RESET Alcohol

Lives saved and disease burden averted through reduced alcohol consumption in South Africa

A health-impact modelling study

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Executive summary

Alcohol use is a major causal contributor to death, disability, violence, injuries, and infectious disease in South Africa. Given the substantial public health burden associated with alcohol use, policies that reduce population alcohol consumption represent an important opportunity to improve population health. Alcohol excise taxation is one such policy instrument, with the potential to influence consumer behaviour and incentivise producers to reduce the alcohol content of their products.

Beer is particularly relevant to alcohol control policy in South Africa, accounting for approximately 54% of total absolute alcohol consumption in 2024. In the context of National Treasury's 2024 review of alcohol taxation, the Research Unit on the Economics of Excisable Products (REEP) has investigated alternative beer excise tax structures designed to encourage product reformulation and reduce overall alcohol consumption. Their analysis estimated the potential reductions in total alcohol consumption associated with each proposed tax structure.

This report extends that work by estimating the potential health benefits associated with these reductions. Using a comparative risk assessment approach, it quantifies the potential reductions in alcohol-attributable deaths and disability-adjusted life years (DALYs) under four alternative beer excise tax structures, based on the resulting consumption reduction as estimated by REEP:

- **Alcohol industry proposal:** 2.3% reduction in total absolute alcohol consumption.
- **REEP two-tier proposal:** 4.9% reduction.
- **REEP three-tier proposal:** 7.7% reduction.
- **REEP four-tier proposal:** 8.5% reduction.

The estimates are based on 2022 population, alcohol consumption, and burden of disease data for South Africa. Uncertainty is quantified using Monte Carlo simulation, and sensitivity analyses test the influence of alternative burden estimates and the exclusion of conditions without reliable alcohol relative risk functions.

Key findings

- Reducing alcohol consumption could avert a substantial number of alcohol-attributable deaths and DALYs in South Africa. Even the smallest modelled reduction, 2.3%, was estimated to avert approximately **509 deaths** and **24 201 DALYs** in one year, across males and females.
- The largest estimated gains occurred under the REEP four-tier proposal, corresponding to an 8.5% reduction in total alcohol consumption. This scenario was estimated to avert approximately **1 916 deaths** and **91 391 DALYs** across sexes.
- The revised three-tier REEP proposal, associated with a 7.7% reduction in total alcohol consumption, produced estimates close to those of the four-tier proposal: approximately **1 731 deaths** and **82 561 DALYs** averted across sexes.
- The alcohol-industry proposal produced the smallest estimated health gains, while the REEP two-tier proposal produced intermediate gains.
- Most absolute deaths and DALYs averted were among males, reflecting their higher levels of alcohol consumption and greater baseline alcohol-attributable burden. However, females experienced comparable—and for DALYs, sometimes larger—proportional reductions in burden.
- Infectious diseases, particularly HIV/AIDS and tuberculosis, accounted for the largest share of averted DALYs, followed by non-communicable diseases and injuries.
- If the reductions in alcohol consumption were sustained, similar annual health benefits could potentially be achieved in subsequent years. However, the magnitude of these benefits would depend on changes in population size, disease patterns, and drinking behaviour.

Policy implications

The results indicate that the design of beer excise taxes can have important implications for population health. Tax structures that create stronger incentives for producers to reformulate beer towards lower alcohol concentrations, and that reduce overall alcohol consumption more substantially, are associated with larger estimated reductions in alcohol-attributable deaths and disability.

The REEP three-tier proposal stands out as a potentially attractive option: it retains most of the estimated health benefit of the original four-tier structure while using fewer tax bands, which may simplify administration and compliance.

These findings support considering expected health outcomes alongside government revenue, industry effects, and administrative feasibility when evaluating alcohol-tax reforms. However, the estimated benefits depend on the assumed reductions in consumption and full industry reformulation. They should therefore be interpreted as potential health gains under specified scenarios, rather than guaranteed effects of implementation.

Conclusion

Reducing alcohol consumption through well-designed beer excise-tax reform could deliver meaningful public-health gains in South Africa. The evidence suggests that a tiered tax structure with stronger reformulation incentives could avert a substantial burden of alcohol-attributable mortality and disability while balancing health, fiscal, and administrative considerations.

Acronyms

- **AA**: absolute alcohol
- **AB**: Attributable Burden
- **BoDRU**: Burden of Disease Research Unit
- **CRA**: Comparative Risk Assessment
- **DALY**: Disability-Adjusted Life Year
- **GBD**: Global Burden of Diseases, Injuries, and Risk Factors
- **HED**: Heavy Episodic Drinking
- **IARC**: International Agency for Research on Cancer
- **LMIC**: Low- and Middle-Income Country
- **NBD3**: 3rd National Burden of Disease Study
- **NCD**: non-communicable disease
- **NDIS**: National Dietary Intake Survey
- **NIDS**: National Income Dynamics Study
- **PAF**: Population Attributable Fraction
- **PIF**: Potential Impact Fraction
- **REEP**: Research Unit on the Economics of Excisable Products
- **RR**: relative risk
- **SACRA2**: Second South African Comparative Risk Assessment Study
- **SAMRC**: South African Medical Research Council
- **SARS**: South African Revenue Service
- **SAWIS**: South African Wine Industry Information and Systems
- **SSB**: sugar-sweetened beverage
- **TMREL**: Theoretical Minimum Risk Exposure Level
- **UI**: Uncertainty Interval
- **WHO**: World Health Organization
- **YLD**: Year Lived with Disability
- **YLL**: Year of Life Lost

Background

Alcohol consumption contributes to a wide range of adverse health outcomes, from injuries and interpersonal violence to chronic conditions such as liver disease, cardiovascular disease and cancers, as well as mental and behavioural conditions. It is also associated with an increased risk of infectious diseases, including HIV and tuberculosis, through a combination of biological pathways and its influence on behaviour, vulnerability and engagement with health services.

In South Africa, alcohol-related harm is a particularly important public health and policy concern. The contribution of heavy episodic drinking to injuries, interpersonal violence, and HIV through sexual assault and risky sex is especially consequential., as these are all major contributors to South Africa's disease burden, while its longer-term effects add to the growing burden of non-communicable diseases. The harm also extends beyond individual health outcomes, affecting families and communities and placing additional demands on healthcare services.

National estimates have repeatedly demonstrated the substantial contribution of alcohol to mortality and disability. The Second South African Comparative Risk Assessment Study (SACRA2) estimated that 7.1% of all deaths and 5.6% of Disability-Adjusted Life Years (DALYs) were attributable to alcohol in 2012.[1] More recent Global Burden of Disease estimates suggest a declining share of total burden attributable to alcohol use – coinciding with reduced HIV mortality – but absolute figures remain high, at more than 21 000 alcohol-attributable deaths and 990 000 DALYs in 2023.[2]

The breadth of alcohol's effects on health, its substantial contribution to premature mortality and disability, and the resulting social and economic costs make it a leading modifiable population-level determinant of health and a suitable target for public health policy.

The potential of such policies was illustrated during the COVID-19 pandemic, when South Africa introduced temporary restrictions on alcohol sales, including periods of complete prohibition. The consequent reduction in alcohol availability effected a sizeable reduction in the overall number of unnatural deaths including femicide, and declines in several forms of alcohol-associated harm, including trauma presentations and demand on emergency healthcare services,[3–7] even after controlling for the contemporaneous effects of lockdowns and curfews.[5–7] The experience showed that changes in availability can be followed by rapid changes in health outcomes,

particularly those linked to acute consumption and injury. More broadly, it reinforced the evidence that policies influencing alcohol consumption can deliver measurable public health benefits. Sustained reductions in consumption may yield further gains over the longer term by reducing exposure to chronic disease risks and preventing premature death and disability.

Taxation is one of the key policy instruments for reducing alcohol consumption at the population level. By influencing the prices of alcoholic beverages, taxation can affect consumption levels, drinking patterns and choices between products of different alcohol content. Evidence shows that higher alcohol prices can delay the initiation of alcohol use, slow young people's progression towards heavier drinking, and reduce the prevalence of heavy episodic drinking. Pricing and taxation have been assessed as highly cost-effective "best-buy" interventions for the prevention of non-communicable diseases.[8]

In the South African alcoholic beverage market, beer occupies a dominant position, accounting for the majority of absolute alcohol (AA) consumption. Estimates from Euromonitor International show that beers were responsible for 54% of total consumption of AA in 2024, in line with the South African Wine Industry Information Systems (SAWIS) statistics showing that beer accounted for more than 70% of alcoholic beverage volume and 55% of AA.[9,10] This marked dominance of the alcohol market and the substantial contribution to total ethanol intake makes reducing alcohol consumption through beer particularly relevant for public health policy.

In the context of a global review of the alcohol taxation framework, the South African National Treasury has been considering, among other interventions, reforms to the alcohol excise structure for beers, moving from the existing uniform rate per litre of AA to a tiered structure, under which stronger beers would face higher tax rates (Figure 1, green line).[11] Such a structure could incentivise producers to reformulate products towards lower alcohol concentrations, while also influencing consumer choices through changes in relative prices.

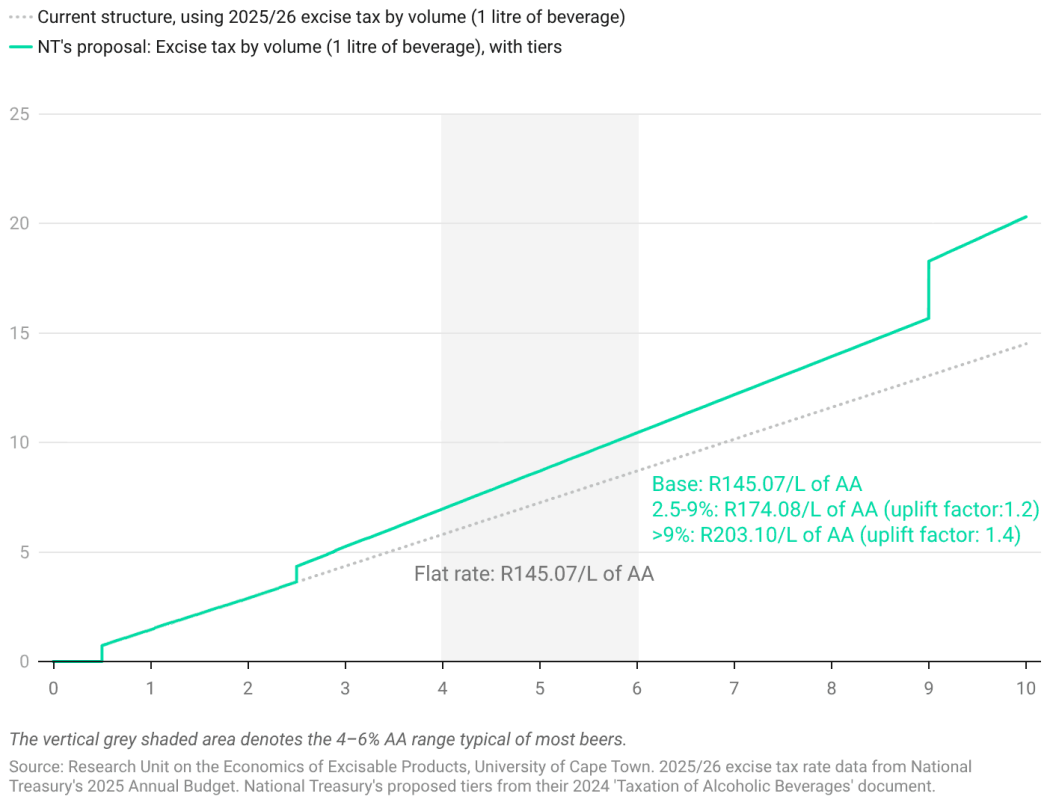


Figure 1: Beer excise tax by volume (1L of beverage), current vs. NT proposal

The Research Unit on the Economics of Excisable Products (REEP) developed a tax simulation model to assess the potential effects of the proposed beer excise tax reform in terms of population alcohol consumption, taking into account both consumers' response to changes in price structure and industry response in terms of reformulation.[12] The results of the simulations showed that National Treasury's proposed thresholds were unlikely to create meaningful incentives for reformulation, because nearly all beers on the South African market fall within the proposed 2.5%–9% AA band. Alternative tax structure were therefore developed, designed to provide stronger incentives for reformulation.[12]

The tax simulation model was used to compare the likely effects of the National Treasury and REEP proposals on beer consumption, AA consumption, government excise revenue, and industry revenue, under different assumptions about industry reformulation. In REEP's original report,[12] the main recommendation was a four-tier structure. Following further consultations organised by National Treasury to obtain feedback on its proposals from stakeholders, REEP published an addendum[13] that considered a range of alternative tax structures, including three-tier and two-tier options, as well as an alcohol industry proposal.

