

## Preplanned Studies

## Geographic Distribution of Alcohol Use Among Chinese Adults — China, 2015

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### Summary

#### What is already known on this topic?

Alcohol use is attributed to more than 200 diseases and injury conditions. Recent conventional and genetic evidence is beginning to counter the benefit of moderate drinking. The prevalence of current alcohol use was 35.7% in 2007 among the Chinese population aged 18–69 years, but comparable estimations on a provincial-level has not been reported in China.

#### What is added by this report?

The prevalence of current alcohol use in the preceding year was 41.3% among the Chinese population aged 18 years and above in 2015. The prevalence of current alcohol use and the average level of daily pure alcohol intake among drinkers showed clustered and diversified geographic distribution across provinces.

#### What are the implications for public health practice?

Given diversified demographics and geographic characteristics of the current alcohol drinking population, the alcohol control policies and intervention strategies should be adopted at a provincial level to reduce alcohol-related mortality and disability.

Alcohol use is a causal factor in more than 200 diseases and injury conditions and is the leading risk factor for premature mortality and disability among people aged 15–49 years by causing an estimated 3 million deaths per year, which is more than 5% of all deaths globally (1). In China, alcohol use resulted in 381,200 deaths in 2013, which reduced overall life expectancy by 0.43 years, and though drinking alcohol is common across diverse populations, its use varies considerably across demographic subgroups (2–4). In this study, cross-sectional data from the 2015 China Chronic Disease and Nutrition Surveillance (CCDNS) was used to report the demographic and geographic distribution of current alcohol use among Chinese residents aged 18 years and above on a national and

provincial level. In 2007, the CCDNS reported that the prevalence of current alcohol use in those aged 18–69 years was overall 35.7%, in men 55.6%, and in women 15.0%, and this study uncovered a prevalence of current alcohol use among Chinese adults over 18 years overall to be 41.3% (95% CI\*: 39.2%–43.4%), in men 61.7% (95% CI: 59.3%–64.1%), and in women 20.3% (95% CI: 18.4%–22.2%), which indicates an increase. There were important provincial variations in the prevalence of current alcohol use.

Recent studies have debunked perceived health benefits of consuming up to two drinks of alcohol per day, and current research states that there is no safe level of alcohol consumption (5–6). Due to this focus on dose, many previous studies (3,7–8) primarily examined harmful alcohol use rather than presenting a more comprehensive picture of all alcohol use. Therefore, identifying the demographic and geographic distribution of those with any alcohol use in the preceding year and quantifying pure alcohol intake by demographic subgroup is necessary to better reduce alcohol-related mortality and disability. This is the first study to present comparable estimates of current alcohol use on a provincial level in China.

In 2015, the CCDNS used 298 disease surveillance points across 31 provincial-level administrative divisions (PLADs) and a multistage stratified cluster randomized sampling method to select a representative sample of households. Local CDC's invited eligible residents aged 18 years and above in selected households to participate. Of the 88,250 households sampled, 189,605 subjects completed the survey, which yielded a 95.4% family response rate and 94.9% individual response rate. After excluding subjects with incomplete data (0.21%), 189,198 subjects who responded to the question of current alcohol use were included. Similar recruitment methods used in the CCDNS were reported elsewhere (8–9). The Ethics Committee for Research in Human Subjects of China CDC approved the study protocol (Approval Notice:

\* CI=Confidence Interval.

No.201519-A). Interviewers obtained written informed consent prior to the start of the study. Trained local personnel conducted face-to-face interviews, physical measurements, and blood draw.

Current alcohol use was defined as those who self-reported any alcohol intake in the past 12 months. The average level of daily pure alcohol intake was recalibrated using alcohol type and the method was described elsewhere (3). The present study weighted all calculations based on the sampling scheme. The post-stratification adjustment used 2015 Chinese population estimates from the National Bureau of Statistics. We reported unweighted frequency and weighed proportion for the demographic characteristics. Prevalence was weighted to represent the national and provincial levels. Rao Scott  $\chi^2$  tests were used to test global differences, and a logistic regression model was used to test the trend for the ordinal categorical variables. Taylor's linearization method with finite population correction was considered when estimating the standard errors. All statistical analyses used the SAS software package (version 9.4; SAS Institute, Inc. Cary, NC, USA).

