British Heart Foundation

Trend projection of preventable risk factors in Scotland

January 2022

Non-communicable disease prevention in Scotland

1 Introduction

Purpose: The Policy influencing campaign to date has relied on current information available through traditional sources (e.g.National Records of Scotland, Scotland Burden of Disease study).

The next stage of the Policy campaign aims to:

- Create a sense of urgency regarding the implementation of Government Commitments
- Illustrate the impact of inaction on the Scottish population
- Illustrate the health inequalities that exist regarding burden of disease

This report looks at trend projections on tobacco use, alcohol consumption, and obesity rates in Scotland and the effect these risk factors have on non-communicable diseases (NCDs).

Where data were available, these risk factors were also examined by sex and deprivation to examine the existing health inequalities and possible future trends.

2 Methods

2.1 Risk factor trends

The Scottish Health Survey (SHeS) has been assessing the nation's health outcomes and risk annually since 2008. The Scottish Health Survey is designed to yield a representative sample of the general population living in private households in Scotland every year.[1] Commissioned by the Scottish Government Health Directorates, the series provides regular information on aspects of the public's health, allowing for prevalence estimates for several risk factors and diseases based on self-reported survey data.

In March 2020, SHeS suspended face-to-face interviewing and the level of detail published differed from previous surveys. For 2020 interviews, all participant information was collected by the interviewers during the interview, which differs from previous years where participants are given a self-completion questionnaire. This may impact the degree to which participants reveal sensitive information, and there may also be positivity and social-desirability biases, where participants over-report how well they feel and report behaviour they feel is more likely to be perceived as healthy or socially acceptable.

The survey was shortened to minimise the burden of participants, and some questions changed slightly. For example, in 2020 non-drinkers were defined as those who reported they did not drink alcohol in the 7 days prior to being interviewed, whereas the face-to-face SHeS surveys asks about drinking in the past 12 months.[2] There was also a large drop in sample size, from 4,900 in 2019 down to 1,920 in 2020. For these reasons and the SHeS advice to use 2020 data as a standalone report we used SHeS published data from 2008-2019.

We estimated the number of adults (defined by SHeS as at least 16 years old) with 'hazardous/harmful' alcohol consumption, obesity, and who were smokers by applying the survey prevalence estimates to the corresponding annual Scotland population data. The risk factors we used were defined as:

- **Alcohol consumption.** According to the weekly guideline, adults are safest not to regularly drink more than 14 units per week, to keep health risks from drinking alcohol to a low level. Hazardous/harmful drinkers are defined as consuming over 14 units per week.
- **Obesity**. Body Mass Index (BMI) of 30 or more.

[1] Scottish Government (2020) Scottish Health Survey 2019 - volume 1: main report.

[2] Scottish Government (2021) Scottish Health Survey – telephone survey – August/September 2020: technical report

- **Smoking status.** 'Current smoker', which excludes those who reported only smoking cigars or pipes. The survey collects information on cigar and pipe us, but as prevalence is low these are not considered in the definition of current smoking.

Based on these data, we used a linear regression model to predict the prevalence of each risk factor from 2020 to 2026. This assumes that the prevalence data for each risk factor would not be hugely impacted by the pandemic at the population level. We can adjust the data as it is published, however, we must take into consideration the data quality, which had a smaller and less representative sample size in 2020 (and likely 2021) than it had been in years prior to 2020.

The linear model shows how many people would be expected to have each risk factor if the trend continues as it is, with no policy interventions. We also modelled what the trend would look like if the rate of change doubled or halved, increasing or decreasing the trends, respectively. The models were broken down by deprivation quintiles (using the Scottish Index of Multiple Deprivation, or SIMD) and sex (female or male) to show how the trends will affect those specific populations and the impact an increase or decrease to the trend would have to them.

To understand the model in terms of prevalence data, we used National Records of Scotland population projections. In order to calculate the prevalence projections by deprivation quintile, we looked at the projected year-on-year percentage increase to the total population and applied it to each decile, based on the 2020 SIMD population estimates by decile, and then converted to quintiles.

All risk factors graphs present the actual and modelled numbers of people with each risk factor, and the text reflects both the numbers of people as well as population-adjusted prevalence data, meaning annual calculations were calculated based on reported and projected population numbers.

2.2 Attributable morbidity and mortality trends

To better understand the disease burden of these risk factors, we used Global Burden of Disease (GBD) data[3] to assess the attributable morbidity and mortality for alcohol consumption, obesity, and smoking.[4] Mortality burden was evaluated based on the number of deaths attributable to each risk factor, and Disability Adjusted Life-Years (DALYs)[5] were used to assess attributable morbidity. We looked at death or DALYs for NCDs (such as cardiovascular disease, cancer, stroke, chronic respiratory disease, and diabetes) attributable to each risk factor.

Data were available from 1990 to 2019 and we used age-standardised rates. As was the case with the risk factor trends, we assumed that the pandemic would not hugely impact the number of attributable deaths or DALYs at a population level. We can adjust the model when additional years are published in GBD.

These trends were not conducive to a linear regression model because the relationship between the number of deaths or DALYs was not linear over time. For smoking and obesity burden of disease predictions we used an exponential smoothing model. An exponential smoothing model makes predictions based on past observations by weighting the most recent observations most heavily. In the case of smoking, where the trend was linear apart from the most recent data point, an exponential model was used, excluding 2019 data.

In the case of alcohol consumption, we did not include a prediction due to the varied nature of the trend (see Section 3.3 for more detail).

3 Results

3.1 Smoking

[3] Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2020.