Table 1 and Figure 2 illustrate the four main scenarios considered in the simulations. [13]

Table 1: Simulated effects of alternative excise tax scenarios on alcohol consumption

Scenarios*	Reduction in AA consumed through beer	Reduction in total AA consumption**
A: Alcohol industry's proposal: • 0.5% to 3.5% AA: Uplift factor 0.8 • >3.5% to 9% AA: Base uplift factor 1.0 • >9% AA: Uplift factor 1.2	4.3%	2.3%
B: REEP's two-tier proposal: • 0.5% to 4.5% AA: Base uplift factor 1.0 • >4.5% AA: Uplift factor 1.2	9.0%	4.9%
C: REEP's three-tier proposal: • 0.5% to 3.5% AA: Base uplift factor 1.0 • >3.5% to 4.5% AA: Uplift factor 1.2 • >4.5% AA: Uplift factor 1.4	14.3%	7.7%
D: REEP's four-tier proposal: • 0.5% to 2.5% AA: Base uplift factor 1.0 • >2.5% to 3.5% AA: Uplift factor 1.2 • >3.5% to 4.5% AA: Uplift factor 1.4 • >4.5% AA: Uplift factor 1.6	15.7%	8.5%

* Simulations are from the (Zondi *et al.*, 2026) [13].

** Assuming that beer accounts for 54% of AA.[9]

AA = absolute alcohol.

All REEP scenarios assume that producers fully reformulate their products in response to the tax structure. The alcohol industry scenario assumes that only beers with an alcohol content between 3.5% and 4.9% ABV reformulate to 3.5% AA or below, while beers with 5.0% AA and above retain their existing alcohol content. Under REEP's original four-tier proposal (Addendum: Simulation 1), full reformulation is estimated to reduce AA consumed through beer by 15.7%. The revised three-tier proposal (Addendum: Simulation 2), which simplifies the structure by using thresholds of 3.5% and 4.5% AA, produces a similar reduction of 14.3%. The addendum therefore recommends this three-tier structure as the preferred option, as it retains most of the reduction in AA consumption while reducing the number of tax bands. Fewer tax

bands make the system easier to administer and comply with, thereby reducing complexity for the South African Revenue Service (SARS).

A two-tier structure with a threshold at 4.5% AA (Addendum: Simulation 7) produces a smaller estimated reduction in beer AA consumption of 9.0% under full reformulation. The industry proposal (simulation 9) produces an even smaller reduction, at 4.3%, reflecting its weaker incentives for reformulation.

As a reference, the original proposal from National Treasury (in the hypothesis of no reformulation) would result in a reduction of AA consumption through beer by less than 2%, equivalent to a reduction of approximately 1% in total alcohol consumption.

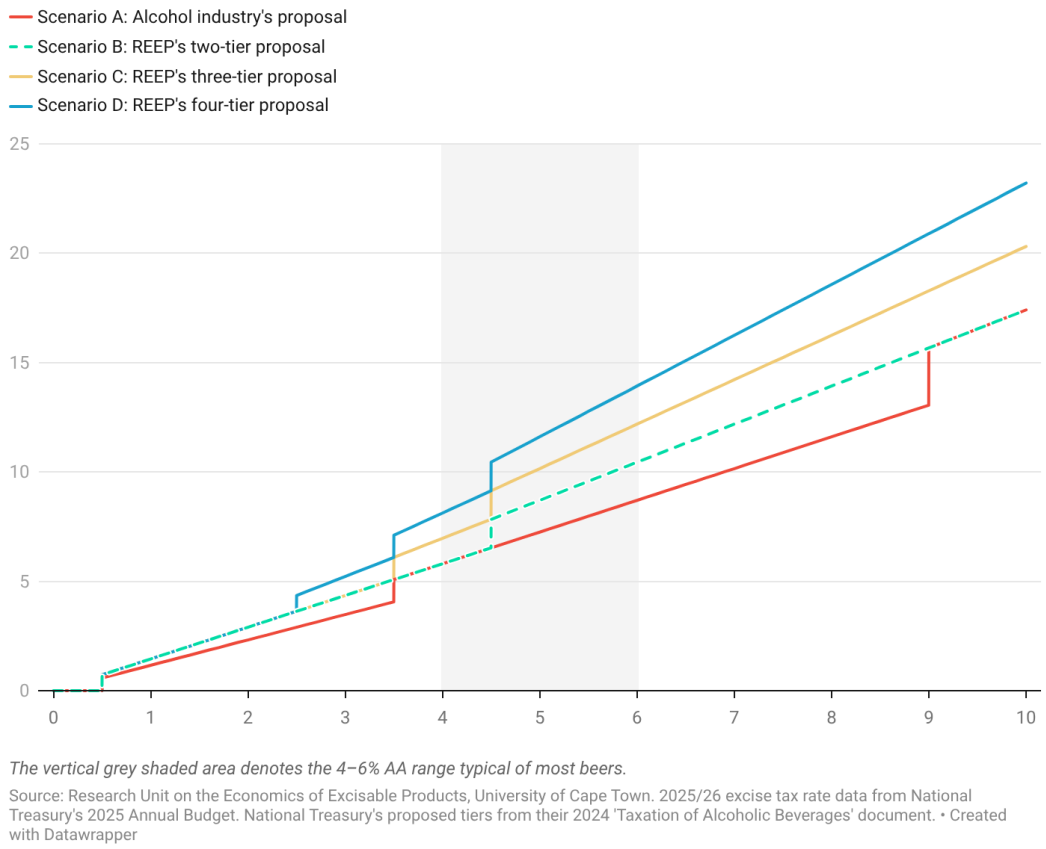


Figure 2: Beer excise tax by volume (1L of beverage), scenarios A-D

This report translates the alternative scenarios A, B, C and D into estimates of the potential health benefits for South Africa. Using a simulation approach, it estimates the alcohol-attributable burden that could be avoided under the different consumption-reduction scenarios.

The analysis considers two measures of health loss: deaths and DALYs. Together, these capture both the mortality and the non-fatal consequences of alcohol consumption, providing a broader assessment of potential health gains than mortality estimates alone. By comparing results across scenarios, the report illustrates how the magnitude of the averted burden depends on both the overall scale of the consumption reduction and its distribution across the population.

The report is complemented by a user-friendly simulation tool that allows users to extend the simulations presented here and explore the potential effects of arbitrary changes in population patterns of alcohol use (prevalence of drinkers, average daily consumption among drinkers across various risk categories, and prevalence of Heavy Episodic Drinking (HED) among drinkers defined by consumption of 60g of AA or more (5 standard drinks) in a single occasion.[14]).

Study objectives

The overall objective of this study was to estimate the annual reductions in the burden of disease in the South African population that could be achieved under alternative scenarios of total alcohol consumption (i.e., the averted burden).

Specific objectives were to:

1. estimate the number of deaths averted over one year with a 2.3%, 4.9%, 7.7% and 8.5% reduction in overall alcohol consumption.
2. estimate the number of DALYs averted in one year with a 2.3%, 4.9%, 7.7% and 8.5% reduction in overall alcohol consumption.
3. provide an age- and sex-specific breakdown of the averted burden.

The simulations were based on estimates of alcohol consumption and the total burden of disease for 2022.

Methods

To quantify the burden averted, we used the Comparative Risk Assessment (CRA) methodology,[15] as implemented in SACRA2.[16] The CRA methodology is a standardised and systematic approach to estimate the contribution of individual risk factors to the observed burden of disease. It compares the observed burden due to

health conditions affected by exposure to a risk factor with a hypothetical distribution in a population, making use of the observed level of the exposure and the epidemiological relationship between the risk factor and the affected health conditions.

The method is usually applied to estimate the reduction in burden that we would observe if the distribution of the risk factor of interest (alcohol consumption in this case) was the distribution associated with the minimum risk according to epidemiological evidence (Theoretical Minimum Risk Exposure Level (TMREL), usually assumed as 0 exposure in alcohol studies), leading to the estimation of Population Attributable Fractions (PAFs). However, the CRA approach is more general, and it can be used to compare the observed exposure with any counterfactual scenario to calculate generic Potential Impact Fractions (PIFs), of which PAFs are a special case.

Figure 3 provides an overview of the estimation procedures implied by the CRA methodology as applied in this study. Details are provided in the following sections.

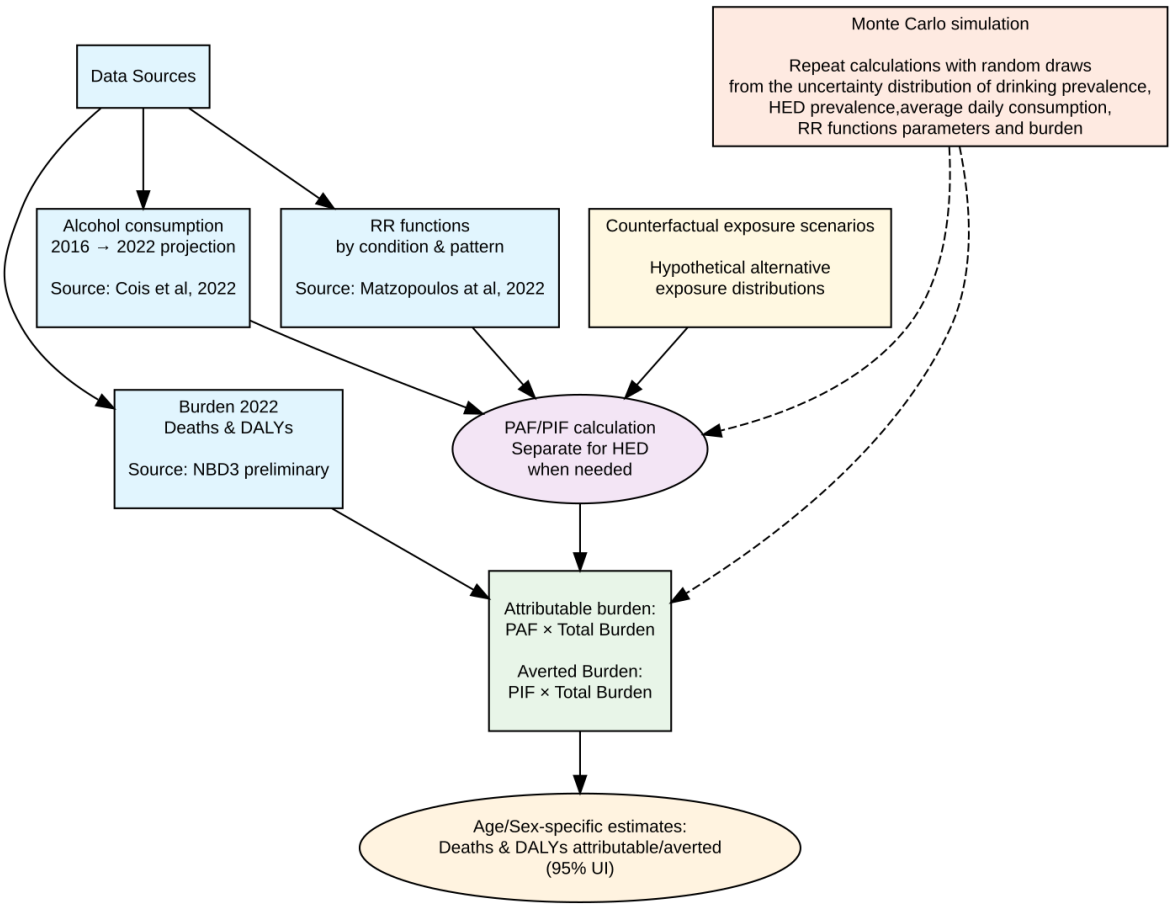


Figure 3: Overview of the estimation process

Data sources

Alcohol consumption

The estimation approach described in Cois et al.[17] and Matzopoulos et al.[1] was used to model age and sex-specific patterns of alcohol consumption (prevalence of drinkers and former drinkers, average daily consumption of alcohol and prevalence of HED) using multiple national surveys conducted between 1998 and 2016 and to project the results to the year 2022 under regularity assumptions.

