

# Does switching from tobacco to reduced-risk products free up hospital resources?

Francesco Moscone<sup>1,2</sup>

Author details can be found at the end of this article

**Correspondence to:**  
Francesco Moscone;  
francesco.moscone@brunel.ac.uk

## Abstract

Promoting a shift from smoking tobacco to reduced-risk products—such as vapes and heat-not-burn tobacco—has the potential to ease the burden on healthcare resources, particularly health expenditure, if empirical evidence shows that reduced-risk products are an effective smoking cessation tool or can help to mitigate the risk of disease. However, there are notable variations in needs and provision of healthcare services between different regions. This article will explore this heterogeneity with the aim of understanding the different health impacts of switching from smoking to reduced-risk products across England, assessing the potential savings for the NHS and potential progress towards the goal of the country becoming smoke-free. This exploratory analysis of different sources of variation across regions offers policy insights to motivate further research.

**Key words:** E-cigarettes; Health expenditure; Heat-not-burn tobacco; Hospital admissions; Reduced-risk products; Regional variations; Smoking

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## Introduction

Despite widespread knowledge about the harmful effects of tobacco smoking, this remains the primary cause of premature death worldwide, contributing to over 6 million deaths each year from various related diseases, such as cancer, heart disease, stroke, chronic bronchitis and emphysema (GBD 2019 Diseases and Injuries Collaborators, 2020). In recognition of the health risks linked to smoking, the UK government has set the goal of making England ‘smoke-free’ by 2030. As part of this effort, a new tobacco control plan for England was released in 2017 (then updated in 2020) to implement necessary measures to make smoked tobacco obsolete, with smokers either quitting or moving to reduced-risk products (Department of Health and Social Care, 2020). Reduced-risk products include nicotine-delivery systems with lower health risks than smoking tobacco, such as vaping products. The prevalence of smoking among English adults decreased from 13.9% in 2019 to 13.0% in 2021, with a general decreasing pattern being observed since 2011 (Office for Health Improvement and Disparities, 2022). This decline may be a result, at least in part, of the increased use of vapes, e-cigarettes and heat-not-burn products, with the highest use concentrated among people aged 16–24 years (Office for National Statistics, 2022a).

Considerable discrepancies exist across England, both in the demand and supply for healthcare services related to smoking. Understanding this heterogeneity in needs, risks and service access can provide insights into the different health impacts of switching from smoking tobacco to reduced-risk products, and any potential savings for the NHS.

## Reduced-risk products vs smoking

Although the long-term health effects of reduced-risk products are unknown, research has suggested that they may carry substantially fewer health risks compared to smoking tobacco. For example, Forster et al (2018) compared the aerosol- and smoke-generated impact of reduced-risk products, such as electronic cigarettes and heat-not-burn tobacco, with that of traditional cigarettes. On average, reduced-risk products contained 97% less of the toxicants highlighted by the World Health Organization and the US Food and Drug Administration as harmful or potentially harmful than traditional cigarettes (Forster et al, 2018). Meanwhile, Mallock et al (2018) found that heat-not-burn tobacco products contained

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80–90% less aldehydes and 97–99% less volatile organic compounds (which are major contributors to health risk) compared to traditional cigarettes. However, in a later study, Mallock et al (2019) reviewed the differences between heat-not-burn tobacco products and traditional cigarettes, concluding that, while the former may have some advantages over the latter, they are not risk-free, as the long-term health effects are not yet fully understood. Therefore, the authors recommended that heat-not-burn tobacco products should be subject to strict regulation and monitoring to protect public health.

In terms of the effectiveness of reduced-risk products for helping people to quit smoking, Kalkhoran and Glantz (2016) observed a positive correlation between e-cigarette use and smoking cessation, but the effectiveness of e-cigarettes varied based on the type of device used and the population being studied. This study also found that e-cigarettes were linked to a higher probability of reducing cigarette consumption, although the long-term health effects of e-cigarettes remain uncertain. Similar conclusions were reached in a randomised trial comparing the effectiveness of e-cigarettes vs nicotine-replacement therapy as smoking cessation tools (Hajek et al, 2019), although the authors concluded that e-cigarettes seemed to be more effective than nicotine-replacement therapy in helping people to quit smoking. A systematic review by Hartmann-Boyce et al (2021) indicated that e-cigarettes may be effective as a smoking cessation tool, and that they are likely to be less harmful than traditional cigarettes.