The study included a total of 189,198 Chinese residents aged 18 years and above; 88,842 males and 100,356 females; and 80,823 in urban areas and

108,375 in rural areas (Table 1). In 2015, the prevalence of current alcohol use among Chinese adults aged 18 years and above was 41.3% (95% CI: 39.2%–43.4%), with 61.7% (95% CI: 59.3%–64.1%) in men and 20.3% in women (95% CI: 18.4%–22.2%). There was an inverted U-shaped across all age groups for the prevalence of current alcohol use for both men and women. For women, the prevalence of current alcohol use in the urban areas was significantly higher than in rural areas (23.7% vs. 15.2%,  $p < 0.0001$ ). However, the prevalence was similar among men in urban and rural areas (61.9% vs. 61.5%,  $p = 0.8474$ ). Minority groups in China had a lower drinking prevalence than Han Chinese (35.8% vs. 41.7%,  $p = 0.0245$ ). Southern areas of China have the highest prevalence of current alcohol use for both men (69.1%) and women (28.4%), while the lowest prevalence for men is located in the northwestern areas of China (51.1%) and for women in the central areas of China (14.5%). The prevalence of current alcohol use varied significantly for both men and women across age groups, educational levels, marital status, occupations, and household income levels. The prevalence of current alcohol use increased with educational level and household income but decreased

TABLE 1. Prevalence of any alcohol use in the past 12 months and average daily pure alcohol intake\* among drinkers in Chinese adults aged 18 years and above in 2015†.

| Characteristics <sup>§</sup>  | Overall         |                         |                     | Men             |                         |                     | Women           |                         |                   |
|-------------------------------|-----------------|-------------------------|---------------------|-----------------|-------------------------|---------------------|-----------------|-------------------------|-------------------|
|                               | N <sup>  </sup> | Prevalence (%) (95% CI) | Grams (95% CI)      | N <sup>  </sup> | Prevalence (%) (95% CI) | Grams (95% CI)      | N <sup>  </sup> | Prevalence (%) (95% CI) | Grams (95% CI)    |
| Total                         | 69,037          | 41.3<br>(39.2–43.4)     | 15.9<br>(14.7–17.1) | 51,929          | 61.7<br>(59.3–64.1)     | 20.7<br>(19.5–21.9) | 17,108          | 20.3<br>(18.4–22.2)     | 3.2<br>(2.7–3.7)  |
| Age group                     |                 |                         |                     |                 |                         |                     |                 |                         |                   |
| 18–29 years                   | 6,305           | 42.7<br>(39.3–46.1)     | 8.1<br>(6.8–9.5)    | 4,574           | 62.2<br>(58.0–66.4)     | 10.7<br>(9.3–12.2)  | 1,731           | 22.4<br>(19.4–25.3)     | 1.6<br>(1.0–2.1)  |
| 30–39 years                   | 9,501           | 45.6<br>(42.5–48.7)     | 12.6<br>(11.5–13.8) | 6,782           | 66.3<br>(63.0–69.7)     | 16.8<br>(15.5–18.1) | 2,719           | 23.8<br>(20.8–26.7)     | 2.4<br>(1.7–3.0)  |
| 40–49 years                   | 16,675          | 44.7<br>(42.3–47.1)     | 17.8<br>(16.4–19.2) | 12,213          | 66.3<br>(63.7–68.9)     | 23.5<br>(21.9–25.2) | 4,462           | 22.4<br>(20.0–24.9)     | 3.3<br>(2.8–3.8)  |
| 50–59 years                   | 17,240          | 41.1<br>(39.6–42.5)     | 23.0<br>(21.6–24.4) | 13,157          | 63.2<br>(61.4–64.9)     | 29.3<br>(27.5–31.0) | 4,083           | 18.1<br>(16.5–19.6)     | 4.1<br>(3.6–4.6)  |
| 60–69 years                   | 13,966          | 35.9<br>(34.5–37.3)     | 24.4<br>(22.8–25.9) | 109,988         | 56.7<br>(54.7–58.6)     | 30.1<br>(28.3–32.0) | 2,968           | 14.7<br>(13.4–16.0)     | 6.0<br>(4.7–7.2)  |
| ≥70 years                     | 5,350           | 26.2<br>(24.2–28.2)     | 18.9<br>(17.3–20.6) | 4,205           | 40.9<br>(39.0–42.9)     | 24.2<br>(21.7–26.7) | 1,145           | 13.1<br>(11.0–15.3)     | 6.9<br>(5.5–8.4)  |
| <i>p</i> value for trend      |                 | <0.0001                 | 0.0020              |                 | <0.0001                 | <0.0001             |                 | <0.0001                 | <0.0001           |
| Ethnicity                     |                 |                         |                     |                 |                         |                     |                 |                         |                   |
| Han                           | 61,293          | 41.7<br>(39.5–43.9)     | 15.5<br>(14.3–16.7) | 46,399          | 62.3<br>(59.7–64.8)     | 20.3<br>(19.1–21.6) | 14,894          | 20.5<br>(18.6–22.5)     | 3.0<br>(2.6–3.4)  |
| Minorities                    | 7,744           | 35.8<br>(31.4–40.3)     | 20.9<br>(17.9–23.9) | 5,530           | 54.9<br>(50.1–59.8)     | 25.9<br>(23.0–28.8) | 2,214           | 17.2<br>(12.6–21.9)     | 6.8<br>(3.5–10.0) |
| <i>p</i> value for difference |                 | 0.0245                  | 0.0026              |                 | 0.0069                  | 0.0043              |                 | 0.2251                  | 0.0243            |
| Residency                     |                 |                         |                     |                 |                         |                     |                 |                         |                   |
| Urban                         | 30,575          | 43.1<br>(40.0–46.3)     | 13.7<br>(12.2–15.2) | 21,912          | 61.9<br>(58.2–65.7)     | 18.4<br>(16.9–20.0) | 8,663           | 23.7<br>(21.0–26.5)     | 3.0<br>(2.3–3.6)  |

