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# Model-based appraisal of the potential effects of minimum pricing for tobacco in Scotland

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## ABSTRACT

**Background** Minimum tobacco pricing would set a legal price floor. This study aimed to estimate how five minimum price thresholds could impact smoking behaviour, health and economic outcomes alongside tobacco tax increases in Scotland.

**Methods** The Sheffield Tobacco and Alcohol Policy Model was used to estimate effects on tobacco consumption up to the Scottish Government's 'tobacco-free' target of 2034. The model is an individual-based microsimulation that uses data from the Scottish Health Survey, Living Costs and Food Survey, hospital and death records. The £0.40 and £0.50 per cigarette stick minimum prices would impact only hand-rolling tobacco (assuming 0.5 g hand-rolling tobacco per cigarette), and the £0.60, £0.70 and £0.80 per stick minimums would affect hand-rolling and factory-made cigarettes.

**Results** A £0.60 minimum implemented in 2024 was estimated to lead to 16 327 fewer people who smoke and increase weekly tobacco spending by £7.21 for those who continue smoking. It would prevent an estimated 285 deaths, adding 6792 life years, and reducing hospital admissions by 1467 by 2034. These health gains would be higher in more deprived geographic areas, saving the Scottish National Health Service £1.2 million over 5 years and £2.7 million by 2034. Over 5 years, a £0.60 minimum price would reduce UK Government tax revenue by £253 million, while increasing tobacco industry revenue by £996 million.

**Conclusions** A minimum price implemented alongside tobacco duty rises could reduce smoking rates and improve public health, especially for those living in deprived areas where smoking rates and related harms are highest.

## INTRODUCTION

Tobacco smoking remains a leading cause of morbidity and mortality worldwide.<sup>1</sup> In Scotland, approximately 22% of all deaths are linked to smoking.<sup>2</sup> This burden is not evenly distributed across the population, with 25% of people in the most deprived areas smoking compared with 7% in the least deprived areas.<sup>3</sup> The 2018 Tobacco-Control Action Plan for Scotland<sup>4</sup> set a goal that by 2034, Scotland should achieve 'tobacco-free' status, meaning fewer than 5% of the overall population smoking tobacco.<sup>4</sup> To support this target, Scotland's Tobacco and Vaping Framework introduced a range of actions on improving smoking cessation services, health promotion, market regulation and enforcement of the illicit market.<sup>5</sup> However, these did not include tobacco pricing, as authority to set tobacco

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ A 2019 UK survey<sup>31</sup> found that about 20% of people who smoke said they would smoke less or quit if a minimum price for tobacco were introduced, while nearly 40% of people who used to smoke said it would help prevent them restarting smoking.

## WHAT THIS STUDY ADDS

⇒ Modelled estimates are that a £0.60 minimum price would raise prices for all hand-rolling tobacco and the cheapest factory-made cigarettes, reducing the number of people who smoke in Scotland by 16 327 and increasing weekly spending for people who keep smoking by £7.21.  
⇒ The policy would impact deprived areas more, given existing smoking patterns, and higher minimum prices would increase tobacco industry revenue.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Policy makers worldwide should consider incorporating a minimum price as part of a comprehensive package of tobacco control measures.

duty lies with the UK Government. Despite this limitation, Scotland could implement a minimum sales price for tobacco, similar to its approach with alcohol.<sup>6</sup>

Policies that increase the cost of tobacco, especially of the cheapest tobacco, dissuade young people from starting smoking and encourage people who currently smoke to contemplate quitting.<sup>7–8</sup> However, in response to price rises, consumers tend to trade-down to cheaper brands, especially in more deprived neighbourhoods,<sup>9</sup> to switch to hand-rolling tobacco, which in the UK is subject to less tax than factory-made cigarettes, and to roll hand-rolled cigarettes more thinly.<sup>10–12</sup> They may also turn to illicit tobacco, which is by far the cheapest tobacco and requires strong enforcement to limit its supply.<sup>12</sup> Action on Smoking and Health Scotland estimated that around half of people who smoke in Scotland smoke hand-rolled cigarettes, with a 30 g pack costing on average £23.29 (£0.39 per cigarette assuming 0.5 g tobacco per stick<sup>10</sup>).<sup>13</sup>

