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Trends in alcohol consumption and socio-demographic patterns in Belgium, 2010-2040: a modelling study of progress towards harm reduction

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Abstract

Introduction: Alcohol remains a major preventable risk factor for disease and mortality in Belgium. Monitoring future consumption trends is essential for evaluating progress towards the United Nation's Sustainable Development Goal (SDG) 3.5 target and informing alcohol control policies. This study projected alcohol consumption trends in Belgium up to 2040.

Methods: Belgian Health Interview Survey (BHIS) data (1997-2023) were combined with World Health Organization adult per capita consumption data using a triangulation approach. Bayesian time-series models were used to estimate trends in current drinking prevalence and mean alcohol consumption among drinkers by sex, age, region, and educational level. Projections were generated up to 2040 and compared with the SDG 3.5 target of a 20% relative reduction in alcohol consumption in 2030 from 2010 levels.

Results: Alcohol consumption is projected to decline across the Belgian population and all analysed population subgroups. Current drinking prevalence is estimated to decrease from 80.4% in 2010 to 75.1% by 2030 and 72.3% by 2040. Mean alcohol consumption is projected to decrease from 23.8 g/day in 2010 to 14.2 g/day by 2030 and 10.5 g/day by 2040. Men are projected to remain higher consumers than women, although the gap is expected to narrow over time. Similar declining trends were observed across regions, age groups, and educational levels, with projected 2030 mean consumption below the corresponding SDG target in all analysedsubgroups.

Conclusion: Although alcohol consumption is projected to decline, it is expected to remain an important public health concern. These findings provide the first national projections of alcohol consumption by sex, age, region, and educational level in Belgium and can offer a valuable evidence base for monitoring trends, informing alcohol policy, and evaluating future alcohol control measures.

Contributions to the Literature

- Evidence on future alcohol consumption in Belgium and progress towards international reduction targets remains scarce, particularly across population groups and regions.
- This study provides projections of alcohol consumption in Belgium up to 2040 by sex, age group and region, and assesses Belgium's progress towards the WHO's 2030 reduction target
- The findings highlight that targets will be met among all sub-groups, but inequalities will persist in Belgium over time. These estimates can support monitoring and inform tailored interventions and stronger population-level alcohol policies.

Background

Alcohol use has been classified as a known carcinogen by the International Agency for Research on Cancer since 1988. The World Health Organization (WHO) has declared that "there is no safe level of alcohol consumption for our health"(1). Indeed, even a small amount of alcohol can be harmful (2), but its social acceptance, especially in Europe, often conceals the significant physical, mental, and economic burdens (3–5). Despite global efforts to reduce alcohol consumption, its health impact remains substantial (6, 7).

The health risks associated with alcohol use have long been recognised and extensively examined in global studies. The latest Global Burden of Disease Risk Study 2023 (GBD) highlighted that, while in 1990, alcohol ranked as the 14th leading risk factor for deaths worldwide, in 2021, it had risen to the 10th rank, causing over 1.8 million deaths worldwide (8). Alcohol use is an underlying cause of no less than 22 health outcomes, including cancers, cardiovascular diseases, infectious diseases and injuries (9). Alcohol use also leads to both intentional and unintentional injuries, posing risks not only to the drinkers but also to those around them (5, 9–11).

The 2023 Belgian Health Interview Survey (BHIS) found that 78% of people aged 15 and older reported having consumed alcohol in the past 12 months, with around 8% drinking daily (12). Although these trends have slightly decreased over time, they are among the highest in Europe (13, 14). The survey also indicated higher current drinking rates among men (82%) compared to women (74%) (12). These high numbers can be attributed to ineffective public health policies that focus narrowly on harmful use and limit substance use monitoring (15). Although the BHIS provides reliable, nationally representative data on drinking patterns, alcohol consumption is not monitored annually, limiting the assessment of trends and policy impact (16). While several other surveys exist (17), the absence of consistent annual data and monitoring systems limits the ability to establish evidence-based health objectives and effectively evaluate policies (18).

Recognising the substantial health burden of alcohol, several global initiatives aim to reduce alcohol consumption, related harm and mortality from non-communicable diseases (NCDs). These include the WHO's "best-buy" interventions, which involve increasing

alcohol prices through taxation, reducing the availability of alcoholic beverages, and banning alcohol marketing (6, 19). These measures have been effective in several countries (14–16), but remain incompletely implemented in many others (23), as their full implementation requires strong political will (24). Belgium has introduced some of these measures, including alcohol taxation and restrictions on availability, but their scope and strength remain limited (25). Alcohol consumption in Belgium also remains particularly high and above the European average (13, 26). Monitoring alcohol consumption and related health outcomes can help assess progress and identify where stronger measures are needed. Relevant international frameworks include the WHO Global Alcohol Action Plan 2022–2030 and the Sustainable Development Goal (SDG) targets 3.4 and 3.5, which address premature mortality from NCDs and the prevention and treatment of substance abuse, respectively (27, 28). SDG 3.5 specifically seeks to strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol, with alcohol per capita consumption (APC) as a core indicator (27–29).