TABLE 1. (continued)

| Characteristics <sup>§</sup>    | Overall        |                         |                     | Men            |                         |                     | Women          |                         |                  |
|---------------------------------|----------------|-------------------------|---------------------|----------------|-------------------------|---------------------|----------------|-------------------------|------------------|
|                                 | N <sup>¶</sup> | Prevalence (%) (95% CI) | Grams (95% CI)      | N <sup>¶</sup> | Prevalence (%) (95% CI) | Grams (95% CI)      | N <sup>¶</sup> | Prevalence (%) (95% CI) | Grams (95% CI)   |
| Rural                           | 38,462         | 38.5<br>(36.7–40.2)     | 19.4<br>(18.2–20.6) | 30,017         | 61.5<br>(59.2–63.7)     | 24.0<br>(22.5–25.5) | 8,445          | 15.2<br>(13.6–16.7)     | 3.8<br>(3.2–4.4) |
| <i>p</i> value for difference   |                | 0.0114                  | <0.0001             |                | 0.8474                  | <0.0001             |                | <0.0001                 | 0.0694           |
| Education                       |                |                         |                     |                |                         |                     |                |                         |                  |
| Illiterate or below primary     | 14,386         | 27.3<br>(26.0–28.7)     | 22.9<br>(20.9–25.0) | 8,892          | 52.1<br>(50.0–54.2)     | 34.3<br>(31.6–37.0) | 5,494          | 15.2<br>(13.8–16.7)     | 7.2<br>(5.9–8.4) |
| Primary                         | 13,457         | 38.1<br>(36.3–39.8)     | 21.5<br>(20.1–23.0) | 10,682         | 58.5<br>(56.4–60.6)     | 27.2<br>(25.5–29.0) | 2,775          | 16.6<br>(14.7–18.5)     | 3.9<br>(2.8–4.9) |
| Secondary                       | 23,895         | 43.8<br>(42.0–45.6)     | 17.6<br>(16.6–18.6) | 19,455         | 63.2<br>(61.3–65.1)     | 22.1<br>(21.0–23.2) | 4,440          | 19.3<br>(16.3–22.3)     | 2.2<br>(1.7–2.8) |
| Tertiary or higher              | 17,299         | 47.1<br>(43.6–50.6)     | 10.3<br>(9.1–11.5)  | 12,900         | 64.5<br>(60.3–68.7)     | 13.6<br>(12.0–15.2) | 4,399          | 26.4<br>(23.9–28.9)     | 2.0<br>(1.6–2.3) |
| <i>p</i> value for trend        |                | <0.0001                 | <0.0001             |                | <0.0001                 | 0.0053              |                | <0.0001                 | <0.0001          |
| Marital status                  |                |                         |                     |                |                         |                     |                |                         |                  |
| Married                         | 63,165         | 41<br>(39.2–42.8)       | 17.3<br>(16.2–18.3) | 47,712         | 62.7<br>(60.7–64.8)     | 22.5<br>(21.4–23.6) | 15,453         | 19.4<br>(17.7–21.1)     | 3.3<br>(2.8–3.8) |
| Single                          | 3,436          | 47.1<br>(42.9–51.4)     | 7.4<br>(5.9–8.8)    | 2,774          | 58.3<br>(52.9–63.7)     | 9.3<br>(7.7–10.9)   | 662            | 29.0<br>(25.1–32.9)     | 1.5<br>(0.9–2.1) |
| Widowed                         | 1,753          | 22.3<br>(19.4–25.1)     | 14.8<br>(12.5–17.0) | 938            | 44.1<br>(39.9–48.2)     | 26.0<br>(22.5–29.6) | 815            | 15.8<br>(12.5–19.0)     | 6.3<br>(4.7–7.9) |
