholic fatty liver disease | 198                  | 70            | 1.00 (Reference) |         | 128       | 1.13 (0.82-1.56) | 0.466   | 128       | 0.83 (0.58-1.19) | 0.310   | 128       | 0.83 (0.58-1.19) | 0.312   |
| Chronic viral hepatitis       | 226                   | 82            | 1.00 (Reference) |         | 144       | 1.11 (0.82-1.50) | 0.497   | 144       | 1.00 (0.72-1.41) | 0.979   | 144       | 1.01 (0.72-1.41) | 0.973   |
| Total liver disease           | 1775                  | 465           | 1.00 (Reference) |         | 1310      | 1.41 (1.25-1.58) | <0.001  | 1310      | 1.17 (1.03-1.32) | 0.015   | 1310      | 1.17 (1.03-1.33) | 0.014   |

HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.

*Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
Table S13. Adjusted HRs for total and major chronic liver diseases associated with heavy episodic drinking, in male current regular drinkers - in sequentially adjusted models

|                      | ≤60 g/session | >60 g/session (i.e., HED) |
|----------------------|---------------|---------------------------|
|                      | Full model<sup>a</sup> | + Total alcohol intake | + Mealtime habit | + Beverage type |
|                      | N             | HR (95% CI)               | HR (95% CI) | HR (95% CI)   | HR (95% CI) | P value |
| Liver cancer         | 547           | 1.00 (Reference)          | 230   | 1.36 (1.13-1.64) | 1.10 (0.86-1.39) | 1.09 (0.86-1.39) | 1.08 (0.85-1.38) | 0.517 |
| Liver cirrhosis      | 388           | 1.00 (Reference)          | 196   | 1.64 (1.32-2.04) | 1.09 (0.84-1.40) | 1.08 (0.84-1.40) | 1.14 (0.88-1.48) | 0.334 |
| Alcoholic liver disease | 200          | 1.00 (Reference)          | 128   | 2.69 (1.98-3.66) | 1.69 (1.21-2.37) | 1.72 (1.23-2.42) | 1.72 (1.21-2.44) | 0.002 |
| Non-alcoholic fatty liver disease | 198 | 1.00 (Reference) | 103   | 1.46 (1.08-1.98) | 1.05 (0.73-1.51) | 1.05 (0.73-1.51) | 1.05 (0.72-1.52) | 0.806 |
| Chronic viral hepatitis | 226          | 1.00 (Reference)          | 108   | 1.32 (0.99-1.76) | 1.27 (0.89-1.81) | 1.27 (0.89-1.81) | 1.27 (0.89-1.81) | 0.190 |
| Total liver disease  | 1775          | 1.00 (Reference)          | 807   | 1.38 (1.24-1.52) | 1.04 (0.92-1.18) | 1.05 (0.92-1.19) | 1.05 (0.92-1.19) | 0.459 |

HED, heavy episodic drinking; HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.

Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.

<sup>a</sup>Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
Table S14. Adjusted HRs for total and major chronic liver diseases associated with mealtime drinking habits, in male current regular drinkers - in sequentially adjusted models