Alcohol-attributable conditions

Based on epidemiological evidence and data availability, in the burden estimation we considered the health conditions listed in Table 2 and identified by the corresponding ICD-10 codes.[1] We sourced the relative risk (RR) functions linking alcohol consumption patterns to risk of developing each health condition from Matzopoulos et al.[1]

Given the lack of reliable evidence regarding the shape of the RR functions for alcoholic cardiomyopathy and alcohol use disorders (fully attributable to alcohol use), in the calculation of PIFs we assumed proportionality between average daily consumption and attributable burden.

Table 2: Health conditions related to alcohol consumption

Health outcomes	ICD-10 codes
Infectious diseases	
HIV/AIDS	B20 - B24.9, Z21
Lower respiratory infections	J09 - J15.8, J16 - J16.9, J20 - J21.9
Tuberculosis	A15 - A19.9
Injuries	
Interpersonal violence	X85 - Y09
Self-inflicted injuries	X60 - X84
Road traffic injuries	V01 - V04, V06, V09 - V80, V82 - V85, V87, V89
Drowning	V90, V92, W65 - W70, W73, W74
Falls	W00 - W19
Fires	X00 - X19
Poisoning	X40 - X49, Y67

Health outcomes	ICD-10 codes
Other unintentional injuries	V05, V81, V86, V88, V91, V93 - V98, W20 - W46.2, W49 - W62, W64 - W70, W75, W77 - W81, W83 - W94, W97, W99, X20 - X39, X50 - X54, X57 - X58, Y35 - Y84, Y87.0 - Y87.1, Y88 - Y88.3, Y89.0 - Y89.1
Cancers (neoplasms)	
Breast cancer	C50, D05
Colon and rectum cancer	C18 - C21, D01.0 - D01.4
Larynx cancer	C32, D02.0
Liver cancer	C22, D01.5
Oesophageal cancer	C15
Oral cavity, nose and pharynx cancer	C00 - C05; C08 - C10; C12 - C14, D00.0
Pancreatic cancer	C25, D01.7
Cardiovascular diseases	
Alcoholic cardiomyopathy	I42.6
Atrial fibrillation and cardiac arrhythmia	I47 - I49
Haemorrhagic stroke	I60 - I61.9, I62.0 - I62.03, I67.0 - I67.1, I68.1 - I68.2, I69.0 - I69.298
Hypertensive heart disease	I11 - I11.9
Ischaemic heart disease	I20 - I25
Ischaemic stroke	I63 - I63.9, I65 - I66.9, I67.2 - I67.3, I67.5 - I67.6, I69.3 - I69.398
Neuropsychiatric conditions	
Alcohol use disorders	F10 - F10.99, G31.2, G72.1, P04.3, Q86.0, R78.0, X45 - X45.9
Epilepsy	G40 - G41.9
Other chronic diseases	
Cirrhosis and liver disease	K70, K74
Diabetes mellitus	E11, E13, E14
Pancreatitis	K85 - K86

Burden

We sourced the estimates of the total number of deaths attributable to the conditions in Table 2 in the year 2022 from the preliminary estimates of the 3rd National Burden of Disease Study (NBD3), currently underway in the SAMRC Burden of Disease Research Unit. We used the methodology described in Bradshaw et al.[16] to recover the total number of Years of Life Lost (YLLs) and Years Lived with Disability (YLDs) and calculate DALYs attributable to each condition from the number of deaths.

Analyses

Analytical approach

For each scenario in Table 1 (and for the consumption scenario resulting from the National Treasury proposal, equivalent to 1% reduction in total AA consumption) and each disease in Table 2, we calculated the PIF and multiplied it to the total number of

deaths and DALYs attributable to the specific condition to obtain the averted burden of the condition relative to the specific scenario.

For conditions where the relative risk functions do not differ depending on HED status we used the exposure estimates and the RR functions described above to calculate the proportion of burden due to each disease attributable to alcohol use with the formula:

$$PIF = \frac{P_{FD} \cdot RR_{FD} + P_{CD} \int_{0.03}^{150} C(x) \cdot RR_{CD}(x)dx - (P^c_{FD} \cdot RR_{FD} + P^c_{CD} \int_{0.03}^{150} C(x) \cdot RR_{CD}(x)dx)}{1 + P_{FD}[RR_{FD} - 1] + P_{CD} \int_{0.03}^{150} C(x)[RR_{CD}(x) - 1]dx}$$

Where:

- P_{FD}, P_{CD}, $C(x)$ are the *observed* proportions of former drinkers and current drinkers, and the density function that describes the distribution of average daily use among drinkers, respectively.
- P^C_{FD}, P^C_{CD}, $C^C(x)$ are the corresponding *counterfactual* descriptors, i.e. the quantities that we would observe in case of reduction of alcohol consumption according to the various scenarios.
- RR_{FD} is the condition-specific RR for former drinkers and $RR_{CD}(x)$ is the RR for current drinkers as a function of the average daily alcohol use x in grams.

The integrals are extended from 0.03 g/day (corresponding to 1 drink per year, which is the minimum quantity that defines a current drinker) and 150 g/day.[18]

For conditions where the RR function depends on HED status, we applied the equation above separately to the fraction of population engaging/not engaging in HED, using the specific RR function, as described in Matzopoulos et al. and Sherk et al. [1,19]

Counterfactual distributions

In the main analyses we assumed that the proportional reductions in Table 1 apply uniformly across demographic strata and consumption categories.

A review of the literature (presented in Appendix 1) did not provide sufficient evidence to dispute the assumption of similar responses by sex and age category, but did suggest that price elasticities tend to decrease as alcohol consumption increases and

drinking patterns become riskier. Therefore, in secondary analyses, limited to Scenario D, we repeated the simulations assuming decreasing proportional reductions in alcohol consumption moving from low risk to high risk groups of drinkers, as per Table 3.

Table 3: Drinking risk categories definition and assumed relative elasticities

Risk category	Average daily consumption	Relative elasticity
Low risk	1 to 40 g (Males); 1 to 20 g (Females)	1 (ref)
Medium risk	41 to 60 g (Males); 21 to 40 g (Females)	0.8
High risk	61 to 100 g (Males); 41 to 60 g (Females)	0.5
Very high risk	>100 g (Males); >60 g (Females)	0.4

For this exercise we grouped drinkers according to the four World Health Organization (WHO) drinking risk categories,[20] and kept unchanged the total reduction at the population level (at 8.5%),

Uncertainty quantification

We used Monte Carlo simulation to quantify uncertainty in PIF and averted burden estimates. For each of the parameters involved in the calculation (prevalence of drinkers and HED, average consumption among drinkers, parameters of the RR functions and cause-specific burden) we extracted 1 000 draws from their uncertainty distribution (defined by their most likely values and their variance/covariance matrices) and repeated the estimation procedures. We considered the 2.5^{th} and 97.5^{th} percentiles as the limits of the 95% Uncertainty Interval (UI) of the estimate.

Sensitivity analyses

We analysed the sensitivity of our results to our assumptions regarding the total burden for each of the considered conditions, by repeating the simulations with the NBD3 estimates substituted with the published 2022 estimates from Global Burden of Diseases, Injuries, and Risk Factors (GBD).[2] We also repeated the simulations by

excluding the burden due to alcoholic cardiomyopathy and alcohol use disorders (for which no reliable RR functions are available).

The planned sensitivity analyses regarding the exposure distribution using the results from the 2022 National Dietary Intake Survey (NDIS) could not be conducted as the survey report and the underlying data are not yet available.

Results

Averted deaths and disability-adjusted life years

The simulations indicate that reductions in population alcohol consumption could avert a substantial burden of alcohol-attributable mortality and disability in South Africa each year. As expected, the estimated health gains increased monotonically with the assumed reduction in total alcohol consumption: the alcohol-industry proposal, corresponding to a 2.3% reduction, produced the smallest gains, whereas the REEP four-tier proposal, corresponding to an 8.5% reduction, produced the largest gains (Figure 4).

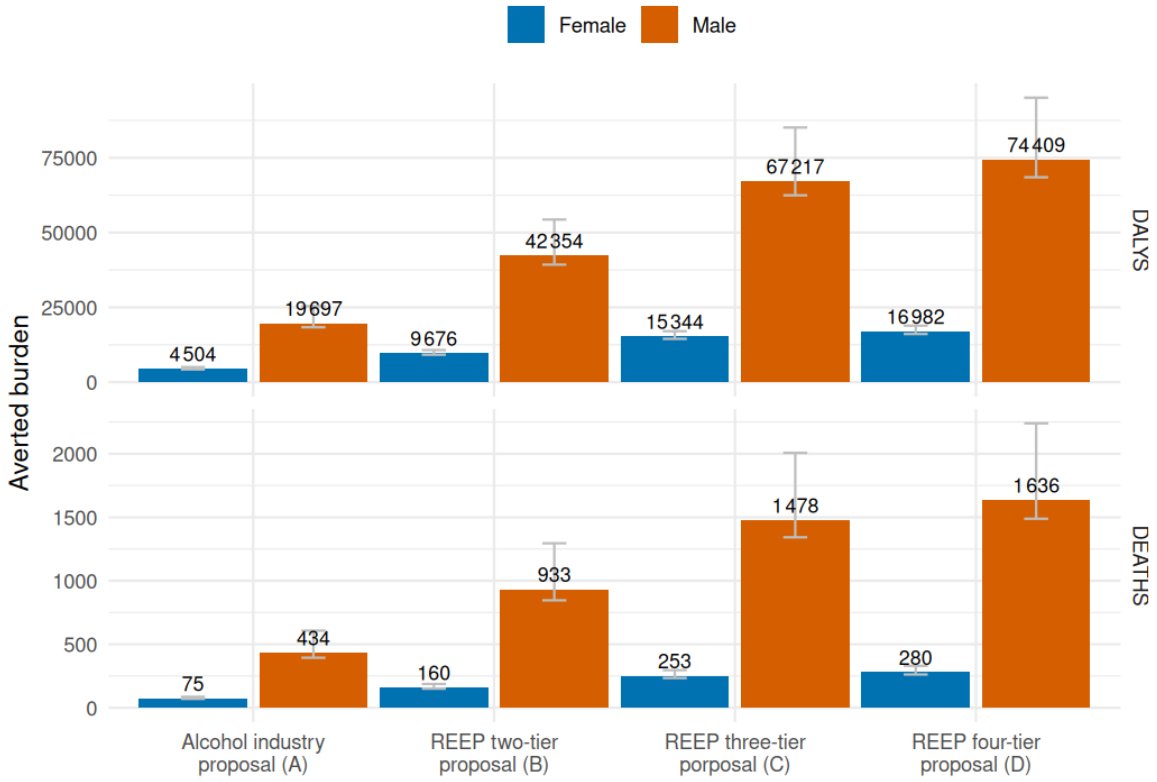


Figure 4: Averted burden by sex, South Africa 2022 (point estimate and 95% UI)

Under the alcohol-industry proposal, the model estimated 434 (95% UI: 394-607) averted deaths among males and 75 (70-86) among females, together with 19 697 (18 336-25 376) averted DALYs among males and 4 504 (4 255-5 013) among females in 2022. Under the REEP four-tier proposal, the corresponding estimates were 1 636 (1 488-2 239) deaths and 74 409 (68 484-95 078) DALYs averted among males and 280 (262-330) deaths and 16 982 (16 085-18 876) DALYs among females. Moving from the industry proposal to the four-tier REEP proposal was associated with an approximately four-fold increase in estimated averted deaths and DALYs.

For context, the original National Treasury proposal, was estimated to avert 188 (170-267) deaths and 8 524 (7 905-10 991) DALYs among males and 32 (30-38) deaths and 1 950 (1 841-2 170) DALYs among females.

These estimates represent the annual burden that could be averted under the modelled consumption scenarios, using 2022 population and disease-burden data. If the reductions in alcohol consumption were maintained, similar benefits could potentially occur in subsequent years, although the number of deaths averted would vary with changes in population size, disease patterns, and drinking behaviour.

Table 4: Estimated deaths and DALYs averted by scenario, South Africa 2022

Scenario	Total AA reduction	Male deaths averted	Female deaths averted	Male DALYs averted	Female DALYs averted
National Treasury reference	1%	188 (170-267)	32 (30-38)	8524 (7 905-10 991)	1 950 (1 841-2 170)
A: Alcohol industry proposal	2.3%	434 (394-607)	75 (70-86)	19697 (18 336-25 376)	4504 (4 255-5 013)
B: REEP two-tier proposal	4.9%	933 (846-1 295)	160 (150-187)	42 354 (39 275-54 347)	9 676 (9 159-10 729)
C: REEP three-tier proposal	7.7%	1478 (1 342-2 007)	253 (234-296)	67 217 (62 450-85 126)	15 344 (14 459-17 018)
D: REEP four-tier proposal	8.5%	1636 (1 488-2 239)	280 (262-330)	74 409 (68 484-95 078)	16 982 (16 085-18 876)

95% UI in brackets.