The current policy approach to influencing the price of tobacco products in the UK is through tobacco duty.<sup>14</sup> In the UK Government's 2024 Autumn Budget, the duty rate on factory-made



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cigarettes was set to rise annually by 2% above Retail Price Index (RPI) inflation, compared with 12% for hand-rolling tobacco.<sup>15 16</sup> However, duty on hand-rolling tobacco would have to increase by 18.2%+RPI per year for the average price of a hand-rolled cigarette to be the same as the average price of a factory-made cigarette by 2030 (assuming 0.5 g tobacco per hand-rolled stick<sup>10</sup>). In addition, the tobacco industry has consistently responded to tax increases by absorbing some of the added costs on their cheapest products, while increasing profit margins on their more expensive products, increasing price variation in the tobacco market.<sup>17–20</sup>

A minimum price for tobacco could complement ongoing tobacco duty increases by preventing the tobacco industry from weakening the effects of tax rises on the cheapest products.<sup>21</sup> However, questions remain about how the effectiveness of this approach on smoking rates and health compare with additional tax increases (see a similar model-based comparison for alcohol<sup>22</sup>). Additionally, minimum pricing for tobacco could increase tobacco industry profits while reducing UK Government tax revenue, making it important to compare the revenue impacts to a tax increase with equivalent effects on smoking rates and health.

Existing evidence regarding the potential impacts (from modelling studies) and realised impacts (through evaluations after the policy is introduced) of minimum pricing for tobacco primarily comes from the USA.<sup>21 23–30</sup> This shows that implementing a minimum pack price can increase the cost of the least expensive tobacco products and, as a result, reduce the number of people who smoke. However, the policy's impact can be undermined by factors such as cross-border shopping to areas with no minimum price, and limited retailer compliance. In 2019, a UK survey of adults who currently smoke or used to smoke indicated that in response to a hypothetical minimum price for tobacco, approximately a fifth of people who currently smoke said they would smoke less or quit and almost two-fifths of people who used to smoke said the price rise would help them to remain smoke-free.<sup>31</sup>

The aim of this study is to provide an appraisal of the potential effects of minimum pricing for tobacco in Scotland, when introduced alongside ongoing tobacco duty rises. The investigation had two objectives: (1) to estimate how five minimum price thresholds could impact tobacco purchases, smoking behaviours, health inequalities and economic outcomes in Scotland; (2) to compare the estimated impacts of a minimum price policy with those of tobacco duty increases, illustrating the difference in terms of impact on health inequalities and revenue for the tobacco industry and the UK Government.

## METHODS

### Model overview

The study uses the Tobacco and Alcohol Tax and Price Intervention Simulation Model (TAX-sim) V2.5.0,<sup>32 33</sup> built on the Sheffield Tobacco and Alcohol Policy Modelling platform (<https://stapm.gitlab.io/>). The TAX-sim model can simulate tax and price policies for alcohol and tobacco, either separately or jointly, having been used to model changes to the minimum unit price for alcohol in Scotland.<sup>34</sup> In this investigation, the model was used to appraise minimum pricing for tobacco, with no exploration of changes in alcohol pricing policy or indirect effects on alcohol consumption. This study is based on a report commissioned by Public Health Scotland,<sup>35</sup> describing the methods in full. We have presented an overview of the model here, and a detailed description in the online supplemental methods appendix. The

design of the study was informed by discussion with policy stakeholders, including a workshop on tobacco pricing policy options in Scotland involving academic and policy experts.