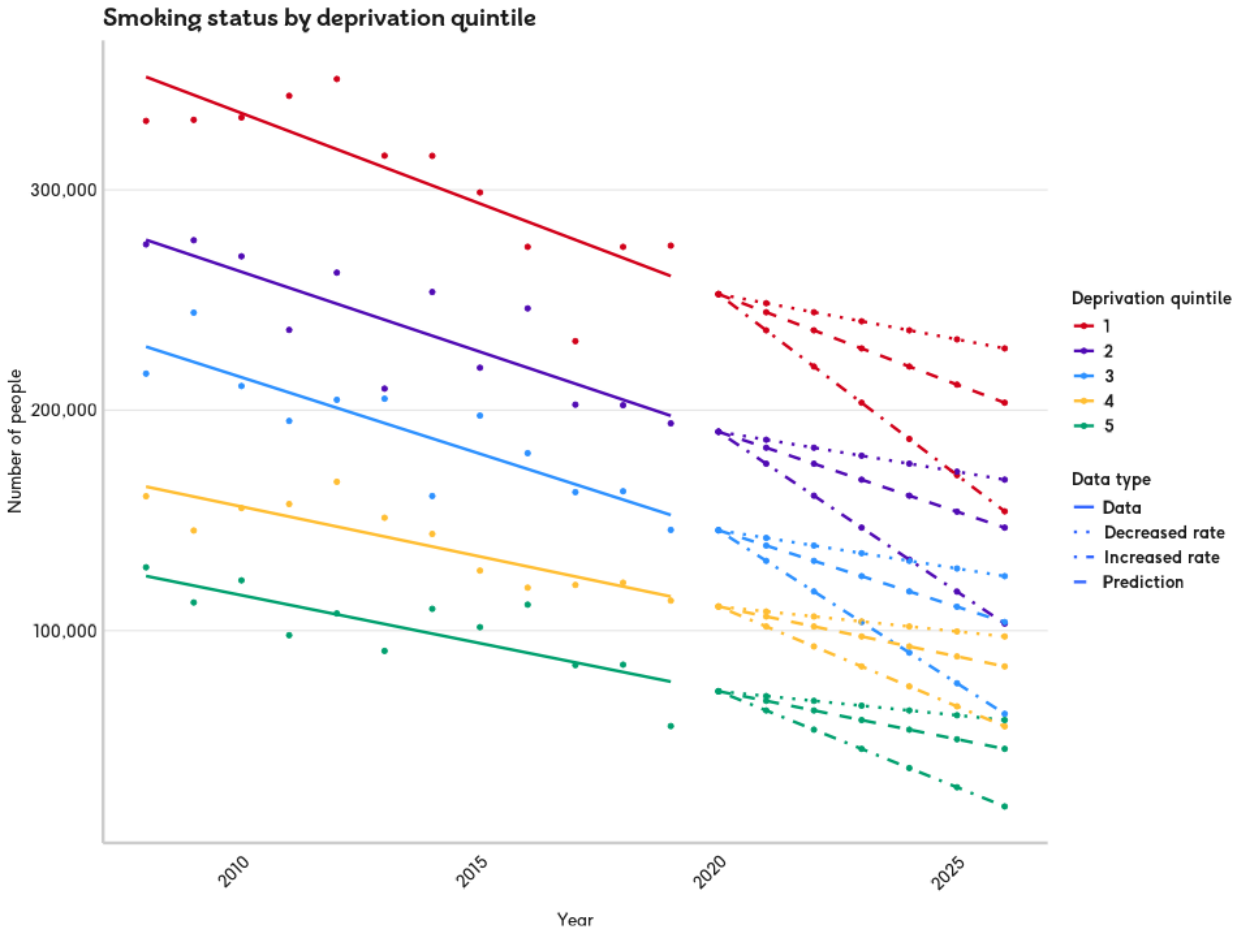
[4] ScotPHO data shows different rates for smoking attributable deaths. However, we chose to use GBD for consistency across the risk factors showing morbidity and mortality burden. ScotPHO did not have equivalent data for obesity and alcohol consumption.

[5] One DALY represents the loss of the equivalent of one year of full health. DALYs for a disease or health condition are the sum of the years of life lost to due to premature mortality (YLLs) and the years lived with a disability (YLDs) due to prevalent cases of the disease or health condition in a population. (Source: World Health Organization).

Nearly a decade ago, the Scottish Government set an ambitious target of only 5% of the adult population smoking by 2034.

Based on the SHeS, 17% of adults (around 772,000 people) in Scotland were smokers in 2019. The burden is higher in the most deprived quintile (quintile 1) compared to the least deprived (quintile 5), as shown in Figure 1 below. On average, the number of adults who smoke in the most deprived groups is 3 times the number of adults who smoke in the least deprived areas. Men have also had a continuously higher prevalence of smoking compared with women (19% and 16%, respectively, in 2019).