| Divorced or Separate            | 683            | 48.3<br>(43.1–53.6)     | 21.3<br>(17.2–25.4) | 505            | 60.9<br>(53.4–68.5)     | 28.0<br>(23.1–33.0) | 178            | 31.2<br>(24.6–37.7)     | 4.8<br>(2.4–7.2) |
| <i>p</i> value for difference   |                | <0.0001                 | <0.0001             |                | <0.0001                 | <0.0001             |                | <0.0001                 | <0.0001          |
| Occupation                      |                |                         |                     |                |                         |                     |                |                         |                  |
| Office/shop/other non-manual    | 25,539         | 42.5<br>(39.4–45.5)     | 12.7<br>(11.4–13.9) | 17,887         | 63.9<br>(60.2–67.6)     | 17.4<br>(16.0–18.8) | 7,652          | 23.0<br>(20.6–25.4)     | 2.7<br>(2.3–3.1) |
| Farming related                 | 30,928         | 38.5<br>(37.1–39.8)     | 22.3<br>(20.9–23.6) | 24,460         | 59.7<br>(58–61.4)       | 27.1<br>(25.5–28.7) | 6,468          | 14.9<br>(13.5–16.3)     | 5.1<br>(4.1–6.0) |
| Factory and construction manual | 3,893          | 59.6<br>(56.0–63.2)     | 15.6<br>(13.6–17.7) | 3,417          | 68.5<br>(65.1–71.9)     | 17.7<br>(15.7–19.7) | 476            | 30.9<br>(23.1–38.8)     | 1.6<br>(1.1–2.2) |
| Retired                         | 5,876          | 34.7<br>(31.6–37.7)     | 15.0<br>(13.2–16.7) | 4,121          | 52.6<br>(49.4–55.8)     | 21.3<br>(18.7–24.0) | 1,755          | 19.5<br>(16.5–22.6)     | 3.0<br>(2.4–3.6) |
| Not working                     | 2,801          | 36.5<br>(33.7–39.3)     | 13.5<br>(11.6–15.4) | 2,044          | 56.2<br>(52.8–59.6)     | 18.1<br>(16.0–20.3) | 757            | 19.0<br>(15.8–22.2)     | 3.0<br>(1.3–4.6) |
| <i>p</i> value for difference   |                | <0.0001                 | <0.0001             |                | <0.0001                 | <0.0001             |                | <0.0001                 | <0.0001          |
| Household income                |                |                         |                     |                |                         |                     |                |                         |                  |
| Q1 (≤15,000 yuan)               | 12,589         | 34.6<br>(32.9–36.2)     | 20.8<br>(19.1–22.4) | 9,865          | 54.0<br>(51.8–56.2)     | 25.7<br>(23.8–27.5) | 2,724          | 14.3<br>(12.9–15.7)     | 4.8<br>(3.7–5.9) |
| Q2 (15,000–30,000 yuan)         | 14,653         | 39.0<br>(37.6–40.4)     | 19.2<br>(17.9–20.5) | 11,350         | 60.8<br>(58.9–62.8)     | 24.1<br>(22.5–25.6) | 3,303          | 16.5<br>(15.1–17.9)     | 3.5<br>(2.8–4.3) |
| Q3 (30,000–60,000 yuan)         | 17,215         | 42.6<br>(40.6–44.7)     | 15.7<br>(14.9–16.6) | 12,795         | 63.0<br>(60.6–65.5)     | 20.6<br>(19.6–21.7) | 4,420          | 21.6<br>(19.3–23.9)     | 2.9<br>(2.6–3.3) |
| Q4 (>60,000 yuan)               | 12,277         | 48.2<br>(44.1–52.2)     | 12.4<br>(10.7–14.1) | 8,736          | 68.3<br>(63.3–73.3)     | 16.8<br>(14.7–18.8) | 3,541          | 26.5<br>(23.9–29.2)     | 2.9<br>(2.3–3.5) |
| Unwilling to disclosure         | 12,303         | 38.4<br>(36.1–40.6)     | 14.7<br>(12.9–16.6) | 9,183          | 58.5<br>(55.8–61.1)     | 19.3<br>(17.5–21.2) | 3,120          | 19.3<br>(16.6–22.0)     | 3.1<br>(2.2–4.0) |
| <i>p</i> value for trend        |                | 0.0016                  | <0.0001             |                | <0.0001                 | <0.0001             |                | <0.0001                 | <0.0001          |