The model is a dynamic micro-simulation of tobacco and alcohol consumption in the Scottish population aged 18–89 years, beginning 1 January 2017, and progressing in 1-year steps until 31 December 2042.<sup>36</sup> At each time step, a new birth cohort of 18-year-olds is added to the model. The model uses data from the Scottish Health Survey<sup>37</sup> to create an initial synthetic population of 200 000 individuals stratified into 800 population subgroups based on smoking status, level of alcohol consumption, age, sex and Scottish Index of Multiple Deprivation (SIMD) quintile. The SIMD is a composite measure of deprivation based on indicators including income, employment, education and housing, and is calculated for small geographic areas in Scotland, each representing approximately 1500 people.<sup>38</sup>

### Tobacco consumption

Tobacco consumption is described in terms of smoking status (ie, never smoked regularly, currently smokes or used to smoke), the average daily number of cigarettes smoked, and the number of years since quitting. Data are drawn from the Scottish Health Survey,<sup>37</sup> supplemented by the split of tobacco consumption between factory-made cigarettes and hand-rolling tobacco from the Smoking Toolkit Study for Scotland.<sup>39</sup> The model estimates a future population-level trajectory of smoking behaviour that varies according to age, sex and SIMD quintiles.<sup>40</sup> These population-level trajectories are a function of individual-level probabilities of transitioning between smoking states or the amount smoked, and of survival, all of which vary by the subgroups above. Policy effects are assessed using these trajectories as the 'business-as-usual' baseline.

### Prices

Price distributions describing how purchases are spread across prices paid for cigarettes (expressed as price per cigarette stick, assuming 0.5 g tobacco per hand-rolled stick<sup>10</sup>) were derived from 2006 to 2018 Living Costs and Food Survey data,<sup>41</sup> a UK-wide 2-week household-purchasing diary survey of approximately 5400 households.<sup>42</sup> Price distributions were derived for factory-made cigarettes and hand-rolling tobacco in each of the 800 modelled subgroups (ie, 1600 distributions in total), and then matched to individuals based on their subgroup membership.

The model calculates the expected change at each price point implied by the introduction of the minimum price, assuming all products previously sold below the minimum price threshold are increased to the threshold level. This is in line with evidence on how price distributions changed when minimum unit pricing for alcohol was introduced in Scotland.<sup>43</sup> A key assumption of the model is that there is no supply-side response to the introduction of a minimum price as tobacco products and marketing are already subject to strong restrictions in the UK.

### Effects on consumption and health outcomes

Price changes can affect tobacco consumption in the model by preventing people from starting to smoke, causing people who currently smoke to quit, and reducing the amount smoked by those who continue. The change in tobacco product prices for each individual is expressed as a percentage change in the average price of tobacco products they encounter. The percentage changes in the average prices affect tobacco consumption via price elasticities of demand, as estimated by Pryce *et al.*<sup>44</sup> Elasticities measure the percentage change in consumption of a

product that arises from a percentage change in its own price (own-price elasticities), or prices of other products (cross-price elasticities). Pryce *et al* estimate separate elasticities for participation (consume or not), and consumption (amount consumed) conditional on participation.

The model uses risk functions to model the impact of consumption changes on mortality and hospitalisation for 52 conditions attributed to tobacco.<sup>45</sup> Baseline data on hospitalisations and deaths from these conditions, as well as deaths from other causes, from 2008 to 2021 were provided to the research team by Public Health Scotland and National Records Scotland. The data were stratified by age, sex and SIMD quintile. Data on morbidity rates by condition come from hospital episode-level data on inpatient admissions and day cases for acute hospitals in Scotland (the SMR01 dataset).

### Policy scenarios

The effect of introducing minimum pricing for tobacco is assessed against a baseline of tobacco duty structures remaining the same after 2023, except for an ongoing 2% above RPI inflation tobacco duty escalator. Note that in the November 2023 and 2024 Autumn Statements there was a one-off 12% above inflation rise in duty for hand-rolling tobacco,<sup>16</sup> which is not incorporated here; hence, 2024 prices of hand-rolling tobacco in the model will be slight underestimates of actual prices. The minimum price threshold was set to increase by RPI inflation each year after 2024.

In 2024, the average price per stick of tobacco is estimated to be £0.50. Factory-made cigarettes cost an average of £0.63 per stick, which amounts to £12.60 for a pack of 20. Hand-rolling tobacco is substantially cheaper, at an average of £0.30 per stick, translating to £18 for a 30 g pouch. Five minimum price thresholds for tobacco are investigated, set at £0.40, £0.50, £0.60, £0.70 and £0.80 per cigarette stick, with these thresholds defined in 2024 prices (see online supplemental methods appendix for how these thresholds align with the distribution of tobacco prices). The £0.40 and £0.50 minimums would only affect the prices of hand-rolling tobacco, assuming 0.5 g tobacco per stick equates to £0.80 and £1.00 per gram minimums. The £0.60, £0.70 and £0.80 minimum prices would affect the prices of hand-rolling tobacco and factory-made cigarettes.