| Disease                          | All current regular N | N    | HR (95% CI)   | HR (95% CI)   | P value | HR (95% CI)   | P value | HR (95% CI)   | P value |
|----------------------------------|-----------------------|------|---------------|---------------|---------|---------------|---------|---------------|---------|
| Liver cancer                     | 547                   | 452  | 1.00 (Reference) | 1.35 (1.04-1.75) | 0.023   | 1.32 (1.02-1.71) | 0.036   | 1.32 (1.02-1.71) | 0.035   |
| Liver cirrhosis                  | 388                   | 313  | 1.00 (Reference) | 1.47 (1.10-1.97) | 0.010   | 1.37 (1.02-1.84) | 0.035   | 1.37 (1.02-1.84) | 0.036   |
| Alcoholic liver disease          | 200                   | 146  | 1.00 (Reference) | 1.84 (1.28-2.64) | 0.001   | 1.60 (1.10-2.32) | 0.014   | 1.60 (1.10-2.33) | 0.013   |
| Non-alcoholic fatty liver disease| 198                   | 186  | 1.00 (Reference) | 0.84 (0.45-1.55) | 0.573   | 0.81 (0.44-1.49) | 0.492   | 0.81 (0.44-1.49) | 0.495   |
| Chronic viral hepatitis          | 226                   | 183  | 1.00 (Reference) | 1.13 (0.76-1.66) | 0.550   | 1.12 (0.76-1.65) | 0.578   | 1.11 (0.75-1.64) | 0.591   |
| Total liver disease              | 1775                  | 1512 | 1.00 (Reference) | 1.33 (1.14-1.54) | <0.001  | 1.29 (1.11-1.50) | 0.001   | 1.29 (1.11-1.50) | 0.001   |

HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
* Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
Table S15. Adjusted HRs for total and major chronic liver diseases associated with beverage type, in male current regular drinkers - in sequentially adjusted models

| Disease                          | Non-spirits | Spirits | Spirits | Spirits |
|----------------------------------|-------------|---------|---------|---------|
|                                  | All         | Non     | Full    | + Total alcohol intake | + Mealtime habits |
|                                  | current     | spirits | modela  |                     |                 |
| Liver cancer                     | 136         | 411     | 1.18 (0.94-1.48) | 1.06 (0.84-1.33) | 1.06 (0.84-1.34) |
| Liver cirrhosis                  | 97          | 291     | 1.02 (0.77-1.34) | 0.82 (0.62-1.09) | 0.82 (0.62-1.09) |
| Alcoholic liver disease          | 29          | 171     | 1.73 (1.10-2.70) | 1.32 (0.84-2.09) | 1.34 (0.85-2.12) |
| Non-alcoholic fatty liver disease| 53          | 145     | 1.21 (0.83-1.76) | 1.04 (0.71-1.53) | 1.04 (0.70-1.53) |
| Chronic viral hepatitis          | 63          | 163     | 0.99 (0.70-1.41) | 0.93 (0.65-1.33) | 0.93 (0.65-1.34) |
| Total liver disease              | 453         | 1322    | 1.17 (1.03-1.32) | 1.02 (0.90-1.16) | 1.03 (0.90-1.16) |

HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.

*Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
Figure S9. Associations of alcohol consumption with total and major chronic liver diseases, in all men

Conventions are as in Figure S2.
Table S16. Adjusted HRs for total and major chronic liver diseases associated with alcohol drinking status, in men after various exclusions of participants

| Liver cancer | All | Abstainers | Occasional drinkers | Current regular drinkers |
|--------------|-----|------------|---------------------|-------------------------|
| N            | N   | HR (95% CI) | N                   | HR (95% CI)             | N                       | HR (95% CI) | P value*   |
| Main analysis| 1592| 365 (1.00 (0.90-1.12))| 203 (1.24 (1.08-1.43))| 477 (0.86 (0.78-0.94))| 547 (1.07 (0.98-1.17))| 0.364       |
| Excluded first three years of follow-up | 1098| 215 (1.00 (0.87-1.15))| 117 (1.18 (0.98-1.42))| 318 (0.91 (0.81-1.02))| 358 (1.14 (1.02-1.27))| 0.172       |
| Excluded poor self-reported health | 1409| 309 (1.00 (0.89-1.13))| 159 (1.25 (1.06-1.46))| 439 (0.90 (0.81-0.99))| 502 (1.09 (1.00-1.20))| 0.251       |
| Excluded chronic diseasea | 1088| 239 (1.00 (0.87-1.15))| 112 (1.23 (1.02-1.49))| 337 (0.83 (0.74-0.93))| 400 (1.06 (0.96-1.18))| 0.494       |
| Excluded all of the above | 653 | 133 (1.00 (0.83-1.20))| 60 (1.22 (0.94-1.57))| 215 (0.90 (0.78-1.04))| 245 (1.09 (0.95-1.25))| 0.458       |