\* Average daily pure alcohol consumption was self-reported and estimated by types of alcoholic beverage including high spirit liquor (≥40% v/v), low spirit liquor (<40% v/v), wine, beer, and other fermented beverages made from rice or barley.

† Table presented weighted prevalence, which represents the overall national population. Standard population estimation for the year 2015 was from the National Bureau of Statistics of China.

§ CI=confidence interval, considered complex survey design.

¶ N stands for the number of participants who self-reported had any alcohol use in the past 12 months.

with age for both men and women.

In 2015, the average level of daily pure alcohol intake was significantly higher in men than in women (20.7 vs. 3.2 grams). Daily pure alcohol intake tended to

increase with age, while men aged 60–69 years and women aged 70 years and above have the highest levels. There was an inverted trend for the prevalence of current alcohol use against the average level of daily pure alcohol

intake across ethnicity, urban or rural residence, education level, and household income. The daily pure alcohol intake was higher in minorities, rural areas, lower education levels, and lower household income.

The color-coded maps in Figure 1 show the provincial-level geographic distribution of current alcohol use among Chinese men and women, respectively. The maps suggest that the prevalence of current alcohol use was highest in Shandong, Henan, Jiangsu, Yunnan, and Hainan provinces for men; and

in Heilongjiang and Tibet for women. Figure 2 show the provincial-level disparity for the average level of daily pure alcohol intake among men and women, respectively. Tibet, Guizhou, Hainan, and Inner Mongolia were in the highest category of the average level of daily pure alcohol intake for men, and Tibet and Guizhou for women. Male adult residents aged 18 years and above who live in Xinjiang had both the lowest prevalence of current drinking and the lowest category of the average level of daily pure alcohol