### Modelled outcomes

Outcomes are reported for the overall population and stratified by SIMD. Outcomes for tobacco consumption were percentage point changes to tobacco smoking prevalence, and change to mean spending on tobacco. Health and economic outcomes are reported as cumulative figures up to 2034 to align with Scotland's 'tobacco-free' target. Retail revenues and revenues from duty receipts plus Value Added Tax are also reported. Health outcomes were deaths, total years of life lost due to deaths, and tobacco-related hospital admissions. The model uses unit costs of hospitalisations derived from the hospital episode-level Healthcare Resource Group reference costs associated with the length of stay in hospital and the procedures applied. We calculated these costs using a single year (2016/2017) of English hospital episode statistics data (admitted patient care) provided by NHS England. Unit costs were inflated to 2022/2023 prices using the National Health Service (NHS) cost inflation index.<sup>46</sup>

### The rise in tobacco excise duty needed to produce equivalent effects

We identified the percentage increase in excise duty on all tobacco products that would be necessary to achieve each of the following four criteria for each minimum price threshold:

1. Equal effects on smoking prevalence by 2034.

2. Equal effects on cumulative deaths delayed by 2034.
3. Equal effects on smoking prevalence by 2034 among the most deprived SIMD quintile.
4. Equal effects on cumulative deaths delayed by 2034 among the most deprived SIMD quintile.

Following this analysis, we compared the tobacco industry and UK Government revenue of a minimum price to a tax increase with equivalent effects on smoking prevalence. We also investigated how a minimum price versus a tax increase would impact health inequalities differently, looking at the effects on deaths by 2034 across SIMD quintiles. The inequalities were assessed using two measures: the Slope Index of Inequality (SII) and the Relative Index of Inequality (RII). The SII is an absolute measure that shows the difference in the effect on deaths between the most and least deprived SIMD quintiles.<sup>47</sup> The RII, a relative measure, is calculated in this study by dividing the SII by the average effect on deaths across all SIMD quintiles.

### Sensitivity analysis

The cross-price elasticities evidence from Pryce *et al* used in this study indicates that when the price of hand-rolling tobacco increases, participation in factory-made cigarette smoking decreases and conditional consumption also decreases.<sup>44</sup> However, there is some uncertainty around these cross-price effects, and neither the participation decrease (−0.08) nor the conditional consumption decrease (also −0.08) is estimated to be statistically significant. In the base case, we have used the statistically significant coefficients in the Pryce *et al* published price elasticity matrices and set these cross-price elasticity effects to zero. In our sensitivity analysis, we rerun the model with the cross-price effects included.

## RESULTS

### The 'business-as-usual' future trajectory of smoking prevalence

Table 1 shows the expected baseline characteristics of smoking in Scotland in 2024 under the 'business-as-usual' scenario, which extrapolates past trends in smoking prevalence for the overall Scottish population and for people who live in areas characterised by different SIMD quintiles of deprivation. In this scenario, smoking prevalence among people aged 18–89 years is projected to decrease from 14.0% in 2024 to 8.5% in 2034, still above the tobacco-free target of 5% (figure 1). For people who live in the most disadvantaged areas, the smoking prevalence is estimated to be 26.3% in 2024 and is projected to decrease to 19.7% in 2034.