The revised three-tier REEP proposal, associated with a 7.7% reduction in total alcohol consumption, estimated to avert 1 478 (1 342-2 007) deaths and 67 217 (62 450-85 126) DALYs among males, and 253 (234-296) deaths and 15 344 (14 459-17 018) DALYs

among females. These are close to the estimates of the four-tier proposal. The two-tier REEP proposal produced intermediate gains.

The results indicate that introducing additional tiers in the excise tax structure leads to progressively greater reductions in alcohol consumption, accompanied by increasing health gains in terms of both deaths and disability averted.

In absolute terms, averted deaths and DALYs were consistently larger among males than females. This reflects the substantially higher prevalence of drinking, higher average consumption, and larger alcohol-attributable burden among South African men. In relative terms, however, sex differences were smaller. Notably, the proportional reduction in DALYs was somewhat larger among females than males, indicating that reductions in alcohol consumption may yield proportionally greater gains in healthy life years among female drinkers, even though the absolute number of averted DALYs remains larger among males (Figure 5).

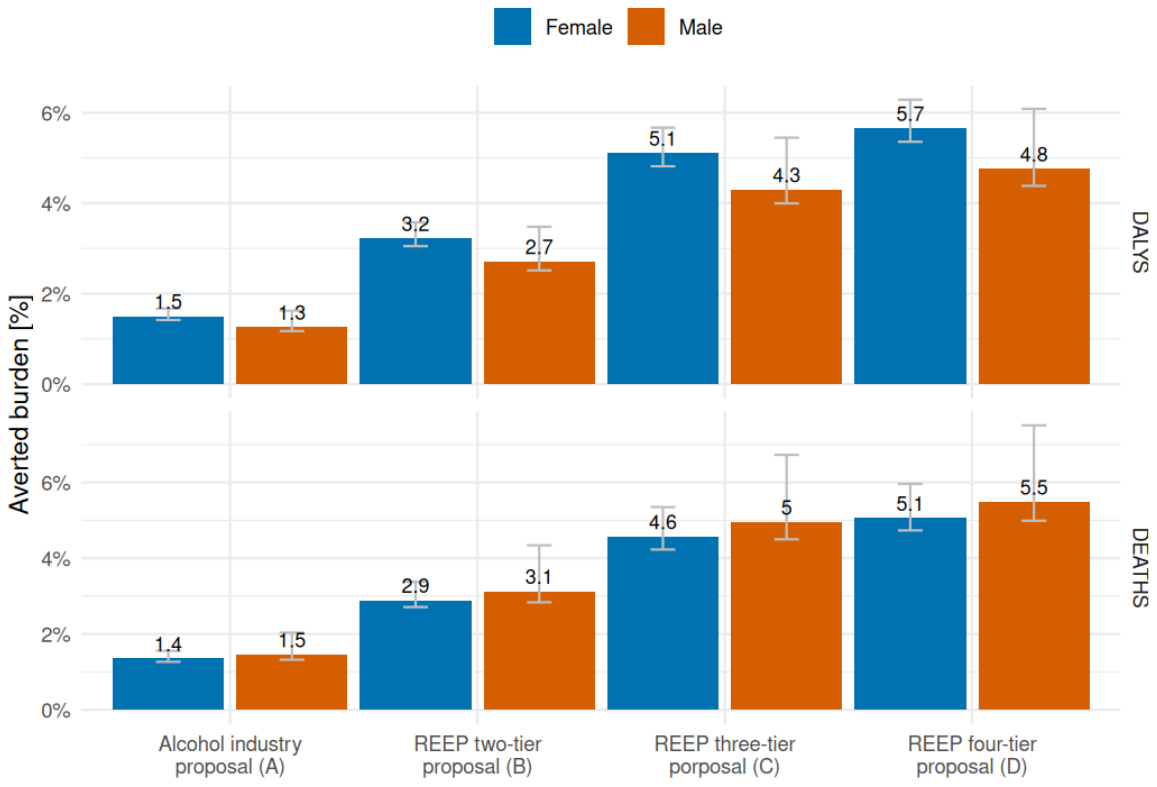


Figure 5: Averted burden as a proportion of the attributable burden, South Africa 2022 (point estimate and 95% UI)

Distribution by age and sex

The averted burden was distributed across all age groups, but its composition differed by age and sex (Table 5 to Table 8). Among males, the largest absolute numbers of averted deaths generally occurred at ages 45–64 years, whereas the largest reductions in DALYs were observed among adults aged 25–44 years. This pattern reflects the combined influence of higher alcohol-attributable mortality at older ages and the greater remaining life expectancy (and therefore greater DALY weight) of premature deaths and disability occurring at younger ages.

Among females, averted deaths and DALYs were concentrated at younger ages relative to males. The largest female DALY reductions were generally observed among those aged 15–34 years. These findings suggest that, although men account for most of the absolute avoidable burden, alcohol-control policies may also produce important gains among younger women, particularly through reductions in disability and premature mortality.

Table 5: Alcohol industry proposal: averted burden by age and sex, South Africa 2022 (point estimate and 95% UI)

		Deaths		DALYs	
Age	Cause	Male	Female	Male	Female
All	All	434 (394–607)	75 (70–86)	19 697 (18 336–25 376)	4 504 (4 255–5 013)
15-24	All	17 (14–21)	11 (9–13)	1 538 (1 304–1 806)	1 066 (928–1 239)
25-34	All	52 (43–64)	19 (15–23)	3 876 (3 320–4 575)	1 461 (1 252–1 739)
35-44	All	78 (65–113)	16 (13–20)	4 592 (3 869–6 235)	997 (862–1 182)
45-54	All	85 (67–163)	9 (8–12)	3 898 (3 170–7 108)	445 (382–560)
55-64	All	111 (83–257)	10 (8–14)	3 802 (2 985–8 649)	347 (285–483)
65+	All	90 (76–113)	10 (7–18)	1 990 (1 741–2 468)	188 (131–315)

Table 6: REEP's two-tier proposal: averted burden by age and sex, South Africa 2022 (point estimate and 95% UI)

		Deaths		DALYs	
Age	Cause	Male	Female	Male	Female
All	All	933 (846–1 295)	160 (150–187)	42 354 (39 275–54 347)	9 676 (9 159–10 729)
15-24	All	38 (30–46)	23 (20–28)	3 324 (2 795–3 900)	2 301 (2 016–2 713)
25-34	All	113 (92–137)	40 (34–50)	8 374 (7 043–9 822)	3 163 (2 731–3 737)
35-44	All	169 (140–237)	35 (29–44)	9 898 (8 409–13 239)	2 135 (1 824–2 556)
45-54	All	183 (143–351)	20 (16–26)	8 362 (6 857–16 097)	943 (809–1 192)
55-64	All	237 (178–562)	20 (16–29)	8 139 (6 312–17 936)	737 (608–999)
65+	All	192 (160–247)	21 (14–38)	4 257 (3 685–5 345)	397 (287–669)

Table 7: REEP's three-tier proposal: averted burden by age and sex, South Africa 2022 (point estimate and 95% UI)

		Deaths		DALYs	
Age	Cause	Male	Female	Male	Female
All	All	1 478 (1 342–2 007)	253 (234–296)	67 217 (62 450–85 126)	15 344 (14 459–17 018)
15-24	All	60 (49–74)	37 (31–44)	5 304 (4 449–6 192)	3 670 (3 187–4 337)
25-34	All	181 (148–217)	65 (54–80)	13 361 (11 389–15 662)	5 056 (4 339–6 032)
35-44	All	270 (224–385)	55 (46–69)	15 749 (13 542–21 184)	3 374 (2 896–4 045)
45-54	All	290 (228–535)	31 (25–41)	13 235 (10 874–24 530)	1 474 (1 254–1 839)
55-64	All	374 (280–840)	32 (26–46)	12 852 (10 071–26 544)	1 151 (958–1 566)
65+	All	303 (253–383)	33 (21–62)	6 717 (5 839–8 295)	620 (439–1 016)

Table 8: REEP's four-tier proposal: averted burden by age and sex, South Africa 2022 (point estimate and 95% UI)

		Deaths		DALYs	
Age	Cause	Male	Female	Male	Female
All	All	1 636 (1 488–2 239)	280 (262–330)	74 409 (68 484–95 078)	16 982 (16 085–18 876)
15-24	All	67 (54–82)	41 (34–49)	5 881 (4 934–6 967)	4 068 (3 547–4 759)
25-34	All	201 (165–243)	72 (59–88)	14 813 (12 430–17 264)	5 608 (4 826–6 639)
35-44	All	299 (246–422)	61 (51–76)	17 447 (14 700–23 952)	3 730 (3 236–4 504)

		Deaths		DALYs	
Age	Cause	Male	Female	Male	Female
45-54	All	321 (253–631)	34 (28–44)	14 639 (11 887–26 516)	1 625 (1 397–2 063)
55-64	All	414 (310–957)	35 (28–49)	14 206 (10 982–29 409)	1 268 (1 074–1 736)
65+	All	335 (275–423)	37 (25–69)	7 422 (6 376–9 165)	683 (487–1 149)

Disease groups

Across all scenarios, infectious diseases contributed the largest share of averted deaths and DALYs, driven principally by HIV/AIDS and tuberculosis. Non-communicable diseases constituted the next largest contributions (Figure 6 and Figure 7).†

† For clarity of representation, uncertainty intervals are not included in the figure. They are available in Appendix 2