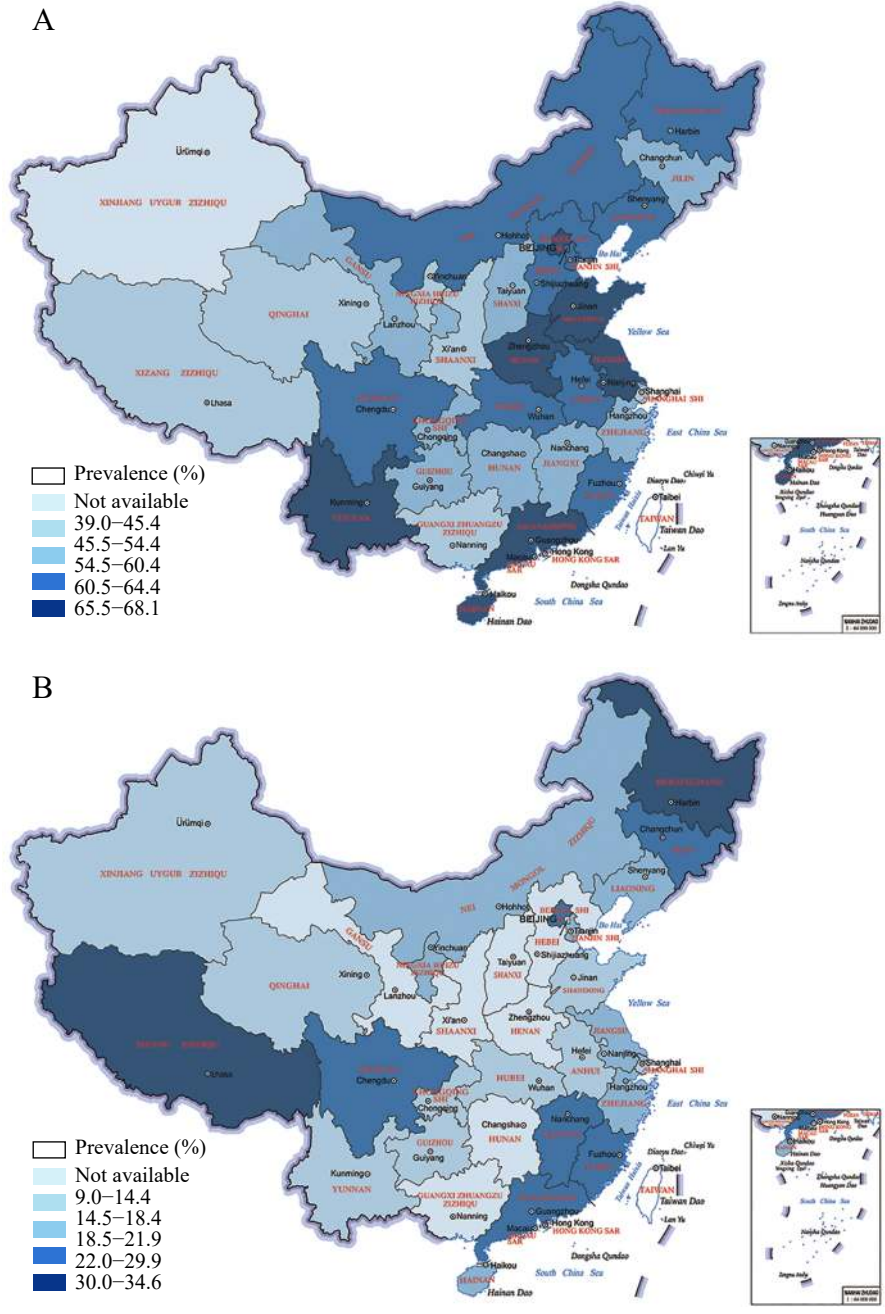


FIGURE 1. Age-standardized prevalence of alcohol use in the past 12 months among Chinese men (A) and women (B) by the province of China in 2015.