| Liver cirrhosis | All | Abstainers | Occasional drinkers | Current regular drinkers |
| N               | N   | HR (95% CI) | N                   | HR (95% CI)             |
| Main analysis   | 1098| 291 (1.00 (0.88-1.14))| 112 (0.97 (0.81-1.18))| 307 (0.68 (0.60-0.76))|
| Excluded first three years of follow-up | 708 | 170 (1.00 (0.85-1.18))| 66 (1.01 (0.79-1.29))| 221 (0.81 (0.70-0.92))|
| Excluded poor self-reported health | 962 | 241 (1.00 (0.87-1.15))| 88 (1.03 (0.83-1.27))| 288 (0.75 (0.66-0.84))|
| Excluded chronic diseasea | 752 | 173 (1.00 (0.85-1.18))| 63 (1.09 (0.84-1.40))| 223 (0.73 (0.64-0.84))|
| Excluded all of the above | 463 | 96 (1.00 (0.80-1.24))| 34 (1.12 (0.79-1.58))| 150 (0.81 (0.69-0.96))|

| Alcoholic liver disease | All | Abstainers | Occasional drinkers | Current regular drinkers |
| N               | N   | HR (95% CI) | N                   | HR (95% CI)             |
| Main analysis   | 239 | 10 (1.00 (0.53-1.87))| 15 (3.72 (2.24-6.20))| 14 (1.11 (0.65-1.88))|
| Excluded first three years of follow-up | 173 | 7 (1.00 (0.47-2.12))| 5 (3.36 (1.69-6.29))| 13 (1.52 (0.88-2.63))|
| Excluded poor self-reported health | 205 | 8 (1.00 (0.50-2.02))| 12 (4.08 (2.31-7.22))| 12 (1.15 (0.65-2.03))|
| Excluded chronic diseasea | 179 | 6 (1.00 (0.45-2.24))| 9 (4.27 (2.21-8.25))| 8 (0.99 (0.49-1.99))|
| Excluded all of the above | 115 | 2 (1.00 (0.25-4.03))| 3 (4.42 (1.42-13.76))| 7 (2.60 (1.23-5.50))|

| Non-alcoholic fatty liver disease | All | Abstainers | Occasional drinkers | Current regular drinkers |
| N               | N   | HR (95% CI) | N                   | HR (95% CI)             |
| Main analysis   | 440 | 64 (1.00 (0.77-1.30))| 67 (1.73 (1.35-2.22))| 111 (0.91 (0.75-1.10))|
| Excluded first three years of follow-up | 257 | 18 (1.00 (0.62-1.61))| 56 (2.83 (1.25-3.72))| 57 (1.02 (0.78-1.34))|
| Excluded poor self-reported health | 391 | 57 (1.00 (0.76-1.31))| 51 (1.69 (1.27-2.24))| 106 (0.99 (0.81-1.20))|
| Excluded chronic diseasea | 282 | 41 (1.00 (0.73-1.38))| 39 (2.13 (1.53-2.94))| 74 (0.99 (0.78-1.26))|
| Excluded all of the above | 137 | 9 (1.00 (0.51-1.96))| 25 (3.02 (2.00-4.57))| 34 (1.15 (0.81-1.64))|