In line with these objectives, countries are expected to achieve at least a 20% relative reduction in per capita alcohol consumption by 2030 compared to 2010 levels (7), using the TOTAL APC indicator. More recently, the Alcohol Policy Playbook was made available to member states to help strengthen evidence-based alcohol policies and counter industry influence (30, 31). This policy framework reinforces the urgent need for stronger regulatory and prevention measures to curb alcohol-related harm and reduce its contribution to the global burden of NCDs (28).

In 2023, Belgium proposed an inter-federal strategy (32) to reduce harmful alcohol use, including measures to improve monitoring of alcohol consumption using indicators looking at the reduction of heavy drinking and binge drinking. To better understand consumption patterns and trends, a biannual surveillance system was recommended, along with the development of indicators to evaluate the current plan (32).

To support this recommendation, this study forecasts future alcohol consumption patterns based on a nationally representative survey and assesses the role of socio-demographic determinants in these projections. By doing so, these results can help with evaluating Belgium's progress toward achieving the Global Action Plan target of a 20% relative reduction in per capita alcohol consumption by 2030.

Methods

This study was conducted as part of the "Improved monitoring of the disease burden attributable to substance use" (SUBOD) project, which seeks to initiate an improved and routine monitoring of the health and economic impacts of tobacco and alcohol use in Belgium (33).

Data sources

The Belgian Health Interview Survey

Self-reported data on alcohol use were sourced from the BHIS, a nationally representative household survey of the general Belgian population. This analysis uses secondary BHIS data, selected as the most relevant source for this objective (17). The BHIS collects information on a wide range of lifestyle and health topics and samples around 10,000 individuals (34). Since 1997, seven cross-sectional waves have been conducted, with surveys every 4 to 5 years, up to the most recent year available in 2023-24 (32).

The survey uses a stratified multistage clustered sampling design based on the national register as the sampling frame, allowing results to be generalised to the entire Belgian population. Only individuals aged 15 years and older were included in this analysis, as alcohol-related questions are not collected for younger respondents. Conducted in accordance with Belgian privacy legislation, the survey was approved by the Ethics Committee of Ghent University (approval number: BC-07544). A detailed description of the methodology can be found elsewhere (34). General information can be found on the BHIS project page.

Alcohol per capita consumption (APC)

TOTAL APC for Belgium is available on the WHO Global Health Observatory dashboard, with the most recent data covering up to 2022, and provides a comprehensive measure of alcohol consumption per capita per year. This indicator includes recorded alcohol consumption data (collected by official statistics like imports, exports, or sales) and an estimation of unrecorded alcohol consumption

(alcohol sales not captured by taxation, mostly sold through illicit channels and spillage, and home-brewed alcohol), while also accounting for and adjusting for tourist consumption (Belgians consuming alcohol abroad and tourists consuming alcohol in Belgium) (36, 39–43). TOTAL APC for countries is constructed based on these components and is smoothed using a three-year moving average (39).

Population Projection

Population projections from the Belgian Federal Planning Bureau, available by year, sex, and region, and 5-year age groups, were used to model alcohol consumption trends up to 2040 (41). To assess inequalities in alcohol consumption by educational attainment, we used the distribution of education in the population estimated using weighted BHIS data (1997–2023), disaggregated by year, sex, region of residence, and age group, and projected forward to 2040. As official population projections do not include education, the estimated education distribution available in the BHIS was combined with projected population counts and model-based alcohol consumption estimates to examine and highlight differences across education groups (33).

Measures

Two main alcohol-related indicators were modelled: the prevalence of current drinking and the mean amount of alcohol consumed per day among current drinkers in the population aged 15 and above.

Current drinkers were defined as participants who responded having had at least one alcoholic beverage in the past 12 months. This indicator was available in all seven BHIS waves conducted in 1997, 2001, 2004, 2008, 2013, 2018 and 2023–2024.

Alcohol consumption among current drinkers in the BHIS was estimated by combining the number of standard drinks (equivalent to 10 grams of pure alcohol (42)) consumed per day among daily drinkers and relating this to the frequency of drinking in current drinkers, which led to an estimation of the average amount of alcohol consumed per day among past 12-month drinkers. This indicator is calculated from the BHIS data since 2008 and can be broken down by age, sex region, and educational level.

However, survey data tend to underreport alcohol consumption (35, 43) in the population; therefore, relying only on survey data would likely underestimate the true burden of alcohol use. To address this limitation, methods have been developed to combine survey-based consumption patterns with sales data, namely per capita alcohol consumption (TOTAL APC), expressed in litres of pure alcohol consumed among individuals aged 15 years and above (44).

The triangulation approach builds on Rehm et al. (45), where the relative distribution of alcohol consumption across population groups derived from the survey was combined with WHO total APC to align overall consumption levels with national estimates while preserving subgroup differences. The resulting variable represents the estimated mean alcohol consumption in grams per day among Belgians aged 15 years and above and by subgroups (46). More information on the method can be found in the study protocol (47). The outcome of the triangulation process will be used for the next steps of this analysis.

The demographic variables included in this analysis were: 5-year age groups, sex, region of residence (i.e., the Flemish Region, the Walloon Region, and the Brussels Capital Region), education attainment, used as a proxy for socioeconomic status (i.e., up to primary education, completed secondary education, and completed tertiary education, based on the highest level among the reference person and/or partner in the household), and self-reported consumption of alcohol (quantity, frequency and drinking patterns as part of a self-administered paper questionnaire for the participants aged 15 years and over) (34).