Figure 1. Current and predicted smoking trends by deprivation, 2008-2026



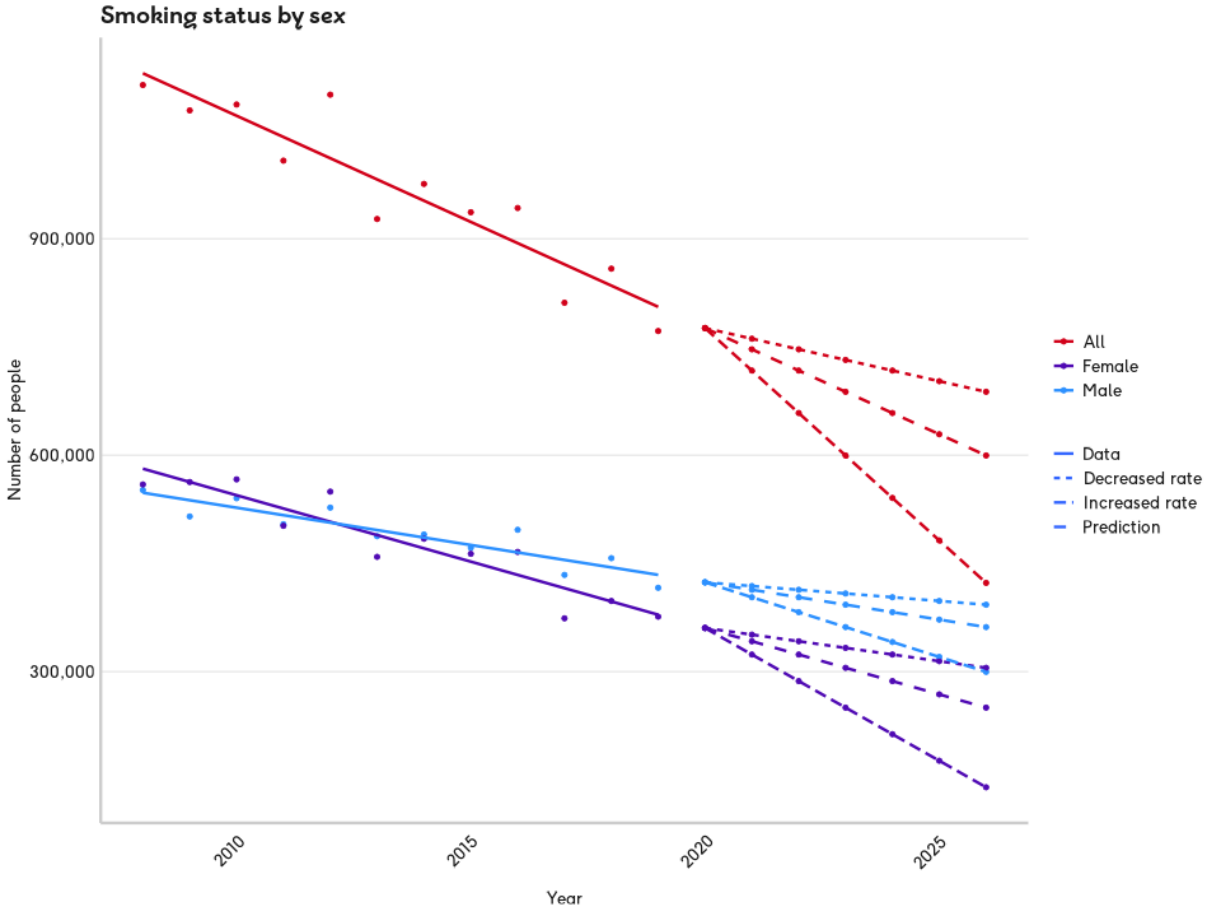
At the current rate, smoking will continue to decrease to 13% by 2026, with a continuation of the disparity by deprivation and sex (

). Assuming the same rate, by 2026, smoking in the least deprived areas could decrease to 5% while smoking in the most deprived areas would remain above 20%.

If the smoking rate were to decline around 1% annually (slightly faster than its current rate), it is possible for the population to reach the 5% smoking rate target by 2034—this would mean over 530,000 people would have to quit or not take up smoking by 2034.[6] However, the gap between the most and least deprived would remain.

If smoking were to decline at twice the rate it currently is, by 2026 only 9% of Scottish adults would be smoking. However, if the declining trend slowed down to half its current rate, around 15% of Scottish adults would still be smoking by 2026.

Figure 2. Current and predicted smoking trends by sex, 2008-2026



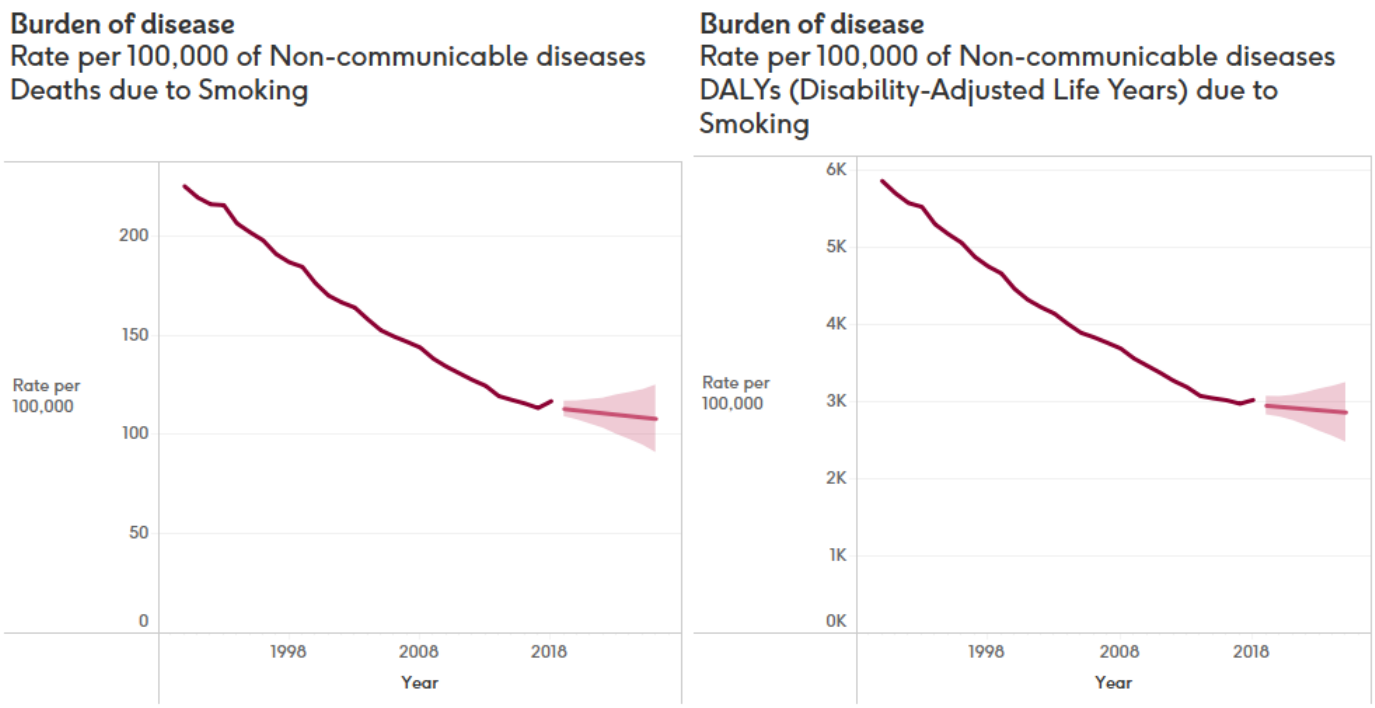
Almost a quarter of NCD deaths are smoking related.[7] The age-standardised rate of NCD deaths due to smoking has been declining since the 1990s, but has increased slightly from 2017 to 2019 (Figure 3). This rate is predicted to decline slightly from around 112 per 100,000 to 108 per 100,000 smoking attributable deaths for NCDs until 2026. The DALY rate per 100,000 has a similar trend, and is predicted to decline slightly from 2,947 per 100,000 to 2,845 per 100,000 NCD DALYs due to smoking.[8] The recent increased trend in burden of disease from smoking indicates that the gains made in previous decades due to improved treatment of smokers with NCDs may be diminishing, and the most productive recourse for future improvement will be smoking prevention.