### Effect of minimum price thresholds on tobacco consumption

A minimum price of £0.60 per stick, which would raise the price of all hand-rolling tobacco, is estimated to result in a 0.38 percentage point reduction in smoking prevalence within the first year of implementation. This equates to 16 327 fewer adults smoking in Scotland. For a detailed breakdown, see table 2, which shows how increasing the price threshold leads to greater reductions in the number of adults who smoke. The impact is expected to be larger for people who live in the most disadvantaged areas. Specifically, the policy would lead to 1863 fewer adults who smoke in the least deprived SIMD quintile and 5788 fewer adults who smoke in the most deprived quintile. When accounting for cross-price effects between factory-made cigarettes and hand-rolling tobacco—though these estimates involve high uncertainty—the reduction in smoking prevalence nearly doubles (see online supplemental results appendix). This



**Table 1** Modelled baseline tobacco consumption and spending for Scotland in 2024 by Scottish Index of Multiple Deprivation (SIMD) quintile

	Whole Scottish population	SIMD rank				
		1 (least deprived)	2	3	4	5 (most deprived)
Number of people who smoke	601 955	68 787	77 899	100 985	145 815	208 469
% of all people who smoke	100%	11.4%	12.9%	16.8%	24.2%	34.6%
Smoking prevalence (%)	14.0%	7.3%	8.7%	11.8%	18.0%	26.3%
Hand-rolling tobacco smoking prevalence (%)	5.9%	3.4%	3.7%	4.9%	6.7%	11.4%
Average sticks per smoker per week	84.9	69.0	80.2	90.6	86.1	88.3
Average spending per smoker per week	£42.85	£35.27	£39.96	£46.83	£44.07	£43.62
Average price per stick (all tobacco)	£0.50	£0.51	£0.50	£0.52	£0.51	£0.49
Average price per stick (factory-made)	£0.63	£0.64	£0.63	£0.64	£0.64	£0.63
Average price per stick (hand-rolling tobacco)	£0.30	£0.30	£0.30	£0.30	£0.30	£0.30

is because factory-made cigarettes and hand-rolling tobacco are complementary products according to our cross-price elasticity estimates; reducing or stopping the use of one often leads to reduced or stopped use of the other.

The model also assessed the impact of each price threshold on smoking prevalence in 2034. These long-term projections show a trend for diminishing effects of the initial introduction of the minimum price on smoking prevalence. For instance, the effect of a £0.60 minimum threshold, estimated to cause a 0.38 percentage point reduction in smoking prevalence in 2024, was estimated to decrease to a 0.11 percentage point reduction in smoking prevalence in 2034 (see online supplemental results appendix). This decreasing effect occurs because the model assumes, conservatively, that the policy's impact is concentrated in the year it is introduced, and some of those who stop smoking in 2024 will relapse by 2034.

We examined the expected rise in weekly tobacco spending for individuals who continue smoking under different price thresholds. At a £0.60 threshold, average weekly spending on

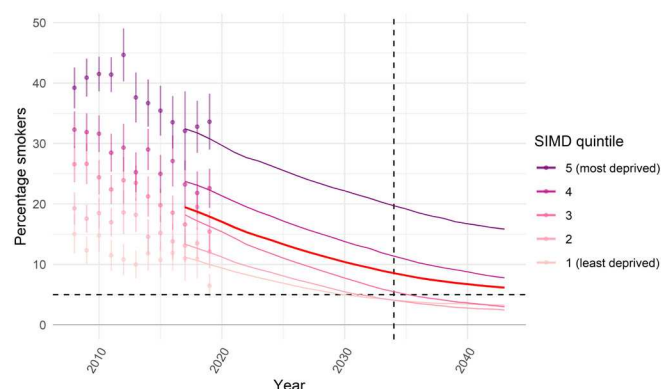
tobacco would increase by £7.21. Across all thresholds, the increase in spending ranged from £2.51 at a £0.40 threshold to £12.28 at an £0.80 threshold. The spending increase is more pronounced among people living in more deprived areas. For a £0.60 threshold, the additional weekly cost would be £5.55, £6.77, £8.03, £6.66 and £7.92 for those in the least to most deprived quintiles, respectively. This uneven trend across deprivation levels reflects two opposing factors: individuals in more deprived areas generally smoke more cigarettes per day but are more likely to buy cheaper tobacco products.