Data analysis

Modelling the prevalence of current drinkers

To model the prevalence of current drinkers and average number of grams of alcohol consumed per day across BHIS waves (1997–2023), Bayesian Generalized Linear Models (GLMs) using Integrated Nested Laplace Approximation (INLA) were fitted. The models included year, sex, region, age group, and educational attainment as explanatory variables. No fixed or random effects were applied to the main model. In the forecasting model, any variables that could not be matched with the demographic strata provided by the

Belgian Federal Planning Bureau's projections were excluded. All models incorporated BHIS survey weights to reflect the population structure.

Modelling alcohol consumption in grams per day

Alcohol consumption was assessed as a continuous outcome representing the average number of grams of alcohol consumed per day.

The outcome of the triangulation process, mean alcohol consumption in grams per day, was modelled from 2008 onwards. As with the prevalence analysis, models of increasing complexity were compared by progressively introducing interaction terms while retaining the corresponding lower-order terms. The selected model was used to estimate annual mean consumption among current drinkers, including for years between BHIS waves, and to project consumption from 2023 to 2040.

Statistical model

Model framework

The general model to forecast the count data can be described as :

$$\log(\mu) = \beta_0 + \beta_1 X_{year} + \beta_j X_j + \epsilon$$

Where μ is the expected count (or rate). The log-link function ensures the predictions remain non-negative. Where μ represents the expected mean alcohol consumption in grams per day, β_0 the intercept, β_1 the coefficient associated with the outcome time (year), and β_j the coefficients associated with the socio-demographic predictors X_j (sex, region, age group and educational attainment).

In parallel, APC values were converted to grams per day (litres × 1,000 × 0.789 / 365) and analysed using linear models to describe temporal trends and generate projections up to 2040.

Model selection

For the survey data, separate Bayesian Generalized Linear Models (GLMs) were fitted using Integrated Nested Laplace Approximation (INLA) for the prevalence of current drinking and the mean alcohol consumption among current drinkers. The prevalence model was based on the seven available BHIS waves (1997, 2001, 2004, 2008, 2013, 2018, and 2023), while the consumption model used BHIS waves from 2008 onwards. Both models included year, sex, region, age group, and educational attainment as predictors. Models of increasing complexity were compared by progressively introducing interaction terms, with the most complex specification including higher-order interactions while retaining lower-order terms.

For the total APC data, several time-series models were tested, including random walk models (RW1 and RW2), models including linear trends, and a three-year moving average approach.

Model performance was evaluated using the Watanabe-Akaike Information Criteria (WAIC), with lower values indicating a better fit. WAIC values for all tested models are presented in the supplementary material (Supplementary File 1), allowing comparison across model specifications.

The final models were selected based on the lowest WAIC, indicating the best-fitting specification. Weakly informative priors were assigned to all model parameters.

Final estimates were stratified by age, sex, year, and region, and by education level where relevant.

Population projections and aggregation

The selected models were used to estimate annual mean alcohol consumption by interpolating missing years between BHIS waves and projecting trends from 2023 to 2040, based on population estimates by age, sex, and region from the Belgian Federal Planning Bureau (41).

Model-based predictions from the survey described the relative distribution of alcohol consumption across population groups, while APC provided the national level of consumption in Belgium. These components were combined through a triangulation approach, whereby the survey-based distribution was normalised within each year and applied to APC, ensuring that total consumption matched national estimates while preserving differences across age, sex, and region from the survey. The resulting variable represents the estimated mean alcohol consumption in grams per day among current drinkers.

Estimates were then combined with projected population data and aggregated to derive population-level averages. Predicted values were weighted according to the projected population distribution.

As population projections do not include educational attainment, the distribution of education was modelled separately using BHIS data by year, sex, region, and age group. Bayesian GLMs fitted with INLA were used to estimate and project the proportion of individuals in each education category from 2008 to 2040. The predicted proportions were normalised within each stratum and merged with population projections to assign an education distribution to the projected population. Education-specific population counts were derived and combined with alcohol consumption estimates to assess differences across education groups, assuming that relative differences remained stable over time.

Posterior distribution

Posterior distributions for all model parameters were obtained using INLA. The posterior median was used as the point estimate for each predicted value, and 95% credibility intervals (CrIs) were derived from the 2.5th and 97.5th percentiles. This approach allows a probabilistic interpretation of uncertainty in the model estimates.

All analyses, including model fitting, estimation, and prediction, were conducted using the INLA package (version 24.05.10) in RStudio (version 4.5.3) (Posit, 2024).

Results

Table 1 presents the estimated trends in the prevalence of current drinkers in Belgium, from 2010 to 2040.

Trends in the prevalence of current drinking

The prevalence of current drinking is expected to decrease over time among the Belgian population aged 15 years and older. At the national level, the estimated prevalence in 2010 is expected to decrease from 80.4% (95% CrI 79.2–81.5) to 75.1% (95% CrI 71.3–78.5) by 2030, and to 72.3% (95% CrI 66.5–77.4) by 2040 (Table 1). These trends are shown in Fig. 1.