| Chronic viral hepatitis | All | Abstainers | Occasional drinkers | Current regular drinkers |
| N               | N   | HR (95% CI) | N                   | HR (95% CI)             |
| Main analysis   | 778 | 162 (1.00 (0.85-1.18))| 82 (1.30 (1.04-1.62))| 308 (1.00 (0.89-1.13))|
| Excluded first three years of follow-up | 494 | 84 (1.00 (0.79-1.26))| 46 (1.39 (1.04-1.87))| 207 (1.22 (1.06-1.41))|
| Excluded poor self-reported health | 691 | 137 (1.00 (0.83-1.20))| 65 (1.58 (1.07-1.77))| 275 (1.04 (0.91-1.17))|
| Excluded chronic diseasea | 568 | 99 (1.00 (0.81-1.24))| 53 (1.65 (1.25-2.17))| 250 (1.25 (1.09-1.42))|
| Excluded all of the above | 322 | 40 (1.00 (0.72-1.39))| 24 (2.10 (1.40-3.16))| 149 (1.73 (1.46-2.05))|

| Total liver disease | All | Abstainers | Occasional drinkers | Current regular drinkers |
| N               | N   | HR (95% CI) | N                   | HR (95% CI)             |
| Main analysis   | 4641| 1021 (1.00 (0.94-1.07))| 513 (1.16 (1.06-1.27))| 1332 (0.83 (0.79-0.88))|
| Excluded first three years of follow-up | 2782 | 516 (1.00 (0.91-1.10))| 303 (1.21 (1.08-1.36))| 849 (0.92 (0.86-0.99))|
| Excluded poor self-reported health | 4092 | 878 (1.00 (0.93-1.07))| 397 (1.16 (1.05-1.28))| 1213 (0.86 (0.81-0.91))|
| Excluded chronic diseasea | 3265 | 664 (1.00 (0.92-1.09))| 298 (1.26 (1.12-1.41))| 978 (0.88 (0.82-0.94))|
| Excluded all of the above | 1791 | 303 (1.00 (0.89-1.13))| 149 (1.28 (1.08-1.50))| 570 (0.95 (0.87-1.04))|

HRb, hepatitis B surface antigen; HR, hazard ratio; CI, confidence interval. Participants with unclear or missing HBsAg test result, or with self-reported prior liver cancer, cirrhosis, or chronic hepatitis were excluded from all analyses. Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity. *P for association comparing current regular drinkers vs. abstainers. aPrior chronic diseases included self-reported prior coronary heart diseases, stroke, transient ischaemic attack, tuberculosis, rheumatoid arthritis, peptic ulcer, emphysema/bronchitis, gallstone/gallbladder disease, kidney disease, and prevalent diabetes (both self-reported and screen-detected).
Table S17. Adjusted HRs for total and major chronic liver diseases associated with amount of alcohol consumption, in male current regular drinkers after various exclusions of participants

| Liver cancer | All current regular | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% CI) | N | N | HR (95% Ci|
| Condition                                              | N     | HR (95% CI)         | Proportion of ever-regular drinkers | Attributable Fraction (approximate 95% CI), % |
|--------------------------------------------------------|-------|---------------------|-------------------------------------|---------------------------------------------|
| Liver cancer                                           | 1592  | 1.22 (1.10-1.36)    | 0.47                                | 8.5 (4.3-12.7)                             |
| Liver cirrhosis                                        | 1098  | 1.21 (1.06-1.38)    | 0.46                                | 7.9 (2.8-12.9)                             |
| Non-alcoholic fatty liver disease                      | 440   | 1.26 (1.03-1.54)    | 0.60                                | 12.5 (2.9-22.2)                            |
| Non-neoplastic liver diseases (all liver diseases excluding liver cancer) | 3529  | 1.21 (1.13-1.30)    | 0.50                                | 8.7 (5.7-11.7)                             |
| Total liver disease                                    | 4641  | 1.21 (1.14-1.29)    | 0.49                                | 8.7 (6.1-11.2)                             |

HR, hazard ratio; CI, confidence interval; ICD-10, international classification of diseases, 10th revision.

Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.

Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, physical activity, and body mass index.

Attributable fraction is calculated as \( \frac{P(HR-1)}{HR} \), where \( P \) is the prevalence of ever-regular alcohol consumption (i.e., current and ex-regular drinking) among those who developed the relevant liver disease during follow-up.