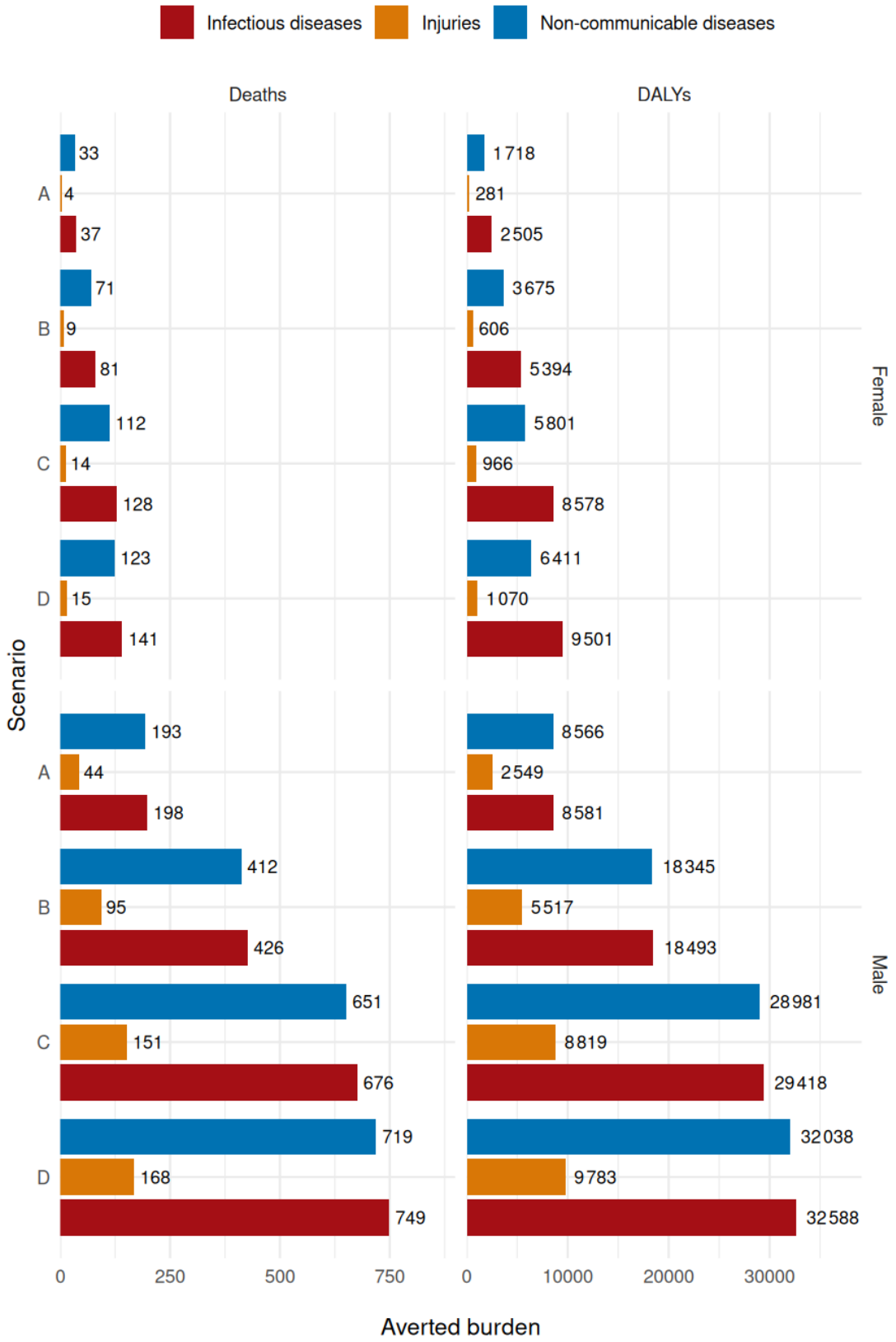


Figure 6: Averted burden, by broad disease group and sex, South Africa 2022

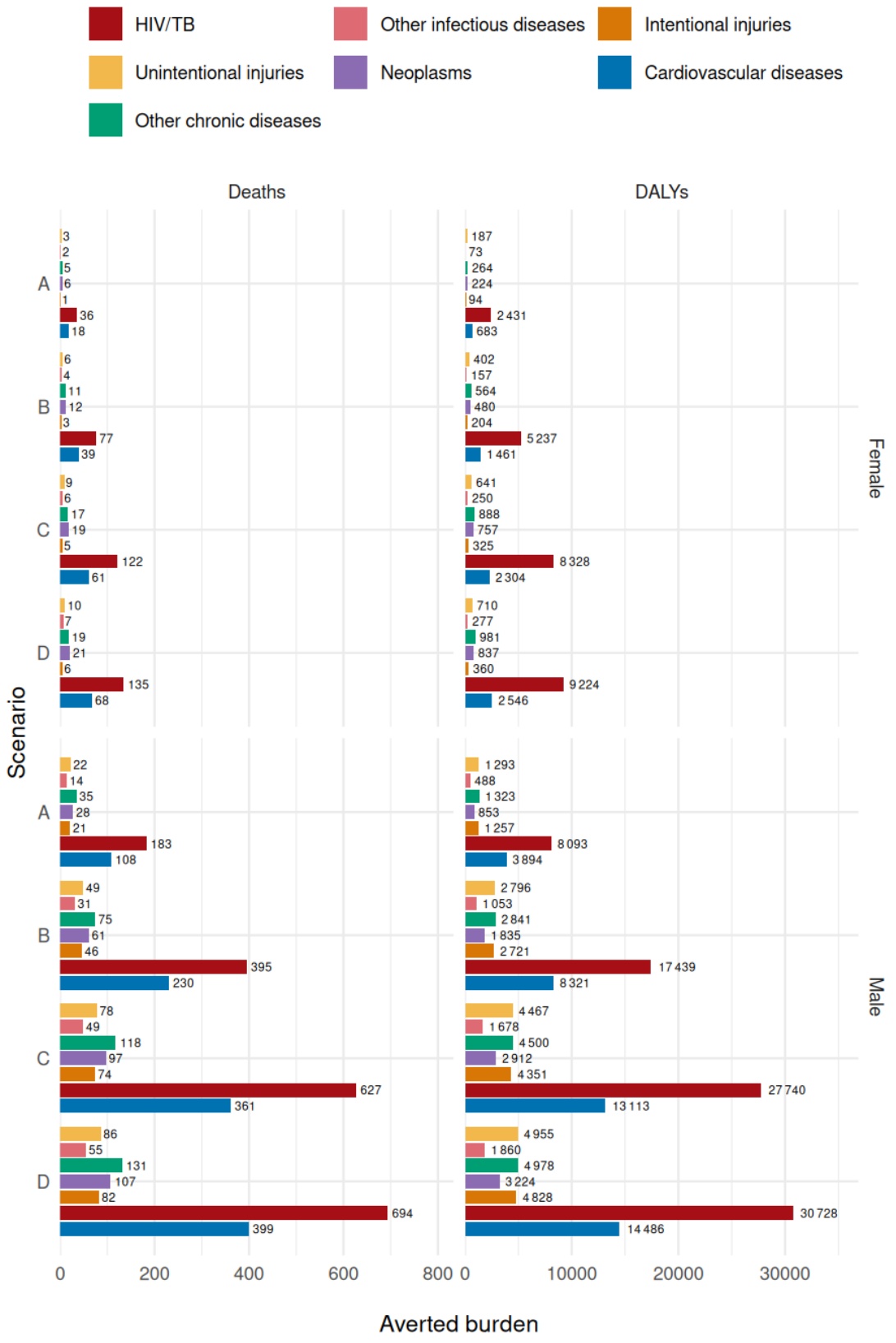


Figure 7: Averted burden, by disease group and sex, South Africa 2022

This distribution is consistent with the epidemiology of alcohol-related harm in South Africa, where alcohol contributes not only to chronic diseases and injuries but also to HIV and tuberculosis through behavioural, social, and health-service pathways. The prominence of infectious-disease outcomes therefore distinguishes the South African setting from many high-income countries, where alcohol-attributable cancer, cardiovascular disease, and injury often dominate burden estimates.

The detailed disease-group results show that HIV/TB accounted for the largest component of averted infectious-disease burden, while cardiovascular diseases were the leading non-communicable-disease contributor. Among injuries, both intentional and unintentional injuries contributed materially to the estimated gains, particularly among males.

Varying price elasticities

Allowing price elasticities to differ across drinking risk categories, while holding the overall reduction in absolute alcohol consumption at 8.5%, increased estimated averted deaths and DALYs among males by 5.6% and 6.5%, respectively. Among females, there was no meaningful change in averted deaths (0.1%), and a modest decrease in the number of averted DALYs (-5.6%).

The redistribution of consumption reductions across risk categories also altered the disease-group composition of the estimated gains. Among males, averted deaths and DALYs increased for infectious diseases by 8% and 9%, respectively, and for injuries by 16% and 17%, with little change for non-communicable diseases. Among females, changes were smaller: infectious-disease deaths and DALYs decreased by 1.4% and 2.7%, non-communicable-disease deaths increased by 2.4% while DALYs decreased by 1.5%, and injury estimates showed no meaningful change (Figure 8).

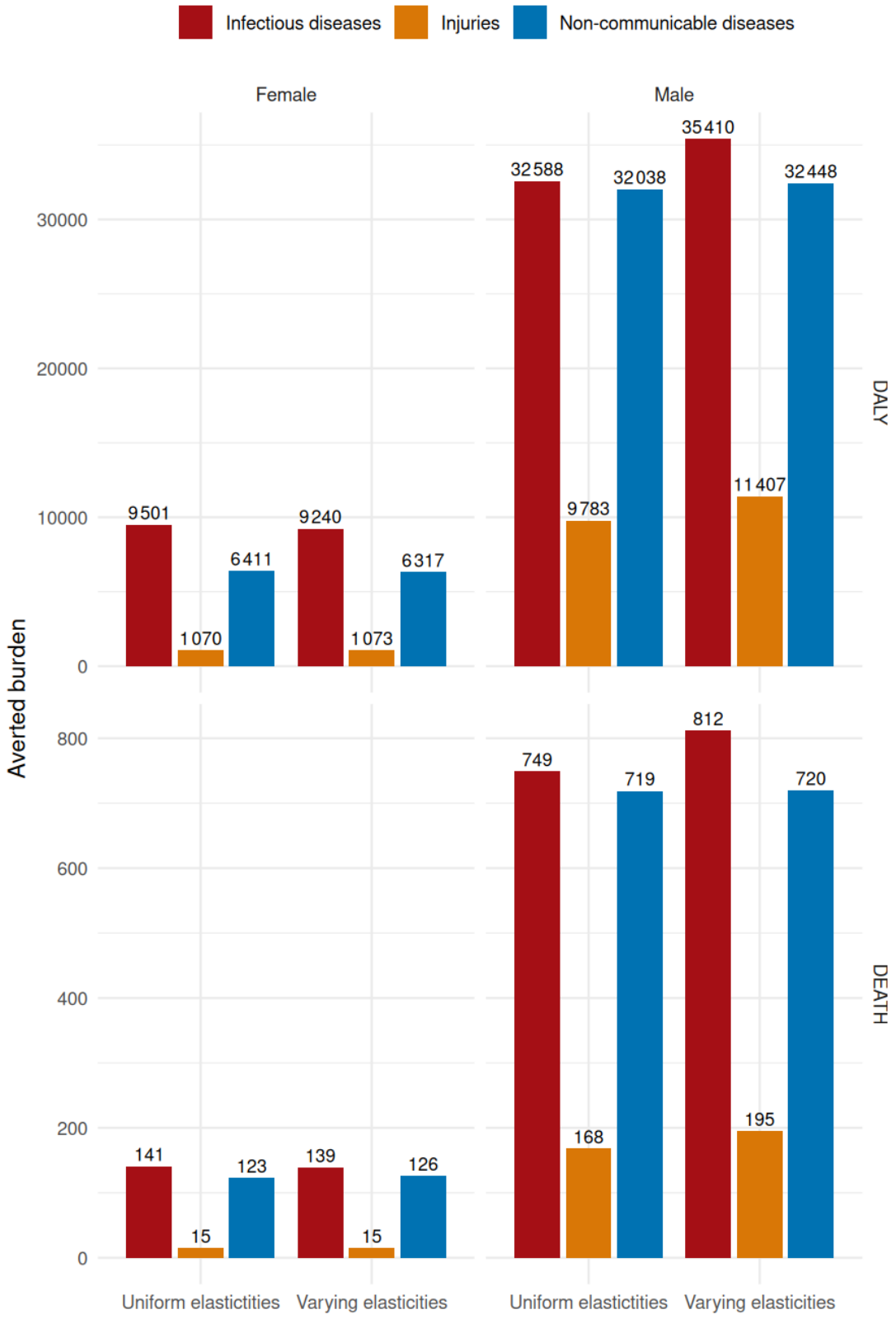


Figure 8: Averted burden for 8.5% reduction in AA consumption by broad disease group and sex under uniform and varying price elasticities, South Africa 2022

Sensitivity analyses

Replacing NBD3 burden estimates with GBD Study estimates produced relatively minor changes in the estimated number of averted deaths and DALYs (Figure 9). This indicates that the direction and broad magnitude of the findings are robust to the choice of burden source, although the precise size of the estimated health gains is sensitive to the underlying cause-specific burden estimates.

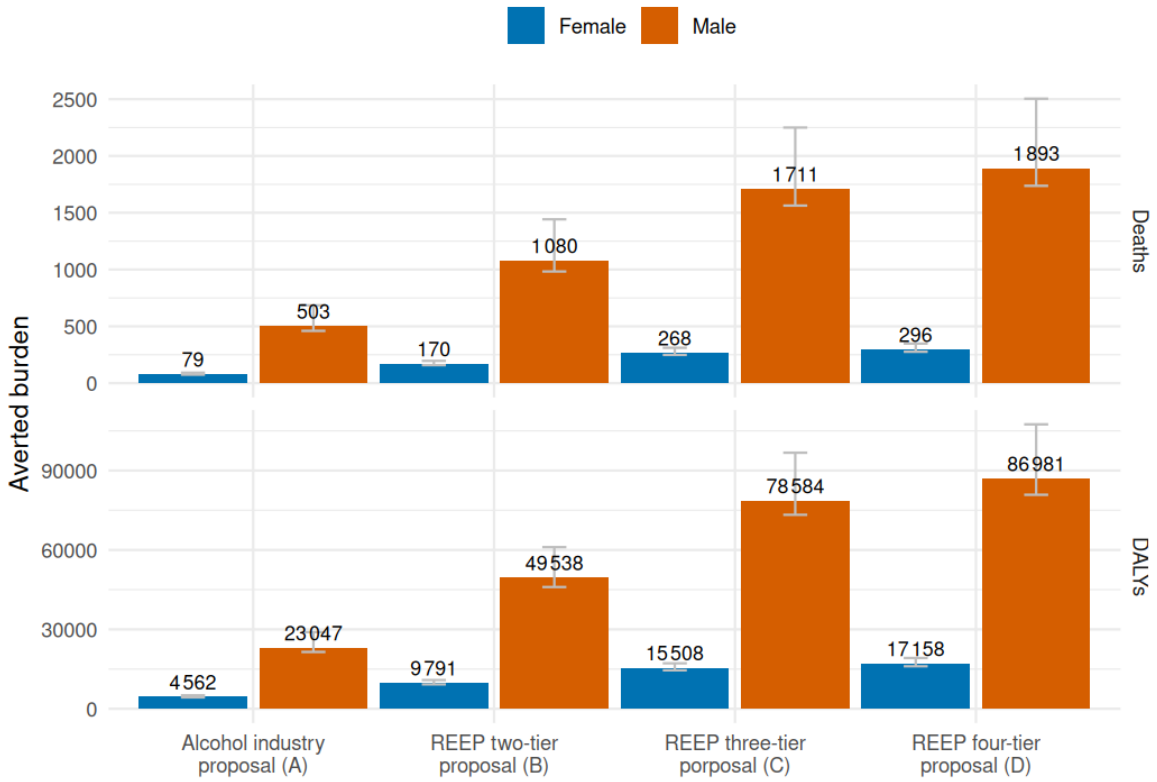


Figure 9: Sensitivity analysis 1 (replacing NBD3 burden estimates with GBD Study estimates): Averted burden by sex, South Africa 2022 (point estimate and 95% UI)

Excluding alcoholic cardiomyopathy and alcohol use disorders (the two conditions for which reliable alcohol relative risk functions were not available) reduced estimated averted deaths between 3.1% and 6.4% across scenarios and sexes, and averted DALYs between 13.4% and 16.2% (Figure 10). The larger effect on DALYs reflects the substantial disability weight and high prevalence of alcohol use disorders. Given the

exclusion of two conditions fully attributable to alcohol consumption, these estimates should be regarded as conservative.