Table 1
Estimated prevalence of current drinkers (%) in the Belgian population aged 15 + years, by sex, region and age group, 2010–2040

	2010	2030	2040
	Prevalence (%, 95%CrI)	Prevalence (%, 95%CrI)	Prevalence (%, 95%CrI)
All of Belgium	80.4 (79.2–81.5)	75.1 (71.3–78.5)	72.3 (66.5–77.4)
Men	85.8 (84.8–86.8)	79.5 (75.7–82.8)	75.9 (70.0-80.9)
Women	75.2 (73.9–76.4)	70.8 (67.0-74.4)	68.8 (63.2–74.0)
Flemish Region	82.5 (81.4–83.5)	77.8 (74.3–80.9)	75.1 (69.6–79.7)
Walloon Region	79.2 (78.0-80.3)	72.9 (68.8–76.7)	69.7 (63.5–75.2)
Brussels Capital Region	71.5 (69.9–73.1)	66.2 (61.4–70.7)	63.7 (56.9–70.0)
15–44	81.4 (80.3–82.4)	72.3 (68.5–75.9)	66.8 (60.8–72.4)
45–64	83.9 (82.8–85.0)	79.7 (76.0-82.9)	77.2 (71.5–82.1)
65–84	72.6 (71.1–74.0)	74.6 (70.7–78.1)	75.5 (70.1–80.2)
85+	70.2 (68.7–71.7)	72.9 (69.0-76.5)	74.0 (68.5–78.9)

The projections showed a declining trend in both men and women, with a higher estimated prevalence among men persisting throughout the study period. Among men, the prevalence was projected to decrease from 85.8% (95% CrI 84.8–86.8) in 2010 to 79.5% (95% CrI 75.7–82.8) by 2030 and 75.9% (95% CrI 70.0-80.9) by 2040. Among women, the prevalence was projected to decrease from 75.2% (95% CrI 73.9–76.4) in 2010 to 70.8% (95% CrI 67.0-74.4) by 2030 and 68.8% (95% CrI 63.2–74.0) by 2040 (Table 1).

Projected regional and age-specific trends were similar (Supplementary File 2, Fig. 2), with a declining prevalence across all groups. Higher prevalence levels were consistently seen among men and adults aged between 44–65 (Table 1).

Trends in mean alcohol consumption

Table 2 presents the projected trends in mean alcohol consumption in the Belgian population aged 15 and above. Figure 2 shows the projected age- and sex-specific trends in current drinking prevalence and mean alcohol consumption. Age- and sex-specific estimates are provided in Supplementary File 2.

Table 2
Estimated mean alcohol consumption (g/day) in the Belgian population aged 15 + years, by sex, region, age group and educational level, 2010–2040

	2010	2030	2040
	Mean alcohol consumption in grams per day (95% CrI)	**Mean alcohol consumption in grams per day (95% CrI)**	**Mean alcohol consumption in grams per day (95% CrI)**
All of Belgium (age 15+)	23.8 (20.8–27.4)	14.2 (9.7–20.5)	10.5 (5.0-19.7)
Men	29.7 (25.9–34.1)	17.5 (11.9–25.1)	12.8 (6.0-24.1)
Women	18.3 (15.9–21)	11.1 (7.6–16)	8.3 (3.9–15.5)
Flemish Region	23.6 (20.6–27.1)	12.4 (8.4–17.8)	8.5 (4–16)
Walloon Region	24.4 (21.2–28)	17.2 (11.7–24.7)	13.7 (6.5–25.7)
Brussels Capital Region	23.4 (20.4–26.9)	16 (10.9–22.9)	12.5 (5.9–23.4)
15–44	24.4 (21.2–27.9)	13 (8.9–18.6)	8.8 (4.2–16.4)
45–64	26.5 (23.1–30.5)	15.4 (10.4–22.1)	10.8 (5.1–20.4)
65–84	18.5 (16.1–21.3)	15.2 (10.3–21.8)	12.8 (6–24)
85+	17.5 (15.2–20.2)	14.3 (9.7–20.6)	12.2 (5.7–22.9)
Less than secondary	25.3 (18.2–35.1)	14.8 (7.9–27.1)	10.5 (3.6–27.3)
Secondary	23.7 (17.3–32.4)	14 (7.6–25.2)	10.1 (3.5–25.9)
Higher education	23.5 (17.1–32.1)	14 (7.6–25.4)	10.2 (3.5–26.2)

Mean alcohol consumption in Belgium is projected to decrease over time. At the national level, mean consumption is projected to decrease from 23.8 g/day (95% CrI 20.8–27.4) in 2010 to 14.2 g/day (95% CrI 9.7–20.5) by 2030, and to 10.5 g/day (95% CrI 5.0-19.7) by 2040 (Table 2).

Figure 3: **Estimated trends in mean alcohol consumption (g/day) among the population aged 15 + years, by sex and region, Belgium 2008–2040, with 2030 targets**

The projected 2030 values were compared with the global target, corresponding to a 20% relative reduction from 2010 levels (Fig. 3). At the national level, the projected mean consumption (14.2 g/day) is below the target (19.0 g/day), suggesting that the reduction goal will be achieved. The same pattern is observed by sex and region, with projected values remaining below their respective targets: 17.5 vs 23.8 g/day for men, 11.1 vs 14.6 g/day for women, 12.4 vs 18.9 g/day in the Flemish Region, 17.2 vs 19.5 g/day in the Walloon Region, and 16.0 vs 18.7 g/day in the Brussels Capital Region (See Table 2).