[6] This is calculated based on estimated number of people smoking in 2019 (17%, or 772,000 people) and a projected adult population of 4,735,299 adults in 2034, which would be equivalent to 236,764 people smoking at a prevalence of 5%.

[7] Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2020.

[8] Ibid.

Figure 3. Burden of NCDs due to smoking



Shaded areas represent 95% prediction intervals. Wider prediction intervals indicate higher levels of uncertainty, i.e. the further into the future we predict, the less certain the prediction.

Key Statistics - Smoking

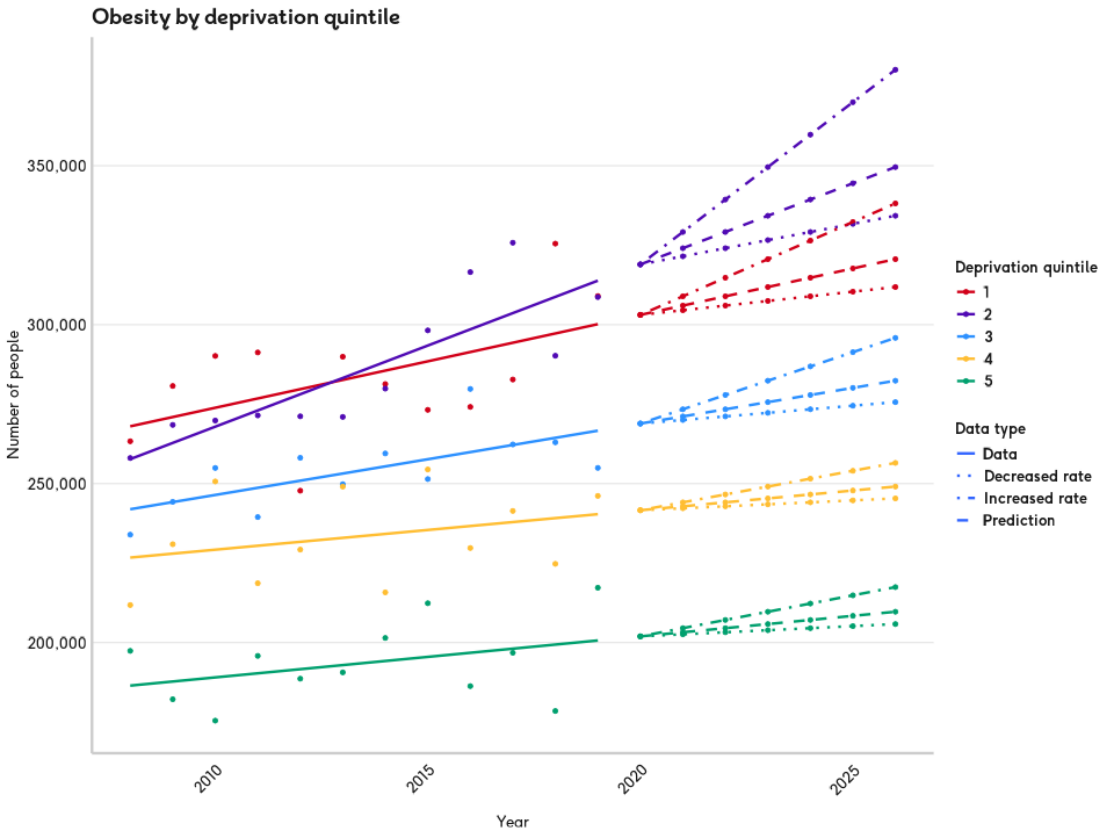
- In 2019, 1 in 15 adults in the least deprived areas smoked while nearly 1 in 3 adults in the most deprived areas smoked.
- On average, the number of adults who smoked in the most deprived groups was nearly 3 times the number of adults smoking in the least deprived areas.
- At the current rate, smoking will continue to decrease to 13% by 2026, and disparities by deprivation and sex will remain.
- If the smoking rate were to decrease around 1% annually (slightly faster than its current rate), it is possible to reach the 5% smoking by 2034—this would mean over 530,000 people would have to quit or not take up smoking by 2034.
- The mortality and morbidity burdens for NCDs that are attributable to smoking are predicted to decrease slightly by 2026.

3.2 Obesity

In 2018, the Scottish government published A healthier future: Scotland's diet and healthy weight delivery plan to address the growing number of people classified as overweight and obese.

In 2019, 29% of Scotland adults were classified as obese (BMI of at least 30). This ranged from 23% in the least deprived areas to 36% in the most deprived areas. If the obesity rate continues to rise at its current pace in Scotland, the number of obese people in the second most deprived quintile will be higher than those in the most deprived quintile, and will be 1.7 times the number of obese people in the least deprived area (**Error! Reference source not found.**). The prevalence of obesity is predicted to be 22% in the least deprived quintile and 39% in the second most deprived quintile in 2026 if it continues at its current rate.