*Included all non-neoplastic liver diseases (ICD-10: B18-B19, B94.2, K70-K77, Z22.5).
|                  | All         | Abstainers | Ex-regular drinkers | Occasional drinkers | Current regular drinkers | P value<sup>a</sup> |
|------------------|-------------|------------|---------------------|---------------------|--------------------------|---------------------|
|                  | N           | N          | HR (95% CI)         | N                   | HR (95% CI)              | N                   | HR (95% CI)         | HR (95% CI)          | P value<sup>a</sup> |
| Liver cancer     | 1172        | 272        | 1.00 (0.88-1.14)    | 152                 | 1.28 (1.09-1.50)         | 358                 | 0.87 (0.78-0.98)    | 390                 | 1.07 (0.96-1.19)    | 0.441                |
| Liver cirrhosis  | 141         | 32         | 1.00 (0.68-1.47)    | 21                  | 1.03 (0.66-1.61)         | 36                  | 0.65 (0.46-0.92)    | 52                  | 0.84 (0.62-1.13)    | 0.493                |
| Alcoholic liver disease | 58         | 5          | 1.00 (0.41-2.46)    | 3                   | 1.64 (0.53-5.12)         | 6                   | 1.17 (0.52-2.66)    | 44                  | 7.11 (5.09-9.92)    | <0.001               |
| Chronic viral hepatitis | 123    | 39         | 1.00 (0.71-1.41)    | 9                   | 0.82 (0.42-1.60)         | 42                  | 0.82 (0.60-1.12)    | 33                  | 1.00 (0.68-1.46)    | 0.994                |
| Total liver disease | 1525 | 359        | 1.00 (0.89-1.12)    | 190                 | 1.23 (1.07-1.43)         | 451                 | 0.85 (0.77-0.94)    | 525                 | 1.11 (1.01-1.21)    | 0.182                |

HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
No deaths from non-alcoholic fatty liver disease as underlying cause were recorded.
<sup>a</sup>P for association comparing current regular drinkers vs. abstainers.
Table S20. Adjusted HRs for liver disease mortality associated with level of alcohol consumption, in male current regular drinkers

| All current regular | <140 g/week | 140-279 g/week | 280-419 g/week | ≥420 g/week | Per 280 g/week usual intake |
|---------------------|-------------|----------------|----------------|-------------|----------------------------|
| N                   | N           | HR (95% CI)    | N              | HR (95% CI)  | N                          |
| Liver cancer        | 390         | 105 1.00 (0.81-1.24) | 92 1.18 (0.96-1.45) | 89 1.62 (1.31-1.99) | 104 1.90 (1.54-2.35) |
| Liver cirrhosis     | 52          | 8 1.00 (0.48-2.08) | 15 2.35 (1.38-3.99) | 11 2.72 (1.51-4.89) | 18 3.82 (2.25-6.50) |
| Alcoholic liver disease | 44       | 6 1.00 (0.42-2.36) | 9 1.85 (0.95-3.61) | 8 2.61 (1.31-5.17) | 21 5.44 (3.33-8.87) |
| Chronic viral hepatitis | 33       | 9 1.00 (0.48-2.08) | 9 1.48 (0.77-2.85) | 7 1.68 (0.79-3.59) | 8 1.71 (0.82-3.56) |
| Total liver disease | 525         | 128 1.00 (0.83-1.21) | 127 1.33 (1.12-1.59) | 116 1.74 (1.45-2.09) | 154 2.24 (1.88-2.66) |

HR, hazard ratio; CI, confidence interval; HBsAg, hepatitis B surface antigen.
Participants with unclear or missing HBsAg test result, or with self-reported prior cancer, liver cirrhosis, or chronic hepatitis were excluded.
Cox models are stratified by age-at-risk, study area, and HBsAg, and adjusted for education, household income, smoking, body mass index, and physical activity.
No deaths from non-alcoholic fatty liver disease as underlying cause were recorded.
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