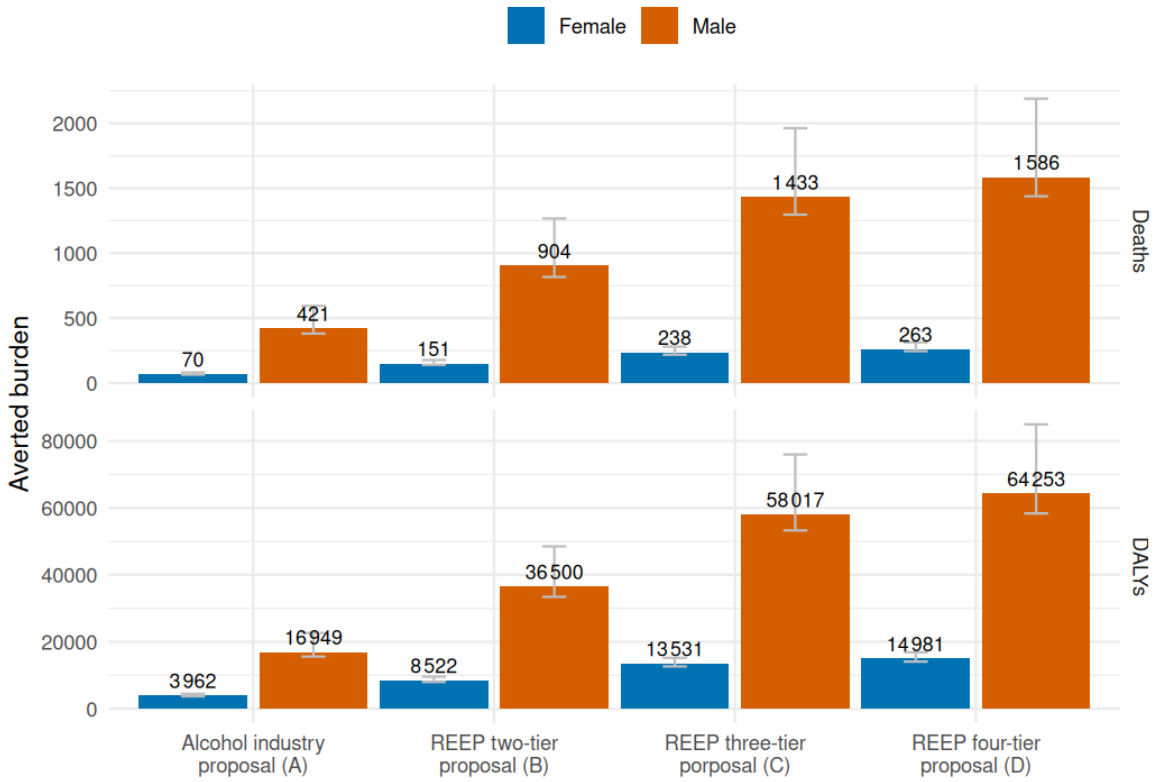


Figure 10: Sensitivity analysis 2 (excluding alcoholic cardiomyopathy and alcohol use disorders): Averted burden by sex, South Africa 2022 (point estimate and 95% UI)

Modelling tool

The interactive modelling tool complementing this report allows readers to go beyond the scenarios discussed above and explore the effect of alternative, user-defined changes in population patterns of alcohol use.

The application reproduces the simulation model used throughout this report‡, but lets users specify their own hypothetical scenario rather than being limited to the

‡ For reasons of computational efficiency, to allow the simulations to proceed at a reasonable speed without requiring high-specification hardware, the app makes slightly different computational choices. This might result in some small, substantively inconsequential, discrepancies between the results provided by the app and those included in this report.

ones presented here. Scenarios are defined in terms of proportional changes, by sex and age group, to three dimensions of alcohol use (Figure 11):

- the prevalence of drinkers in the population;
- the prevalence of heavy episodic drinking among drinkers;
- the average daily consumption among drinkers, specified separately for each WHO consumption-risk category (low, moderate, high and very high risk), allowing changes to be concentrated in specific categories rather than applied uniformly.

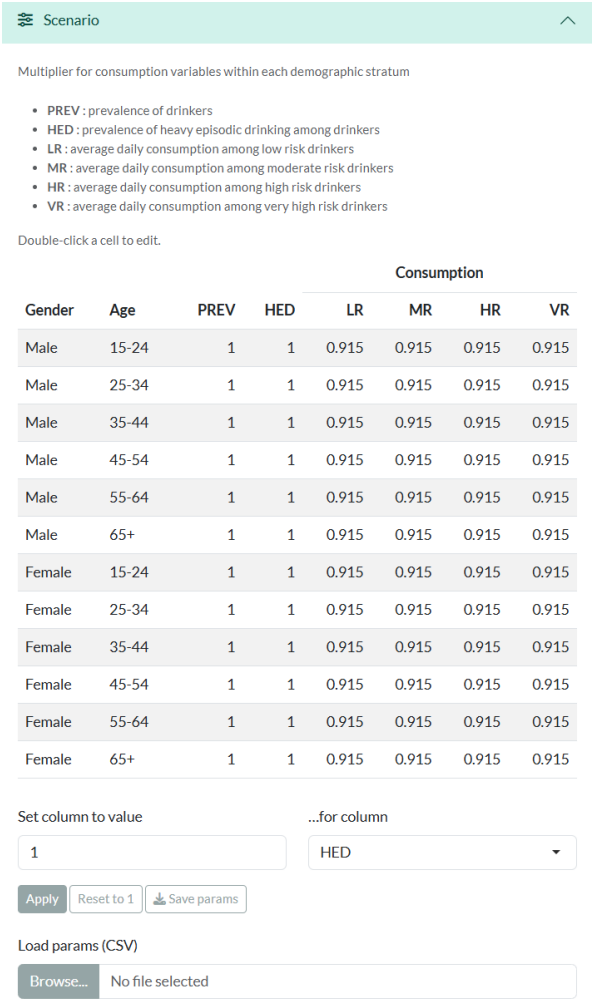


Figure 11: Interactive modelling tool: screenshot of input panel

Once a scenario is specified, the application runs the simulation model and reports the resulting averted burden (deaths, years of life lost, years lived with disability and disability-adjusted life years) broken down by disease, sex and age group, in both graphical and tabular form (Figure 12).

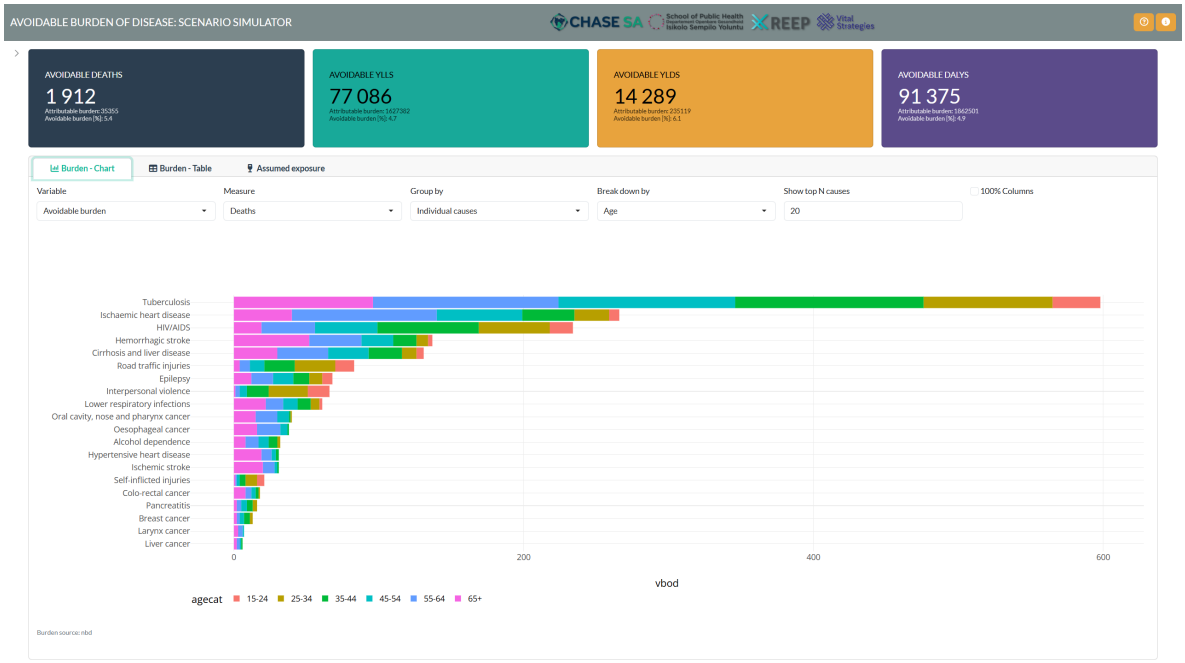


Figure 12: Interactive modelling tool: screenshot of output panel

A dedicated summary view also shows how the scenario reshapes the underlying distribution of consumption across risk categories, before and after the simulated change, making it possible to see not only the resulting change in health burden but the behavioural shift assumed to produce it (Figure 13).

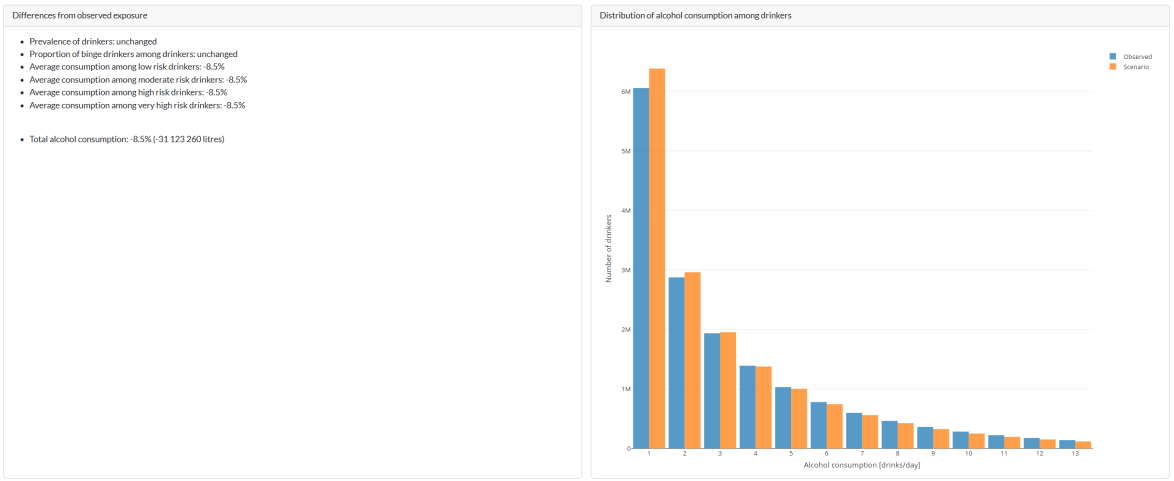


Figure 13: Interactive modelling tool: screenshot of output panel

The application is intended as an exploratory tool for readers wishing to test the sensitivity of the results to assumptions different from those adopted in this report, or to examine scenarios of particular policy interest not covered here. It is not intended to replace the modelling choices and parameterisation described in the Methods

section, which remain the basis for the central estimates presented above. Full instructions for using the application are provided within the tool itself.