We also estimated the potential health benefits of a £0.60 minimum threshold. Between 2024 and 2034, this policy is projected to prevent 285 deaths and add 6792 years of life to the Scottish population, averaging 24 years of life gained per death prevented. The health impacts are greater for individuals in more deprived areas. The number of deaths averted would be 15, 25, 59, 84 and 102 across the least to most deprived areas, with corresponding average years of life gained per death of 23.4, 24.1, 21.3, 20.7 and 27.9, respectively (table 3). The uneven trend in life years gained is due to the interaction of two opposing trends: while people in more deprived areas tend to die younger (increasing potential life years gained), they also tend to have a lower remaining life expectancy (limiting life years gained). The model suggests that a £0.60 minimum threshold could lead to there being approximately 1467 fewer hospital admissions by 2034 (figure 2; table 3). This would result in an overall cumulative cost saving to the NHS of approximately £1.2 million over 5 years and £2.7 million by 2034 (online supplemental results appendix).

### Equivalent tax rises and differential impact on revenue

To achieve equivalent effects to a £0.60 minimum threshold on smoking prevalence by 2034 would require a 12.5% increase in duty on all tobacco products, ranging from 1.5% for a £0.40 threshold to 29.0% for a £0.80 threshold. The findings were broadly similar across the four equivalence criteria investigated, ranging from an 11.5% duty increase to achieve equivalent effects on deaths by 2034 to a 14.0% duty increase for equivalent effects on deaths in the most deprived SIMD quintile (see online supplemental results appendix).

Over 5 years (2024–2028), a £0.60 minimum price is estimated to reduce UK Government tax revenue by £253 million due to decreased tobacco sales, while increasing tobacco industry revenue by £996 million as higher prices raise industry profits, even with some people who smoke quitting (see online supplemental results appendix). In contrast, a 12.5% tax increase—calibrated for equivalent effects on smoking prevalence by 2034—is estimated to reduce government tax revenue by just £3 million



**Figure 1** Observed trends in smoking prevalence by Scottish Index of Multiple Deprivation (SIMD) quintile from the Scottish Health Survey for 2008–2019, with 95% CIs and the resulting forecast rates for 2017–2043. The points and error bars show the observed values from the Scottish Health Survey. The solid lines show the model forecast of smoking prevalence under the assumption that the policy progress and underlying trends that drove the declines in smoking rates from 2008 to 2019 continue into the future. The red line shows the forecast prevalence of smoking in the overall adult population. The dashed black lines refer to the tobacco-free target in Scotland of <5% people who smoke by 2034. The projected values for smoking prevalence in 2034 are 8.5% for the total population, and 4.1%, 4.1%, 5.5%, 11.4% and 19.7% for the least to the most deprived SIMD quintiles, respectively.

**Table 2** The potential decrease in the number of people who smoke after introducing various minimum pricing thresholds

	Whole Scottish population	Scottish Index of Multiple Deprivation rank				
		1 (least deprived)	2	3	4	5 (most deprived)
Number of people who smoke in 2024 before the introduction of minimum pricing	610 110	69 850	78 858	102 414	148 080	210 908
Percentage of people who smoke in 2024 before the introduction of minimum pricing	14.2%	7.5%	8.8%	12.0%	18.3%	26.6%
Reduction in the number and percentage of people who smoke following the introduction of each minimum price threshold						
£0.40 threshold	4297 (0.10%)	559 (0.06%)	538 (0.06%)	853 (0.10%)	890 (0.11%)	1506 (0.19%)
£0.50 threshold	10 312 (0.24%)	1211 (0.13%)	1255 (0.14%)	1963 (0.23%)	2185 (0.27%)	3727 (0.47%)
£0.60 threshold	16 327 (0.38%)	1863 (0.20%)	2061 (0.23%)	3158 (0.37%)	3399 (0.42%)	5788 (0.73%)
£0.70 threshold	26 209 (0.61%)	2887 (0.31%)	3226 (0.36%)	4950 (0.58%)	5664 (0.70%)	9277 (1.17%)
£0.80 threshold	39 958 (0.93%)	4284 (0.46%)	5108 (0.57%)	7340 (0.86%)	8982 (1.11%)	14 193 (1.79%)
These are estimates of effect in the first year after the introduction of the policy. Effects are estimated without considering the cross-price elasticities of demand between hand-rolling tobacco and factory-made cigarettes, which also explains the slightly higher modelled baseline number of people who smoke in 2024 compared with <a href="#">table 1</a> .						

and reduce industry revenue by £73 million. The small decrease in tax revenue is driven by people who smoke quitting entirely or reducing the number of cigarettes they smoke each day and switching to hand-rolling tobacco, which is taxed at a lower rate.