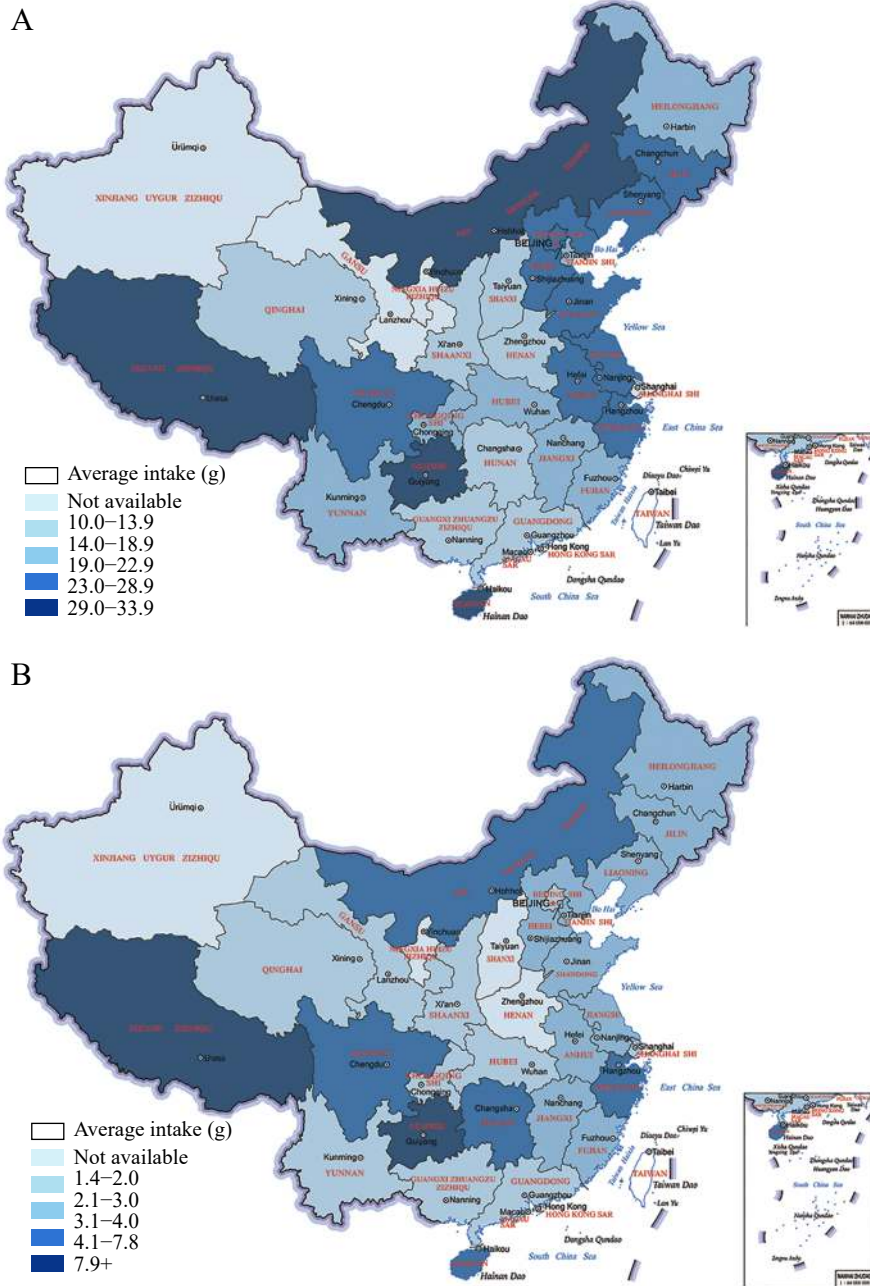


FIGURE 2. Average level of daily pure alcohol intake among Chinese men (A) and women (B) by the province of China in 2015.

intake across China.

### Discussion

This is the first study to describe current alcohol use on a national and provincial level in China, yielding three key findings. First, our study showed that in 2015, the prevalence of current alcohol use among Chinese adults aged 18 years and above was 41.3% overall, 61.7% in men and 20.3% in women.

Compared to women, men were consistently more likely to be current alcohol users across all demographic groups. Although China has a much lower prevalence of alcohol use compared to Western Europe (72.0%) and Australia (78.8%), the prevalence in China seemingly increased for both men and women compared to the years 2002 and 2007 (3–4,10). However, the age group for the study in 2007 was 15–69 years, and the definition of current drinking in the year 2002 was drinking at least once a

week. Therefore, differing age groups and definitions limit direct comparisons in this study.

Second, a significant difference in alcohol use between urban and rural areas was observed in 2015 but not in 2007 (3). Our study illustrates this disparity was largely due to behavior changes among women but not among men. Among women, an increase was observed in the prevalence of current drinking from 2007 to 2015 in urban areas (14.9% vs. 23.7%, respectively) but not in rural areas (15.1% vs. 15.2%, respectively). Moreover, we found that the prevalence of current alcohol use was higher among Han population, urban residents, higher educated, and higher income level, however, the average level of daily pure alcohol intake was lower among the subgroups mentioned above. This may be explained by the characteristics of types of alcohol intake, which warrant further study.

Finally, our study is the first to show the comparative estimates of provincial alcohol use among all 31 PLADs in Mainland China. Study authors identified important provincial variations in the prevalence of current alcohol use, which reflects the impacts of diverse drinking cultures, socioeconomically development, and availability of alcohol beverage types. For most PLADs, more than 50% of men drank alcohol at least once in the past 12 months.

This study is subject to a few limitations. First, the definition of current alcohol use in this study was any alcohol intake in the past 12 months, which limited the direct comparison with national estimates reported using the definition of current alcohol use as drinking at least once a week (4,7). Second, although this study does not present any explanatory variables to indicate the notable geographic variations of alcohol use on the provincial level, it suggests future research directions for those who are interested in alcohol use patterns in China. Third, current alcohol use status and the average daily pure alcohol intake was self-reported, and therefore, information bias may lead to an underreported estimate.

Overall, given the diversified demographics and geographic characteristics of the current alcohol

drinking population, alcohol control policies and intervention strategies should be adopted at a provincial level to reduce alcohol-related mortality and disability.

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