Age- and sex-specific consumption trends

Age- and sex-specific trends in mean consumption are shown in Fig. 2, with detailed estimates provided in Supplementary File 2. Across all age groups, mean consumption is estimated to decrease for both men and women.

The same pattern is observed across all age groups, with projected 2030 consumption remaining below the corresponding targets for both men and women (Supplementary File 3).

Consumption level differences according to educational level

The estimated trends show a decrease in the mean alcohol consumption across all educational groups (Table 2; Fig. 3).

The estimated 2030 consumption is below the corresponding targets across all educational groups. For example, among individuals with less than secondary education, the estimated consumption is 14.8 vs 20.2 g/day, compared with 14.0 vs 19.0 g/day among those with secondary education and 14.0 vs 18.8 g/day among those with higher education.

Discussion

Projections in alcohol consumption

This study aimed to produce projected trends in alcohol consumption in Belgium by sex, region, age group and educational level and assess whether the SDG targets will be met. We found that both the prevalence of current drinking and the mean alcohol consumption among drinkers are estimated to decrease over time across all population subgroups. Despite these projected declines, alcohol consumption levels remain high across several population groups. In 2030, the average projected consumption, such as 16.0 g/day among men and 13.2 g/day at the national level, corresponds to approximately 1.6 and 1.3 standard drinks per day (assuming 10 g of pure alcohol per drink). While these levels are compatible with current national recommendations to reduce health damage (maximum 10 standard drinks per week with two alcohol-free days), they still reflect regular alcohol use (42). Importantly, international evidence indicates that no level of alcohol consumption is risk-free for health, meaning that even moderate consumption carries a risk of developing certain diseases (1). These findings also suggest that, although the 2030 targets of reduced drinking are expected to be achieved, alcohol consumption remains substantial in key subgroups, particularly among men and middle-aged individuals, indicating a persistent public health concern and underscoring the need for tailored interventions.

Our findings differ from those of previous modelling studies examining progress towards the previous WHO target of a relative reduction of at least 10% by 2025 (48, 49). Although alcohol consumption declined overall in the WHO European Region, substantial differences were observed between countries. For Belgium, the prevalence of current drinking was projected to remain stable, increasing from 78.2% in 2010 to 79.3% in 2035, with a similar pattern among both sexes. Total APC was also projected to remain at approximately 11.4 litres of pure alcohol per adult between 2010 and 2035 (48, 49). Based on the change observed between 2010 and 2017, the 10% reduction target set for 2025 was not expected to be achieved? (48, 49). In comparison, the Netherlands had already achieved the target, with a 13.3% reduction projection over the same period. Differences in national alcohol policies may provide some context for these contrasting trends (32, 50, 51).

In contrast to these earlier studies, our study projects declining trends in the proportion of current drinkers and the average consumption. Differences between the findings may be explained by differences in data availability and temporal coverage. The previous estimates were based on country-validated APC data from 2010 to 2016, using modelled estimates for 2017 from a global study (48, 49). Our models included seven BHIS waves between 1997 and 2023 for current drinking and four waves between 2008 and 2023 for mean consumption. The larger number of observations and inclusion of more recent data to better model changes between successive waves allowed for higher statistical power to inform the estimated trends. The two studies also assessed different targets and temporal horizons: a 10% reduction by 2025 in the previous studies (40, 41) and a 20% reduction by 2030 in the present study.

Subgroup analysis highlights important inequalities. Similar to other findings (52, 53), men in Belgium consistently consume more alcohol than women. However, the gap between men and women is estimated to narrow over time, as mean alcohol consumption is projected to decrease more among men, a pattern also reported in another projection study (54). These findings could highlight the need for gender-specific alcohol policies, as changes in alcohol consumption may be influenced by evolving gender norms and gender-targeted marketing (55). Policies should also consider age-related differences in women's drinking patterns across the life course (56, 57).

Age-specific patterns showed differences in alcohol consumption across the life course. While younger adults were estimated to consume less alcohol than middle-aged adults, this may reflect changing social norms, increased health awareness, or shifts in drinking preferences reported in previous studies (58, 59). However, lower average consumption does not necessarily indicate lower alcohol-related risk, as younger adults are more likely to engage in other risky drinking behaviours such as binge drinking (4). Moreover, early initiation remains an important public health concern as it may lead to later risk behaviours in life such as impaired neurocognitive functioning, increased risk of acute harm, greater likelihood of sustained (heavier) drinking over time (60). Studies in Flanders have shown that children and adolescents are frequently exposed to alcohol marketing around schools, which may normalise alcohol use and encourage earlier initiation (55, 58, 59). These findings support stronger regulation of alcohol marketing, particularly in environments frequently visited by young people (55).

In contrast, alcohol use among older adults is more likely to be regular and habitual, increasing risks of chronic disease (61), while regional differences further reflect the complexity of alcohol use in Belgium. Whereas some regions show progress, others exhibit slower declining trends, suggesting that local policy environments, cultural norms, and alcohol availability may be influencing drinking

patterns (62). This supports the need for region-specific preventive approaches alongside national strategies. Overall, these point to an uneven landscape: reductions among younger groups and progress in some regions are offset by sustained or slow declining trends of consumption among women, older adults, and certain regions. Achieving more consistent progress across population groups and regions requires both tailored interventions and stronger population-level measures (63, 64)

Policy implication

Although the projections suggest that the 2030 reduction targets are likely to be achieved, these relative targets do not necessarily correspond to alcohol consumption levels associated with low health risk (1, 42). Differences by sex, age, and region also highlight the value of monitoring progress across population groups, as national trends present important disparities (55, 65). These findings could be placed within Belgium's broader policy context, although the present study did not assess the content, implementation, or effectiveness of alcohol policies.