Finally, we compared the inequalities of impact on deaths by 2034 between a £0.60 minimum price and an 11.5% tax increase—calibrated for equivalent effects on deaths by 2034 (see online supplemental results appendix). The findings show that minimum pricing has a slightly more focused effect on people who live in deprived communities, with the SII showing a 93-death difference between the most and least deprived SIMD quintiles (RII: 1.63). In contrast, the tax increase has a smaller SII of 85 deaths (RII: 1.45).

## DISCUSSION

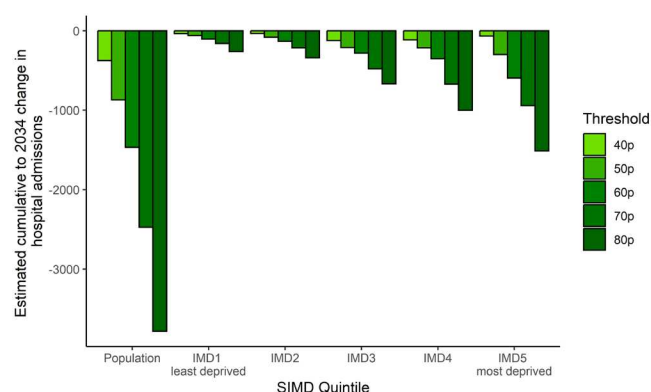
The modelled estimates of the effects of minimum pricing for tobacco in Scotland indicate that it would decrease the number of people who smoke and consequently bring health benefits, more so with higher minimum price thresholds. The impact of

this policy would be larger in areas with higher levels of deprivation, because these areas have higher smoking rates and people who tend to consume cheaper tobacco.

However, minimum pricing for tobacco also brings a public health dilemma because in the short term it would increase tobacco industry revenue, although this might improve the political feasibility of the policy by reducing industry opposition. Tobacco retailers might see higher profits, although it is estimated that only 7% of the revenue from tobacco sales in Great Britain is retained by small retailers,<sup>48</sup> and transnational tobacco corporations have significant control over retailer profit margins. In the long term, tobacco industry revenue should decline if the price increase complements other tobacco control policy leading to a reduction in smoking prevalence. Consequently, minimum pricing for tobacco should be used as part of a coordinated tobacco control strategy, in which tobacco taxation would continue to be used to increase the prices of all tobacco products, actions to limit the supply of illicit tobacco are strengthened (as in the recent UK Government strategy on illicit

**Table 3** Cumulative impact on deaths, years of life lost to death and hospital admissions from 2024 to 2034

	Whole Scottish population	Scottish Index of Multiple Deprivation rank				
		1 (least deprived)	2	3	4	5 (most deprived)
Reduction in the number of deaths from all-causes						
£0.40 threshold	81	6	7	31	27	10
£0.50 threshold	188	9	17	50	65	47
£0.60 threshold	285	15	25	59	84	102
£0.70 threshold	491	26	46	105	152	161
£0.80 threshold	727	46	72	137	225	247
Reduction in the number of years of life lost due to death from all-causes						
£0.40 threshold	1627	133	155	463	538	339
£0.50 threshold	3872	209	380	880	1039	1363
£0.60 threshold	6792	351	602	1256	1740	2842
£0.70 threshold	11 245	536	998	2098	3113	4500
£0.80 threshold	17 137	886	1519	2966	4577	7189
Reduction in the number of hospital admissions from tobacco-related causes						
£0.40 threshold	375	36	34	124	114	68
£0.50 threshold	871	61	82	212	217	300
£0.60 threshold	1467	104	133	283	353	595
£0.70 threshold	2474	161	217	480	673	943
£0.80 threshold	3784	263	341	667	1001	1512



**Figure 2** Cumulative change in the number of tobacco-related hospital admissions. This is assessed relative to tobacco-related hospital admissions in the business-as-usual scenario up to and including 2034. SIMD, Scottish Index of Multiple Deprivation.