Figure 4. Current and predicted obesity trend by deprivation, 2008-2026

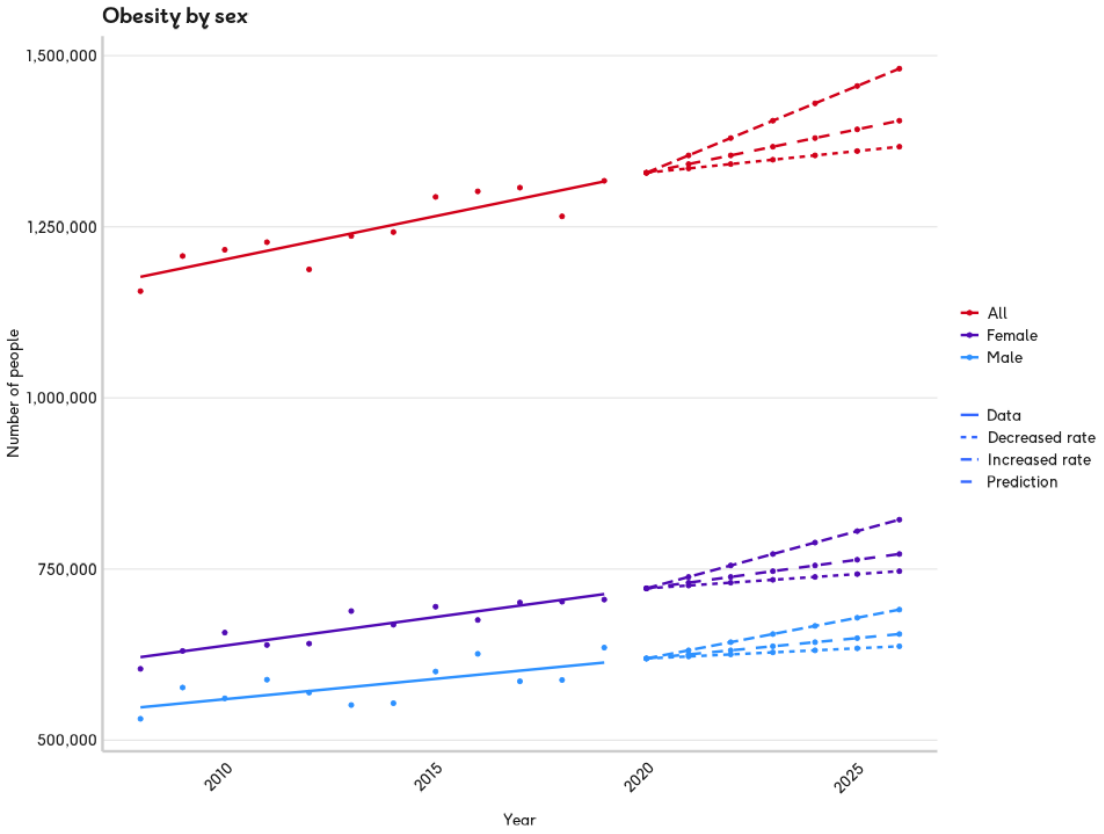


The prevalence of obesity is slightly higher in women when compared with men (Figure 5), with an estimated rise to 29% for men and 32% for women by 2026. If the rate of increase of obesity doubles, the population-adjusted prevalence of obesity would rise to 31% for men and 34% for women, and if the rate slowed down by half, the population-adjusted prevalence would be 28% for men and 31% for women.

In order for the total population-adjusted prevalence to remain stable at 29% until 2026, the current rate would need to be halved. To reduce the prevalence of adult obesity by 5% by 2026, more than 200,000 people would need to reduce their BMI or keep it below 30.[9]

[9] This is calculated based on estimated number of people with obesity in 2019 (29%, or 1,113,316 people) and a projected adult population of 4,638,818 adults in 2026, which would be equivalent to 1,345,257 people with obesity at a prevalence of 5%.

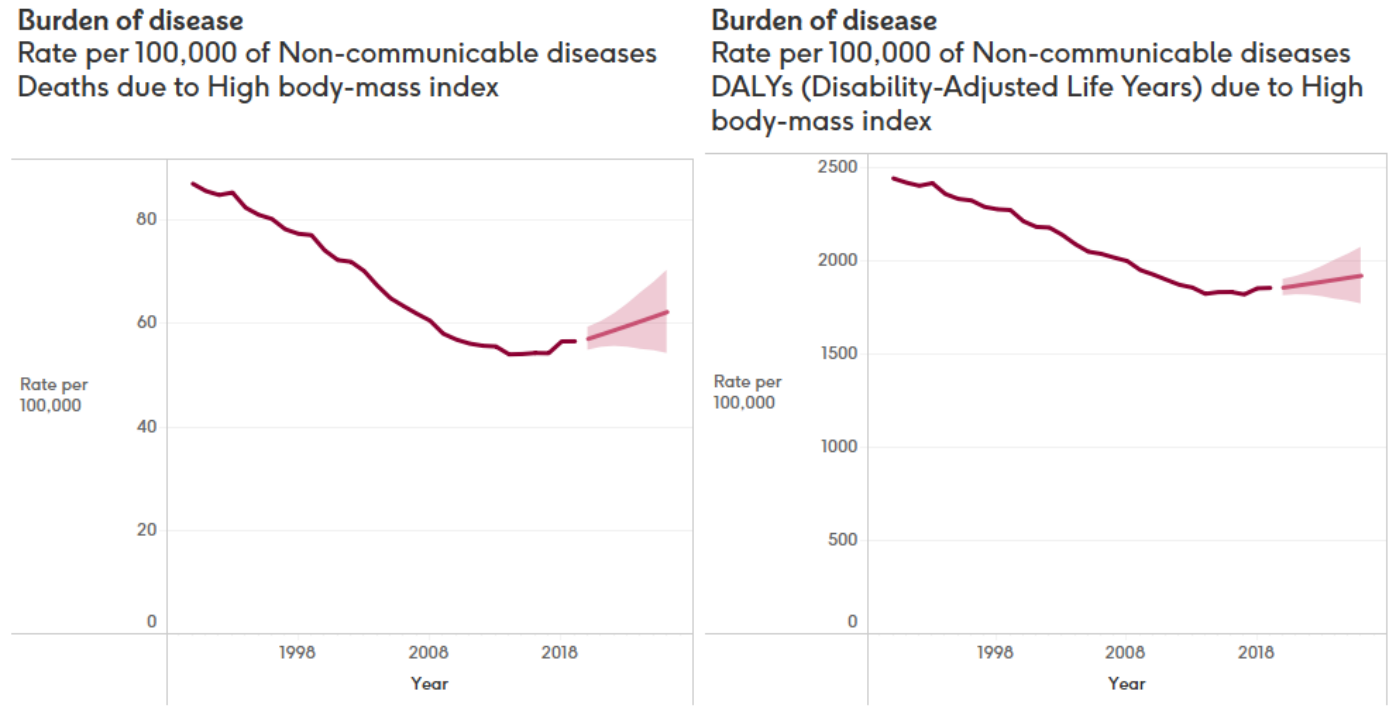
Figure 5. Current and predicted obesity trend by sex, 2008-2026