Belgium's first Inter-Federal Alcohol Plan (2023–2028) marks an important milestone in national alcohol policy, introducing 75 measures on prevention, care, alcohol marketing, availability, binge drinking, and drink-driving (32). However, its focus on harmful drinking indicators rather than overall consumption may limit its impact. At the same time, several WHO-recommended population-level measures, including stronger pricing policies, comprehensive marketing restrictions, and broader controls on alcohol availability, remain only partially implemented in Belgium (15, 42, 66). The WHO SAFER initiative outlines five strategies: drink-driving countermeasures, screening and treatment, restrictions on availability, increased taxation, and bans on advertising and promotion (65). Among these, restricting availability, limiting marketing, and increasing prices are the most cost-effective "best buys" (67). Evidence from Estonia and Lithuania shows that substantial reductions in alcohol consumption and alcohol-related harm can be achieved through comprehensive population-level strategies targeting these areas (16, 63). At the same time, emerging initiatives in the Netherlands suggest increasing attention to complementary local-level measures, including restrictions on alcohol marketing and the protection of vulnerable groups (64). Achieving sustained reductions in alcohol-related harm will depend on continued political commitment to implement and enforce comprehensive, evidence-based strategies (18). Building on the Inter-Federal Strategy, aligning closer with WHO recommendations and acting on the commercial determinants of health, including addressing the historical alcohol-industry lobbying, marketing, and the re-framing of alcohol use as a societal issue rather than an individual responsibility, could help address barriers to effective regulation and maximise the long-term public health impact of alcohol policies in Belgium (45, 63–66).

Limitations and Strengths

This study presents model-based projections of alcohol consumption based on historical trends observed in the BHIS and WHO consumption data. The projections assume that the relationships observed during the study period remain stable over time and should therefore be interpreted as projections under these assumptions rather than as precise forecasts (44, 47). Although survey data are essential for estimating drinking patterns across population subgroups, they are known to underestimate alcohol consumption. Combining survey data with APC improves the validity and comparability of alcohol exposure estimates (40, 44).

The modelling framework does not explicitly account for the implementation of current or future alcohol control policies and therefore cannot estimate their individual effects on alcohol consumption. Instead, the projections provide a reference scenario against which future observed trends can be compared. If future declines exceed those projected, this may suggest an additional contribution of alcohol control policies or other societal changes. Future research should therefore combine routine monitoring with robust quasi-experimental approaches, such as interrupted time-series (21) or difference-in-differences analyses (73), to evaluate the impact of specific policy measures.

Finally, the modelling approach is based on repeated cross-sectional data and does not capture individual behavioural changes or explicitly account for age-period-cohort APC effects, which may influence alcohol consumption through generational and societal changes (74). Educational differences were modelled separately and combined with the overall projections, assuming that these relationships remain stable over time. Changes in socioeconomic inequalities may therefore affect the accuracy of future subgroup projections.

Despite these limitations, this study provides the first comprehensive projections of alcohol consumption in Belgium. By combining nationally representative survey data with Total APC data through a triangulation approach (44), it produces more robust estimates while preserving differences across key sociodemographic groups. This allows detailed analyses by year, sex, region, age, and educational level, providing valuable information for public health monitoring, policy planning, and future evaluation.

An additional strength is the use of country-specific data, allowing the projections to reflect the Belgian drinking context rather than relying on global estimates. The modelling framework is flexible and can be updated as new data become available. Similar approaches have been applied in alcohol epidemiology (14, 52) and have already been used successfully to project smoking trends in Belgium (75), supporting their use for monitoring future alcohol consumption.

Conclusion

Alcohol consumption in Belgium is projected to decline over the coming years, with the 2030 reduction targets likely to be achieved at the national level and across population subgroups. However, alcohol consumption is expected to remain substantial, highlighting the need for continued monitoring and sustained public health action. By combining nationally representative survey data with adult per capita consumption through a triangulation approach, this study provides the first comprehensive projections of alcohol consumption in Belgium. These findings provide a valuable evidence base to support alcohol surveillance, policy development, and the future evaluation of alcohol control measures.

Abbreviations

AB
Attributable Burden
BeBOD
Belgian National Burden of Disease study
BHIS
Belgian Health Interview Survey
CrIs
Credibility intervals
GBD
Global Burden of Disease
GLM
Bayesian Generalized Linear Models
IHME
Institute for Health Metrics and Evaluation
INLA
Integrated Nested Laplace Approximation
NCDs
Non-communicable diseases
RW
Random Walk
SDGs
Sustainable Development Goals
SES
Socio-economic status
TOTAL APC
Total alcohol per capita
WHO
World Health Organization

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

BD is Co-Editor-in-Chief at Archives of Public Health. The other authors declare that they have no competing interests.