tobacco<sup>49</sup>), and there is increased investment in public health initiatives that support people in the most disadvantaged situations to quit smoking. Investment in supporting people to quit is especially important given the risk that tobacco price increases could stigmatise or impose financial burdens on individuals who are not yet prepared to quit or may not be in a position to quit.<sup>14 50</sup> In Scotland, the actions outlined in the Tobacco and Vaping Framework<sup>5</sup> include implementing the recommendations from the Public Health Scotland review of smoking cessation services, increasing their promotion and accessibility.<sup>51</sup>

In addition, a wholesale tobacco price cap implemented alongside a substantial increase in excise duty could be used to mitigate the industry gains from the introduction of minimum pricing and to gain money to reinvest in smoking cessation services.<sup>52–54</sup> The price cap, acting as an upper limit on wholesale prices, restricts industry profits from more expensive tobacco products. It would also prevent the industry from increasing the prices of more expensive products to maintain differences from cheaper products affected by the minimum price. Simultaneously, the excise duty increase can be calibrated to prevent tobacco products from becoming cheaper due to the price cap while raising the prices of all tobacco products. This would limit the possibility of price variation in the tobacco market and therefore limit the ability for the tobacco industry to use pricing strategies as a marketing tool.

A key strength of the model is its synthesis of several data sources representative of the Scottish population, enabling it to project future smoking prevalence based on past trends. The model also provides the ability to exactly model the impact of tobacco pricing policies on the expected prices paid by consumers and on the future trends in smoking.<sup>32</sup> Using this facility, the model was able to project the effect of maintaining an ongoing tobacco duty escalator at a set amount above RPI inflation while simultaneously introducing a minimum price threshold for tobacco. Finally, the model estimates a range of key outcomes that allow the relevant trade-offs to be considered: consumer spending on tobacco, UK Government tax revenues, and retailer/industry revenue; and health outcomes including the NHS costs of hospitalisations.

The main limitation of the modelling is the limited evidence on people's behavioural responses to tobacco price changes, which necessitates some caution in interpreting our findings. First, there is uncertain evidence on the cross-price effects between hand-rolling tobacco and factory-made cigarettes. The cross-price elasticity estimates in this report suggest that when

the price of one product increases, consumption of both products decreases.<sup>44</sup> However, the 95% CIs around these estimates leave room for the less likely possibility that they are substitutes, where a price increase for one product causes consumers to switch to the other. Second, there is uncertainty about the extent to which the modelled policy effects will continue to affect smoking prevalence in subsequent years. The official UK estimates for the price elasticity of demand for tobacco have alternative 'short-run' and 'long-run' estimates: the 'short-run' elasticity for all tobacco products is  $-0.57$ , while the 'long-run' elasticity is  $-1.19$ .<sup>39 40</sup> This suggests an alternative long-run scenario in which the initial impact of a minimum price could roughly double over several years, leading to larger effects than presented in this study. Third, price effects are assumed to be the same for smoking initiation and cessation. While there is evidence of separate price effects on smoking initiation<sup>55</sup> and quitting,<sup>56</sup> recent UK evidence is lacking. Fourth, the model does not investigate the potential effects of the policy options modelled for the consumption of other tobacco products, for example, cigarillos and heated tobacco, or for the use of e-cigarettes and other nicotine-containing products. There is evidence from the USA of cross-price effects between tobacco and e-cigarettes,<sup>57</sup> but again little evidence for the UK.

When applying this study's findings to other countries, it is important to consider how a minimum price would interact with the other tobacco control policies in place. For example, in countries that have not yet implemented bans on multi-buy discounts and price promotions on tobacco packs, these could be restricted by a minimum price. Furthermore, minimum pack size regulations could prevent the tobacco industry from reducing pack sizes in an effort to keep the price of a pack relatively affordable.

In conclusion, this modelling-based study shows the potential impact of implementing a minimum price for tobacco in the context of ongoing tobacco duty increases. The main benefit of setting a minimum price for tobacco is that it constrains the ability for the tobacco industry to maintain relatively affordable products on the market. Nevertheless, supplementary policies are essential, including those that ensure retailer compliance with minimum price regulations, reduce the supply of illicit tobacco and support individuals who rely on inexpensive tobacco to quit smoking.

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