Obesity related NCD deaths have decreased from 1990 to 2014, but have slowly been increasing since then (Figure 6). By 2026, the rate of obesity related NCD deaths could increase by 10%, from 56 per 100,000 to 62 per 100,000. The rate of increase in obesity-related DALYs followed a similar trend, and could increase from 1,859 per 100,000 in 2019 to 1,923 per 100,000 in 2026.

As is true for smoking, the recent increased trend in burden of disease from obesity indicates that the gains made in previous decades due to improved treatments may be diminishing, and the only way to reverse these trends is through obesity prevention.

Figure 6. Burden of NCDs due to obesity



Shaded areas represent 95% prediction intervals. Wider prediction intervals indicate higher levels of uncertainty, i.e., the further into the future we predict, the less certain the prediction.

Key Statistics - Obesity

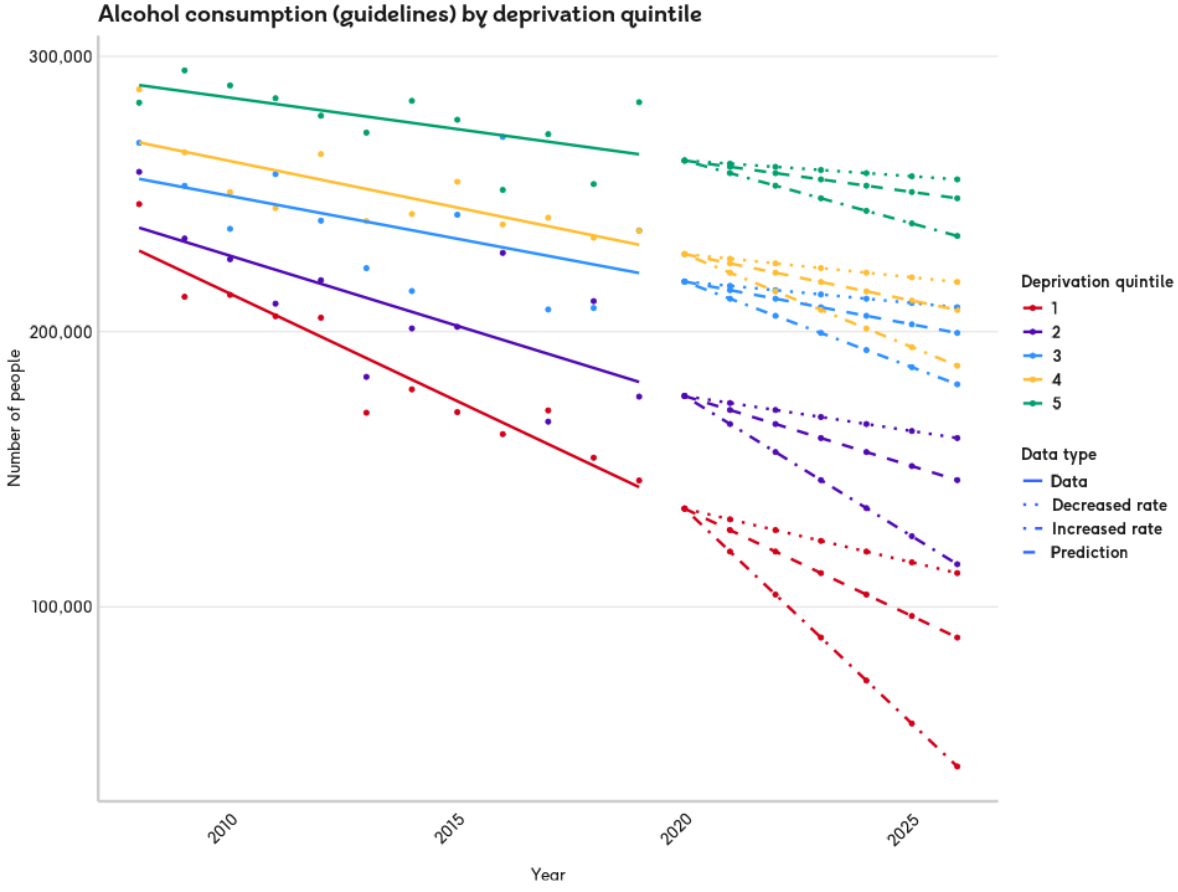
- In 2019, 29% of Scotland adults were classified as obese (BMI of at least 30).
- The prevalence of obesity is predicted to be 22% in the least deprived quintile and 39% in the second most deprived quintile in 2026 if it continues at its current rate.
- The prevalence of obesity is slightly higher in women when compared with men, with an estimated rise to 29% for men and 32% for women by 2026.
- For the population-adjusted obesity prevalence in Scotland to remain stable at 29% in 2026, the current rate of increasing obesity would need to be halved.
- By 2026, the rate of obesity related NCD deaths could increase by 10%

3.3 Alcohol consumption

The prevalence of hazardous or harmful drinking (more than 14 units per week) has decreased since 2003, but has remained stable from 2017 to 2019 (24%).[10]

The number of people considered to be harmful or hazardous drinkers based on guidelines is highest in the least deprived quintile compared to the most deprived (Figure 7). This trend is similar in England and Wales. However, this does not mean that those in the most deprived areas are protected from the harms of alcohol consumption.