The application's source code is available at https://github.com/AnnibaleCois/RESET-IMPACTSIM (tag v1.0.0, corresponding to the results in this report). Instructions for running it locally are provided in the repository's README.

Discussion

This study used a comparative risk assessment framework to estimate the potential reduction in alcohol-attributable deaths and DALYs associated with alternative reductions in population alcohol consumption in South Africa. The central finding is that even modest reductions in alcohol consumption could avert meaningful numbers of deaths and DALYs, and that the magnitude of these gains rises substantially with the size of the consumption reduction.

Under the most ambitious scenario modelled, the REEP four-tier proposal corresponding to an 8.5% reduction in total alcohol consumption, the analysis estimated approximately 1 916 deaths and 91 391 DALYs averted across sexes in one year. Even the smallest modelled reduction, 2.3%, was associated with an estimated 509 deaths and 24 201 DALYs averted.

These estimates translate a fiscal-policy scenario into population-health outcomes and provide a health dimension against which alternative beer excise-tax structures can be compared. The estimated benefits were strongly related to the assumed reduction in total alcohol consumption: the four-tier REEP proposal produced approximately four times the estimated health gain of the industry proposal, while the revised three-tier proposal retained most of the benefit of the four-tier design while reducing administrative complexity.

These findings are consistent with international evidence that higher alcohol prices reduce consumption and alcohol-related harm. Systematic reviews and meta-analyses find that increases in alcohol price or taxation are associated with lower demand, reduced heavy drinking, and delayed drinking initiation, with effects observed in both high income and low- and middle-income settings.[21–23]

The South African results also highlight the potential value of tax structures that encourage reformulation towards lower-alcohol products. If producers respond to tiered excise rates by reducing the alcohol content of beer, the resulting reduction in

population ethanol exposure could generate health benefits even among consumers who do not materially change their purchasing behaviour. However, the health estimates presented here are conditional on the assumed consumption response and full industry reformulation; they should not be interpreted as predicted effects of an implemented tax without further evidence on behavioural and market responses.

Sex and age patterns

The larger absolute burden averted among males reflects their higher prevalence of drinking, higher average consumption, and greater baseline alcohol-attributable mortality and disability. This pattern is consistent with South African burden of disease evidence showing that alcohol contributes disproportionately to male mortality, injuries, violence, and infectious disease outcomes.[1,16]

Nevertheless, the results should not be read as implying that alcohol control is less important for women. In proportional terms, females were estimated to experience comparable, and in some DALY outcomes larger, reductions in attributable burden. Furthermore, the concentration of female DALY gains among younger age groups underscores the potential for alcohol policy to prevent disability and premature mortality earlier in the life course, particularly in light of the concerted effort by the alcohol industry to grow the young female drinker market segment in South Africa.

The age patterns also have policy relevance. The largest male mortality gains occurred among adults aged 45–64 years, while the largest DALY gains occurred among adults aged 25–44 years. This distinction illustrates why both deaths and DALYs should be reported: mortality-based evaluations may understate the value of interventions that prevent premature death and disability among younger adults.

Disease-specific implications

The prominence of HIV/TB in the estimated averted burden reflects the substantial contribution of alcohol to infectious-disease outcomes in South Africa. Alcohol may increase susceptibility to HIV and tuberculosis and worsen treatment engagement and adherence through behavioural and structural pathways. Consequently, alcohol-tax policy may have benefits that extend beyond conventional non-communicable-disease prevention and complement HIV and TB control strategies.

The substantial contribution of injuries further supports the public-health case for alcohol pricing policy. South African evidence from the COVID-19 alcohol-sales restrictions showed rapid declines in trauma presentations, emergency healthcare demand, and unnatural deaths during periods of restricted availability.[3–5] Although those interventions were far more restrictive than an excise-tax reform, they demonstrate the sensitivity of injury-related outcomes to changes in alcohol availability.

Strengths and limitations

A key strength of this analysis is its use of a transparent comparative risk assessment framework, which links changes in exposure distribution to cause-specific changes in mortality and disability. Reporting both deaths and DALYs provides a more complete assessment of potential policy benefits than mortality alone. The use of Monte Carlo simulation to propagate uncertainty in exposure, consumption, heavy episodic drinking, relative-risk functions, and cause-specific burden also allows uncertainty to be quantified explicitly.

Several limitations should be considered. First, the estimates are model-based counterfactual projections rather than observed effects of an implemented tax. Second, the analysis relies on assumed proportional reductions in total alcohol consumption derived from separate tax simulations; it does not independently model consumer substitution between beverages, unrecorded alcohol, cross-border purchasing, or industry pricing strategies. Third, the results depend on the quality and currency of the underlying exposure, relative-risk, and burden-of-disease estimates.

The sensitivity analyses suggest that the central conclusions are robust in direction, but not immutable in magnitude. Using GBD rather than NBD3 burden estimates lowered the simulated number of averted deaths and DALYs (between 1% and 17%, across sexes and scenarios). Excluding alcoholic cardiomyopathy and alcohol use disorders reduced averted deaths and DALYs by between 3.1% and 16.2%. These findings indicate that the true health impact may be somewhat lower than the central estimates, particularly for DALYs, but also that the estimates omit some alcohol-attributable harm for which reliable dose-response functions were unavailable.

Finally, the planned sensitivity analysis regarding the assumed population patterns of alcohol consumption using the 2022 National Dietary Intake Survey could not be undertaken because the data were unavailable. Future analyses should incorporate

these and other data when released, test alternative assumptions about reformulation and consumer response, and model potential substitution towards other alcoholic beverages or unrecorded alcohol.

Future research

Future work should extend the analysis of distributional effects beyond the initial estimates presented here on differential impacts across consumption categories, including the extent to which tax changes affect lower-income households and young people differently.

A more direct integration of the burden model with the tax-simulation model, allowing uncertainty in price elasticities, reformulation probabilities, and consumption responses to propagate through to health outcomes, might also improve the quantification of the uncertainty in the final estimates. Finally, empirical evaluation of future tax reforms (using sales data, household expenditure surveys, trauma and mortality surveillance, and cause-specific burden data) would be valuable for validating the modelled estimates.

Conclusion and recommendations

This study estimated the potential reduction in alcohol-attributable deaths and disability-adjusted life years (DALYs) associated with alternative reductions in population alcohol consumption in South Africa. The results indicate that even relatively modest reductions in alcohol consumption could avert a meaningful burden of alcohol-attributable mortality and disability, while larger reductions produce proportionally larger health gains.

Under the REEP original four-tier proposal, corresponding to an 8.5% reduction in total alcohol consumption, the model estimated 1 636 deaths and 74 409 DALYs averted among males, and 280 deaths and 16,982 DALYs averted among females. Even the smallest modelled reduction, associated with the alcohol-industry proposal, was estimated to avert 434 male deaths, 75 female deaths, 19 697 male DALYs, and 4 504 female DALYs. These estimates demonstrate that the scale of the assumed consumption reduction is a central determinant of the potential public-health benefit.

The estimated gains were distributed across age groups and major disease categories. Although males accounted for most of the absolute averted burden, females experienced comparable proportional reductions in DALYs. Infectious diseases—particularly HIV/AIDS and tuberculosis—contributed the largest share of averted DALYs, followed by non-communicable diseases and injuries.

The findings provide a population-health perspective for comparing alternative beer excise tax structures. The estimated health benefits increased with the assumed reduction in total alcohol consumption: the REEP four-tier proposal produced the largest estimated gains, followed closely by the revised three-tier proposal, while the two-tier and industry proposals produced smaller gains.

The revised three-tier REEP proposal is particularly noteworthy because it was estimated to retain most of the health benefit of the four-tier structure while using fewer tax bands. A simpler structure may reduce administrative and compliance costs for the South African Revenue Service and the alcohol industry, while still creating meaningful incentives for product reformulation and reduced alcohol consumption.

These results support considering expected health outcomes alongside excise revenue, industry effects, and administrative feasibility when evaluating alcohol tax reforms. In particular, tax structures that encourage producers to lower the alcohol content of beer, and that reduce consumption more strongly among heavier drinkers, may generate larger health gains than structures with weaker reformulation or consumption incentives.

Based on the modelled results, policymakers should:

- Use estimated deaths and DALYs averted, in addition to revenue and industry impacts, when comparing beer excise tax options.
- Give particular attention to tax structures that provide clear incentives for reformulation towards beer products with lower alcohol content.
- Consider the revised three-tier REEP proposal as a potentially attractive balance between substantial estimated health gains and administrative simplicity.
- Monitor the effects of any implemented reform on beer prices, product alcohol content, total and heavy alcohol consumption, and alcohol-related harms.
- Interpret the estimates as potential health benefits under specified consumption scenarios, rather than as guaranteed effects of tax implementation.

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Appendices

Appendix 1: Price elasticities

While the original simulations by REEP assume uniform response to the changes in the price structure across demographics and consumption categories, i.e. constant price elasticities, alternative scenarios can be envisaged in which responses vary across demographic strata, resulting in different proportional reductions in alcohol consumption.

To assess whether such scenarios could be developed, we considered the evidence synthesised by Guindon et al.[24], who conducted a systematic umbrella review of quantitative reviews published since 1980 examining the relationship between alcohol pricing or taxation and alcohol consumption. They included reviews funded by the alcohol industry but reported them separately and excluded them from the overall findings. The authors performed a narrative synthesis of the 30 included reviews rather than conducting a pooled meta-analysis.

Sex

Guindon et al.[24] found that few reviews examined whether alcohol price responsiveness differed by sex. One of the studies they cited was the meta-regression by Gallet[25], which found no meaningful differences in price responsiveness between males and females. However, of the 132 papers Gallet reviewed, only one reported estimates separately by sex.

Age

Guindon et al.[24] found that the evidence on whether alcohol price responsiveness differs by age is mixed. They report that Stockings et al.[26] found no difference in price responsiveness between younger and older people. In contrast, Jackson et al. [27] suggested that younger people tend to favour cheaper alcoholic beverages, which may indicate greater price responsiveness. Similarly, Booth et al. [28] concluded that young people were particularly responsive to alcohol prices and were likely to reduce their consumption when prices increased. However, Guindon et al.[24] note that none of these reviews provided quantitative estimates of the magnitude of price responsiveness among young people.

Guindon et al.[24] also cite Gallet[25] whose meta-regression found that teenagers and young adults were substantially less price responsive than older adults. Evidence on binge drinking was similarly inconsistent. Scott et al.[29] found that higher prices were associated with reduced binge drinking among young people (median age 15 years), although estimated price elasticities varied considerably, ranging from approximately −0.20 to −0.75. In contrast, Booth et al.[28] found insufficient evidence to establish whether younger binge drinkers were more or less responsive to price changes than older binge drinkers.

Overall, the evidence synthesised by Guindon et al.[24] does not provide a sufficiently consistent basis for assigning different price elasticities by sex or age in the present study.

More recently, the International Agency for Research on Cancer (IARC)[30] noted that price responsiveness may vary across population subgroups, citing evidence from Gallet[25] that younger individuals are less responsive to price than older individuals. However, the Handbook does not provide new pooled estimates of price elasticity by age or sex.

Burton et al.[23] conducted a broad umbrella review examining the relationship between price/taxation and consumer demand or health outcomes for alcohol, tobacco, unhealthy food, sugar-sweetened beverages (SSBs), and gambling. The authors searched for systematic reviews published between 2000 and 2023. Eligible studies quantitatively evaluated the effects of price or tax changes on sales, consumption, disease, or mortality in general adult and child populations. Reviews funded by industry actors were excluded. A total of 50 systematic reviews were included (31 on unhealthy food/SSBs, 9 on tobacco, 9 on alcohol, 1 on multiple commodities, and none on gambling) and synthesized using a structured narrative approach. While price increases consistently reduced overall alcohol demand, review-level evidence provided little information on differences in price responsiveness by sex or age.