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Availability of data and materials

Not applicable

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Figures

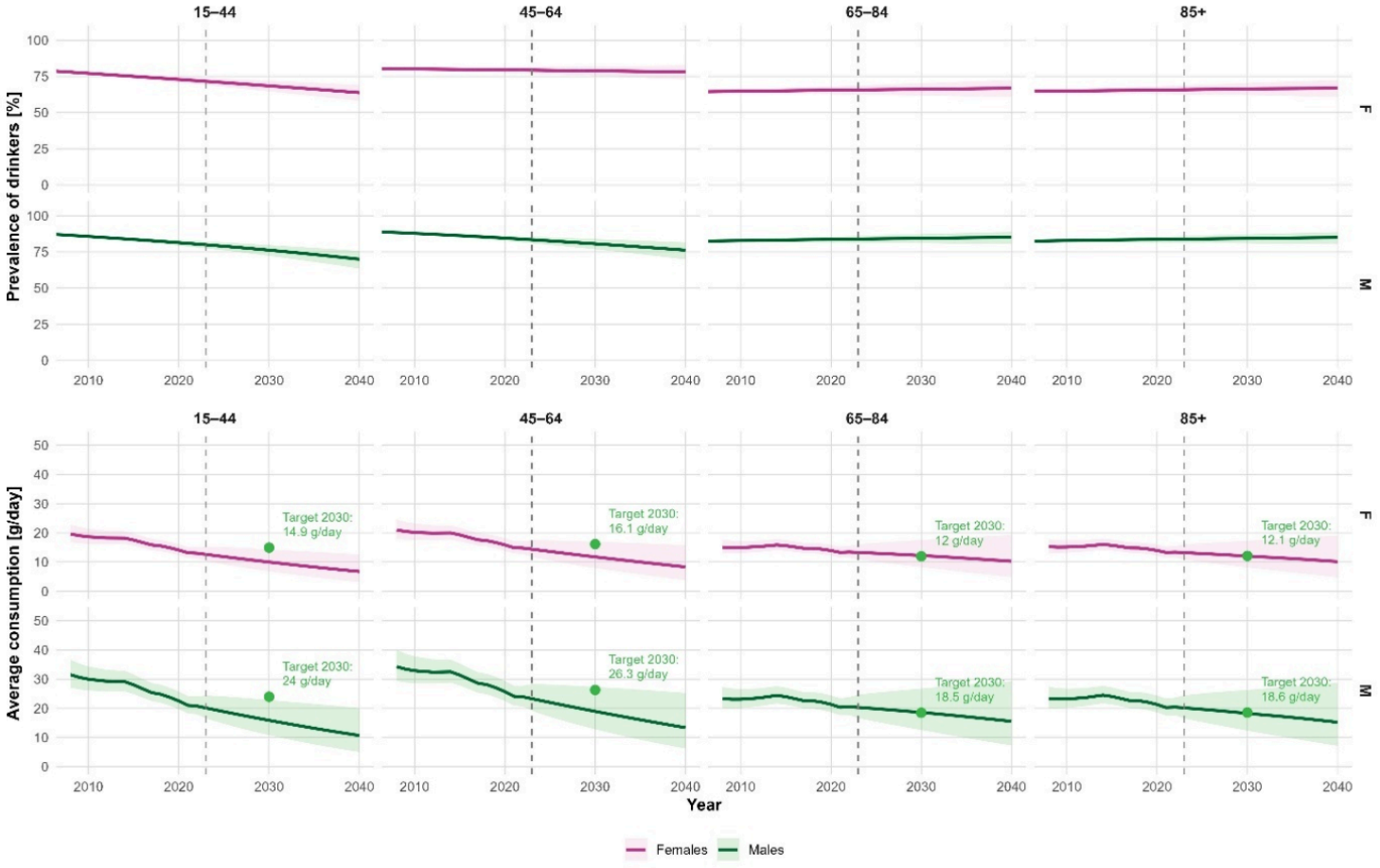


Figure 1

Estimated age- and sex-specific trends in prevalence of current drinking (%) and mean alcohol consumption (g/day) for the population aged 15+ years in Belgium 2008-2040, with 2030 targets