Figure 7. Current and predicted alcohol consumption trend by deprivation, 2008-2026



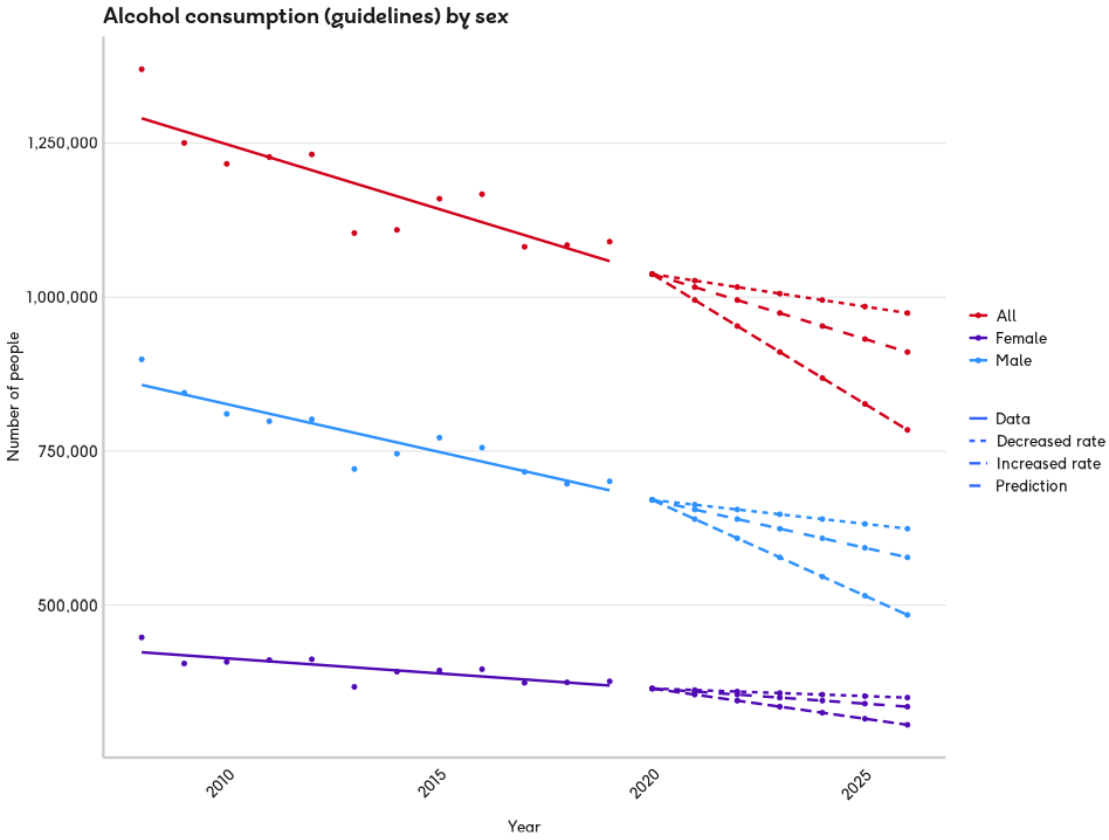
In Scotland, death rates and hospitalisations caused directly by alcohol are higher in the most deprived areas of Scotland compared to the least deprived.[11] The Monitoring and Evaluating Scotland's Alcohol Strategy report noted that alcohol-specific death rates are consistently higher in Scotland than in England & Wales.

[10] Scottish Government (2020) Scottish Health Survey 2019 - volume 1: main report. Chapter 4: Alcohol.

[11] Public Health Scotland (2021) Monitoring and Evaluating Scotland's Alcohol Strategy: Monitoring Report 2021

There is also a disparity between men and women, with 1.8 times the number of men with harmful or hazardous alcohol consumption compared with women (Figure 8).

Figure 8. Current and predicted alcohol consumption trend by sex, 2008-2026



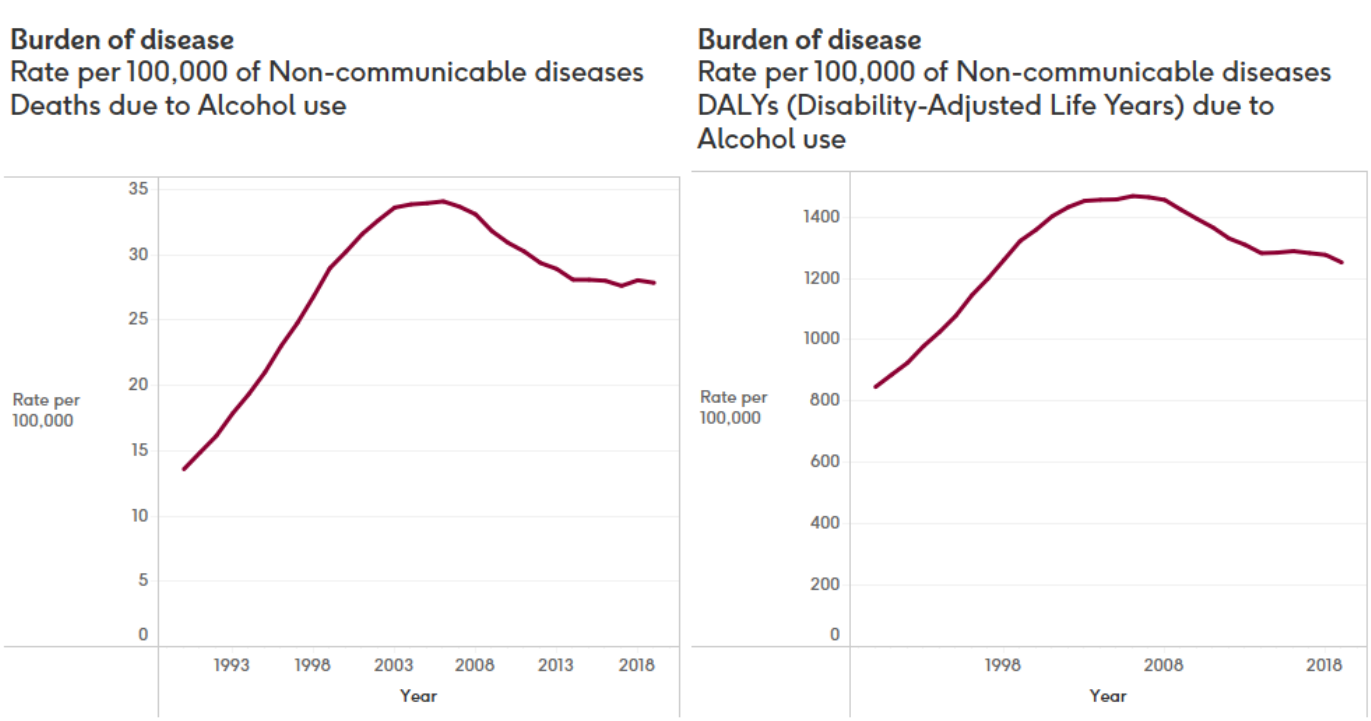
If the downward trend continues at its current rate, 20% of the total adjusted population will be harmful or hazardous drinkers by 2026. If the current decreasing rate is halved, the drop in harmful or hazardous drinking prevalence could be reduced from 24% in 2019 to 21% in 2026. If the decreasing rate is doubled the prevalence could drop to 17%.