Drinking patterns

Guindon et al.[24] found only one review (Wagenaar et al.[21]) that provided price elasticity estimates for both overall alcohol consumption and heavy episodic drinking. Wagenaar et al.[21] examined the effects of alcohol prices and taxes on both general alcohol consumption and heavy alcohol use. For general alcohol consumption, the simple mean of 91 reported elasticity estimates was −0.51. For heavy alcohol use, a meta-analysis of 10 US studies produced a mean own-price elasticity of −0.28. These

estimates suggest that heavy alcohol use is less responsive to changes in price than alcohol consumption overall.

This finding is consistent with evidence from a South African study by Van Walbeek et al.[31]. In modelling the potential effects of minimum unit pricing in South Africa, Van Walbeek et al.[32] used price elasticities of −0.45 for moderate-drinking households, −0.35 for intermediate-drinking households, −0.22 for occasional heavy-drinking households, and −0.18 for regular heavy-drinking households. These estimates were based on earlier South African work (Van Walbeek et al.[32]) and were subsequently updated. Taken together, the evidence indicates that heavier drinkers are less responsive to changes in alcohol prices than moderate drinkers.

To estimate alternative price elasticities for different drinker types, we used price elasticities from Van Walbeek et al.[31], and applied them to data from the 2015 National Income Dynamics Study (NIDS) data[33]. Although a more recent dataset containing information on alcohol consumption exists (the 2022 NDIS) it is not yet available for research.

Definitions of drinker type and elasticities:

- **Moderate drinkers**: People who consumed 1 or 2 standard drinks per day, irrespective of the number of days on which they consumed alcohol. Price elasticity: −0.45.
- **Intermediate drinkers**: People who consumed 3 or 4 standard drinks per day, irrespective of the number of days on which they consumed alcohol. Price elasticity: −0.35.
- **Occasional heavy drinkers**: People who consumed at least 5 standard drinks on a typical drinking day, but drank no more than twice a week. Price elasticity: −0.22.
- **Regular heavy drinkers**: People who consumed alcohol at least 3 times a week, and drank at least 5 standard drinks on a typical drinking day. Price elasticity: −0.18.

Additional table 1 presents price elasticity estimates by drinking pattern and the distribution of drinker types within each sex-age group using data from the 2015 NIDS. These distributions are used to calculate a weighted average price elasticity for each group.

Overall, 27% of drinkers are moderate drinkers, 30% are intermediate drinkers, 37% are occasional heavy drinkers, and 6% are regular heavy drinkers. Occasional heavy drinking is particularly common among younger males, accounting for 49% of male drinkers aged 15–24 and 47% of those aged 25–34. In contrast, moderate drinking is more common at older ages. Among males aged 65+, 53% are moderate drinkers, while the proportion among females aged 65+ is 72%. The overall weighted price elasticity is −0.319. Weighted elasticities are generally smaller in absolute terms among younger groups, where heavy drinking is more common, particularly males aged 15–24 (−0.301) and 25–34 (−0.296). The largest elasticities observed among females aged 65+ (−0.411), females aged 45–54 (−0.377), and males aged 65+ (−0.375). These differences reflect variation in drinking patterns across sex-age groups.

Additional table 1: Weighted average price elasticities by sex-age group and drinker type

	Price elasticity				Drinker type (weighted proportion of drinkers in each sex-age group)				
	MD	ID	OHD	RHD	MD	ID	OHD	RHD	Weighted average price elasticity
Male 15–24	-0.45	-0.35	-0.22	-0.18	0.20	0.28	0.49	0.03	-0.301
Male 25–34	-0.45	-0.35	-0.22	-0.18	0.17	0.30	0.47	0.06	-0.296
Male 35–44	-0.45	-0.35	-0.22	-0.18	0.22	0.28	0.38	0.12	-0.302
Male 45–54	-0.45	-0.35	-0.22	-0.18	0.18	0.36	0.36	0.11	-0.302
Male 55–64	-0.45	-0.35	-0.22	-0.18	0.32	0.35	0.24	0.09	-0.335
Male 65+	-0.45	-0.35	-0.22	-0.18	0.53	0.28	0.12	0.07	-0.375
Female 15–24	-0.45	-0.35	-0.22	-0.18	0.34	0.27	0.38	0.01	-0.332
Female 25–34	-0.45	-0.35	-0.22	-0.18	0.27	0.31	0.38	0.03	-0.321
Female 35–44	-0.45	-0.35	-0.22	-0.18	0.38	0.30	0.29	0.03	-0.346
Female 45–54	-0.45	-0.35	-0.22	-0.18	0.54	0.26	0.18	0.02	-0.377

MD = Moderate Drinkers; ID = Intermediate Drinkers; OHD = Occasional Heavy Drinkers; RHD = Regular Heavy Drinkers.

	Price elasticity				Drinker type (weighted proportion of drinkers in each sex-age group)				
	MD	ID	OHD	RHD	MD	ID	OHD	RHD	Weighted average price elasticity
Female 55–64	-0.45	-0.35	-0.22	-0.18	0.43	0.43	0.11	0.04	-0.373
Female 65+	-0.45	-0.35	-0.22	-0.18	0.72	0.21	0.04	0.04	-0.411
Total	-0.45	-0.35	-0.22	-0.18	0.27	0.30	0.37	0.06	-0.319

MD = Moderate Drinkers; ID = Intermediate Drinkers; OHD = Occasional Heavy Drinkers; RHD = Regular Heavy Drinkers.

The sex-age elasticities from 2015 are then used to estimate changes in AA consumption resulting from both price and reformulation effects in 2022. The headline results are presented in Additional table 2.

A 3% price increase is applied to each group's weighted price elasticity, following simulation 3 in Table 10 of Zondi et al. [12]. The reduction attributable to the price increase is assumed to occur equally through reductions in drinking prevalence and reductions in consumption among those who continue to drink. The reformulation effect is then added to the price effect. At the population level, the model is calibrated to produce an overall 8.5% reduction in alcohol consumption.

The last column shows how the overall reduction varies across sex-age groups when differences in price responsiveness are taken into account. Estimated reductions range from 8.43% among males aged 25–34 to 8.78% among females aged 65+. Reductions are generally smaller among younger males, who have lower weighted price elasticities, and larger among older males and females, who are more price responsive. Overall, the analysis indicates that accounting for different drinking patterns across sex-age groups results in relatively small differences in the estimated proportion of AA consumption remaining across groups.

Additional table 2: Estimated effects of price and reformulation on alcohol consumption by sex and age group, South Africa, 2015

Group	% price change	Weighted average price elasticity*	% reduction in total AA consumption
Male 15–24	3%	-0.301	-8.446%
Male 25–34	3%	-0.296	-8.432%
Male 35–44	3%	-0.302	-8.450%
Male 45–54	3%	-0.302	-8.451%
Male 55–64	3%	-0.335	-8.550%
Male 65+	3%	-0.375	-8.669%
Female 15–24	3%	-0.332	-8.540%
Female 25–34	3%	-0.321	-8.509%
Female 35–44	3%	-0.346	-8.582%
Female 45–54	3%	-0.377	-8.674%
Female 55–64	3%	-0.373	-8.663%
Female 65+	3%	-0.411	-8.776%

* From NIDS 2015.

AA = absolute alcohol.

Appendix 2: Supplementary tables

Additional table 3: Averted burden, by broad disease group and sex, South Africa 2022 (point estimate and 95% UI)

		Deaths		DALYs	
Scenario	Cause	Male	Female	Male	Female
A	Infectious diseases	198 (180–219)	37 (33–43)	8 581 (7 901–9 418)	2 505 (2 225–2 836)
A	Injuries	44 (39–50)	4 (3–5)	2 549 (2 237–2 911)	281 (246–331)
A	Non-communicable diseases	193 (156–369)	33 (29–43)	8 566 (7 253–14 372)	1 718 (1 606–2 038)
B	Infectious diseases	426 (388–476)	81 (71–93)	18 493 (16 888–20 253)	5 394 (4 806–6 094)
B	Injuries	95 (82–107)	9 (7–10)	5 517 (4 794–6 270)	606 (526–716)
B	Non-communicable diseases	412 (331–770)	71 (63–93)	18 345 (15 670–30 264)	3 675 (3 457–4 341)
C	Infectious diseases	676 (615–753)	128 (114–148)	29 418 (27 016–32 300)	8 578 (7 595–9 748)
C	Injuries	151 (132–174)	14 (12–17)	8 819 (7 739–9 996)	966 (835–1 145)
C	Non-communicable diseases	651 (521–1 167)	112 (99–147)	28 981 (24 580–46 617)	5 801 (5 466–6 826)
D	Infectious diseases	749 (679–834)	141 (125–164)	32 588 (29 746–35 573)	9 501 (8 416–10 828)
D	Injuries	168 (147–192)	15 (13–19)	9 783 (8 386–11 107)	1 070 (924–1 255)
D	Non-communicable diseases	719 (576–1 330)	123 (108–166)	32 038 (27 119–52 142)	6 411 (6 013–7 602)

Additional table 4: Averted burden, by disease group and sex, South Africa 2022 (point estimate and 95% UI)

		Deaths		DALYs	
Scenario	Cause	Male	Female	Male	Female
A	Cardiovascular diseases	108 (71–286)	18 (14–28)	3 894 (2 507–9 627)	683 (575–966)
A	HIV/TB	183 (167–203)	36 (31–41)	8 093 (7 407–8 888)	2 431 (2 145–2 757)
A	Intentional injuries	21 (17–27)	1 (1–2)	1 257 (993–1 551)	94 (74–122)
A	Neoplasms	28 (26–32)	6 (5–6)	853 (774–966)	224 (202–258)
A	Other chronic diseases	35 (29–46)	5 (4–7)	1 323 (1 143–1 695)	264 (208–333)
A	Other infectious diseases	14 (8–23)	2 (1–3)	488 (298–726)	73 (45–117)
A	Unintentional injuries	22 (19–27)	3 (2–3)	1 293 (1 109–1 497)	187 (157–229)
B	Cardiovascular diseases	230 (149–583)	39 (30–60)	8 321 (5 529–19 660)	1 461 (1 256–2 048)
B	HIV/TB	395 (359–439)	77 (66–88)	17 439 (15 864–19 151)	5 237 (4 665–5 923)
B	Intentional injuries	46 (37–56)	3 (2–4)	2 721 (2 149–3 339)	204 (162–254)
B	Neoplasms	61 (55–69)	12 (11–14)	1 835 (1 666–2 090)	480 (435–553)
B	Other chronic diseases	75 (62–98)	11 (8–15)	2 841 (2 452–3 675)	564 (452–716)
B	Other infectious diseases	31 (18–49)	4 (2–6)	1 053 (658–1 556)	157 (96–249)
B	Unintentional injuries	49 (41–57)	6 (4–7)	2 796 (2 373–3 238)	402 (335–499)
C	Cardiovascular diseases	361 (229–881)	61 (48–96)	13 113 (8 749–30 339)	2 304 (1 968–3 228)
C	HIV/TB	627 (569–697)	122 (107–141)	27 740 (25 276–30 534)	8 328 (7 386–9 453)
C	Intentional injuries	74 (59–91)	5 (4–6)	4 351 (3 400–5 325)	325 (255–409)
C	Neoplasms	97 (87–109)	19 (17–22)	2 912 (2 643–3 290)	757 (687–872)
C	Other chronic diseases	118 (98–154)	17 (12–23)	4 500 (3 924–5 781)	888 (709–1 148)
C		49 (29–77)	6 (4–9)	1 678 (1 034–2 470)	250 (146–390)

		Deaths		DALYs	
Scenario	Cause	Male	Female	Male	Female
	Other infectious diseases				
C	Unintentional injuries	78 (65–91)	9 (7–11)	4 467 (3 813–5 209)	641 (536–801)
D	Cardiovascular diseases	399 (256–986)	68 (54–108)	14 486 (9 188–34 517)	2 546 (2 188–3 557)
D	HIV/TB	694 (630–773)	135 (118–157)	30 728 (27 887–33 570)	9 224 (8 163–10 516)
D	Intentional injuries	82 (65–100)	6 (4–7)	4 828 (3 759–5 897)	360 (281–453)
D	Neoplasms	107 (96–121)	21 (19–24)	3 224 (2 927–3 636)	837 (758–973)
D	Other chronic diseases	131 (108–165)	19 (14–25)	4 978 (4 300–6 401)	981 (763–1 242)
D	Other infectious diseases	55 (33–83)	7 (4–11)	1 860 (1 197–2 698)	277 (170–440)
D	Unintentional injuries	86 (73–102)	10 (8–13)	4 955 (4 197–5 787)	710 (585–871)