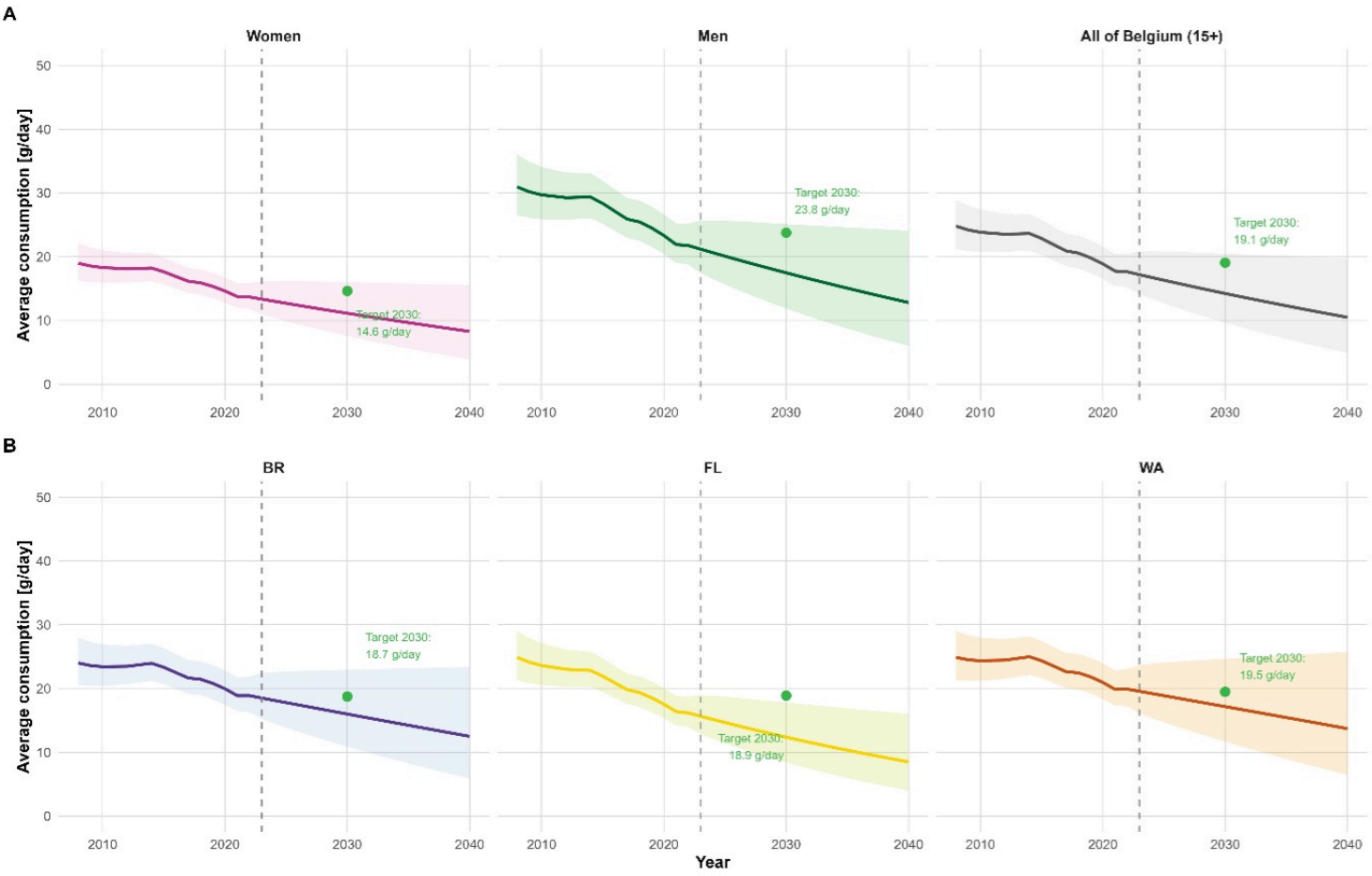


Figure 2

Estimated trends in mean alcohol consumption (g/day) among the population aged 15+ years, by sex and region, Belgium 2008- 2040, with 2030 targets

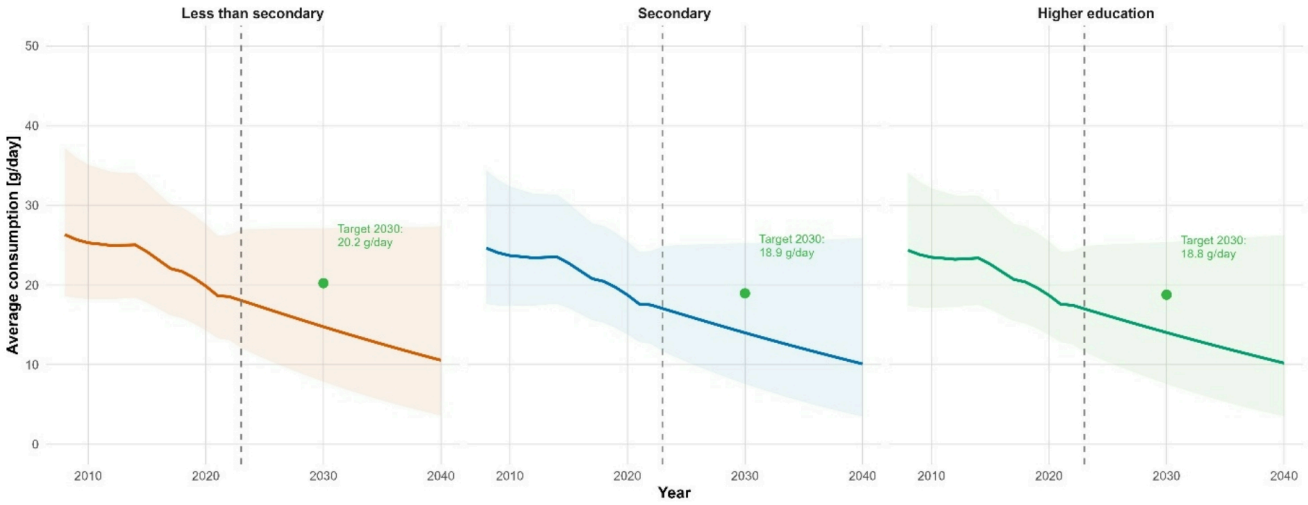


Figure 3

Estimated trends in mean alcohol consumption in the population aged 15+ years, by educational level, Belgium 2008-2040, with 2030 targets

Supplementary Files

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