These rates of decline are faster for men than women– if trends continue, the harmful or hazardous drinking prevalence could decrease from 32% in 2019 to 26% in 2026 for men and from 16% in 2019 to 14% in 2026 for women. This would narrow slightly—but not eliminate—the prevalence gap between sexes. If the rate of decline doubled for men and women, there would still be 1.6 times the number of men with harmful or hazardous alcohol consumption compared to women

From 1990 to 2006, the burden of alcohol related deaths on NCDs was rising. Starting in 2006, this was on the decline, but has stalled and begun to rise again from 2017-2019 (Figure 9).Due to the rise and fall of this trend, it makes the forecast uncertain. However, trends suggest that the progress made in reducing risky drinking since the early 2000s has stalled and remain high in comparison to the 1990s. The trend in alcohol-related hospital admission rates is similar, with a stall in the decline of alcohol-related hospital admissions rates in Scotland hospitals remaining high in comparison to the rates in the 1980s. [12]

[12] Ibid.

Figure 9. Burden of NCDs due to alcohol consumption



Shaded areas represent 95% prediction intervals. Wider prediction intervals indicate higher levels of uncertainty, i.e., the further into the future we predict, the less certain the prediction.

Key Statistics – Alcohol consumption

- If the downward trend continues at its current rate, 20% of the total adjusted population will be harmful or hazardous drinkers by 2026.
- 1.8 times the number of men with harmful or hazardous alcohol consumption compared with women
- The rate of decline is faster for men than women, but a prevalence gap would remain in 2026 at the current pace, and would narrow only slightly if the pace for both sexes doubled.
- Trends suggest that the progress made in reducing the NCD burden of disease due to drinking has stalled and remains high in comparison to the early 1990s.

4 Discussion and limitations

4.1 Discussion

The prevalence of smoking and obesity are consistently higher in the most deprived quintiles compared to the least deprived, which is predicted to continue this way without any intervention. This is most pronounced for smoking, where the average number of adults smoking in the most deprived quintile was nearly 3 times the number of adults smoking in the least deprived quintile. In order to reach the goal of 5% or less smoking by 2034, the rate would need to decrease around 1% annually.

While smoking is on a downward trend, obesity is continuing to trend upwards. This is likely to result in an increasing burden on non-communicable disease prevalence and concomitant mortality and morbidity. For Scotland to stall the rise of obesity in 2026, the current rate of increase would need to be halved.

Alcohol consumption tells a slightly different story, with a higher number of people considered to be harmful or hazardous drinkers in the least deprived quintile compared to the most deprived. This disparity is slightly misleading, given the higher death and hospitalisation rate caused by alcohol in the most deprived areas compared to the least deprived in Scotland. While the overall trend is decreasing, the age-standardised rate of NCD deaths due to alcohol consumption is predicted to be similar through 2026.

For each of these risk factors, there is a danger of improving the overall trend but allowing the sex and deprivation inequalities to persist.

Life expectancy, which has increased for decades, began to stall in Scotland in 2012-14 and slightly declined in 2015-17. This is largely due to stalling life expectancy gains in heart disease, which had previously been adding to life expectancy every year.[13] When deaths from heart disease were decreasing at a fast rate, they added to life expectancy annually, but the amount of added life expectancy from heart disease fell when the rate of improvement fell.[14] Since heart disease accounts for a large proportion of NCD deaths in Scotland, it is not surprising to see that the rate of decline in NCD deaths attributable to obesity, smoking, and alcohol consumption has also slowed in recent years.

4.2 Limitations

The pandemic resulted in changes in methodology for the annual Scottish public health surveys. For this reason, we did not include 2020 data and instead predicted it based on trends from 2008-2019. We still do not know the full extent of the impact of the pandemic on a population level for these risk factors, so while prevalence trends tend to change slowly, it is possible that some behavioural changes from the pandemic will have an acute impact that could be long lasting.

Each individual risk factor also has a set of limitations. The SHeS defines adults as 16 years or older, however, using this population may slightly skew the prevalence estimates of smoking and alcohol consumption which are not legal until age 18, and are unlikely to be accurately reported on household surveys in people under 18.

Obesity is a risk factor that can start in childhood, and these data look at obesity in adults only. We know that there are gaps between males and females and deprivation quintiles starting in childhood, and these are not taken into consideration in this analysis.

Finally, risk-attributable burden in GBD relies on the availability and quality of primary data that underpins the modelling and subsequent analysis. As is true for all of the data included here, exposure measurement in Scotland is based on self-reporting, which is a less reliable mode of data collection subject to bias, and is based on a small sample (about 1%) of the Scottish population.

5 Next steps

- Discuss paper with PPA and NCD prevention report partners
    - Make adjustments based on those conversations
- Prepare relevant data for creative team compiling the report

[13] Ramsay J, Minton J, Fischbacher C, et al. (2020) How have changes in death by cause and age group contributed to the recent stalling of life expectancy gains in Scotland? Comparative decomposition analysis of mortality data, 2000–2002 to 2015–2017, *BMJ Open*

[14] National Records of Scotland (2019) Why is life expectancy stalling in Scotland?