## Regional data for smoking and related diseases

To present a comprehensive overview of the smoking demand and supply for the different regions of England, the author has used data from the 2019–21 annual population surveys, looking at age group, gender and region (Office for National Statistics, 2022b). Hospital episode statistics from 2019–21 have been used to gather data regarding hospital admissions by age group, gender, region and disease category (NHS Digital, 2022). For the same time period, the author collected data on smoking habits by gender and age group from the Office for National Statistics (2022c), as well as information on mortality attributable to smoking and the risk of developing one of five major diseases (lung cancer, oral cancer, chronic obstructive pulmonary disease, cerebrovascular heart disease and ischaemic heart disease) at a national level, split by gender and age group, from the Royal College of Physicians (2018) and Rostron (2013). These data were used to calculate the number of hospital admissions caused by smoking for each disease category by multiplying the number of people who smoke (or used to smoke) by the risk of developing the disease.

The analysis indicated that smoking persists as a major health concern in England, with implications for both people who smoke and the NHS. The average prevalence of smoking among those aged 18 years and over in England in 2019–21 was 13.6%, although this declined from 13.9% in 2019 to 13.0% in 2021. There was strong geographical variation, with the lowest smoking prevalence of 12.2% being seen in the south east of England, compared to 14.1% in the Midlands, 14.6% in the north west and 15.0% in the north east and Yorkshire. Smoking was most common among men aged 35–44 years; 19.9–21.1% of men in this age group in the Midlands and the north of England smoked. There was also an unusually high prevalence of smoking among young men (18–24 years) in the South West (20.2%).

The data showed that admission rates for lung cancer, for which smoking is the most important risk factor (NHS, 2022), were concentrated in the Midlands and north east and Yorkshire regions, with the latter having a lung cancer incidence rate almost twice that of all other areas. This resulted in an average total cost of over £156 million for treating lung cancer in this region during the study period.

## The impact of transitioning to reduced-risk products

Encouraging smokers to switch to reduced-risk products can be achieved in several ways, such as by adding promotional material in tobacco cigarette packaging, or using online advertising. However, it is important that measures are taken to minimise the risk of young people being exposed to these messages (Dawson and Smith, 2022).

To the best of the author's knowledge, there have been no studies into how reduced exposure to harmful substances through switching to reduced-risk products translates into reduced risk of developing a smoking-related disease and consequent hospital admission. However, existing studies have estimated an average reduction of over 90% in exposure to chemicals that are major contributors to health risks (Forster et al, 2018; Mallock et al, 2018). In 2020, the US Food and Drug Administration accepted heat-not-burn tobacco as a modified-risk tobacco product following empirical evidence of a 70–97% risk reduction for developing a smoking-related disease (US Food and Drug Administration, 2020). Therefore, in this article, the author has taken the (conservative) assumption that a person who switches from smoking traditional cigarettes to reduced-risk products will have a 70% lower risk of developing smoking-related diseases such as oral cancer, lung cancer and chronic obstructive pulmonary disease. This estimate is based on the literature above, as well as the fact that the components of cigarette smoke that harm health (such as carcinogens) are either absent in reduced-risk products or mostly at levels below 5% of those present in traditional cigarettes.

Using the data collected from various sources (Rostron, 2013; Royal College of Physicians, 2018; NHS Digital, 2022; Office for National Statistics, 2022b, c), the author calculated the total health expenditure related to hospital admissions by multiplying average ward costs per bed day for a specific disease by the mean length of stay in hospital for that disease. In calculating health expenditure, it was assumed that the mean length of stay in hospital and the associated costs were the same for patients who smoke, patients who used to smoke and those who had switched to reduced-risk products.

In a scenario where 10% of people who smoke switched to reduced-risk products, and assuming a 70% risk reduction for developing a smoking-related disease, a 2.6% reduction in total admissions and 2.5% reduction in health expenditure for lung cancer, oral cancer, chronic obstructive pulmonary disease, cerebrovascular heart disease and ischaemic heart disease across the entire population was calculated. Although seemingly modest, these reductions would result in savings of over £103 million, with the greatest savings seen in the Midlands and north east and Yorkshire regions. Care for lung cancer alone represented £26 million of these savings.

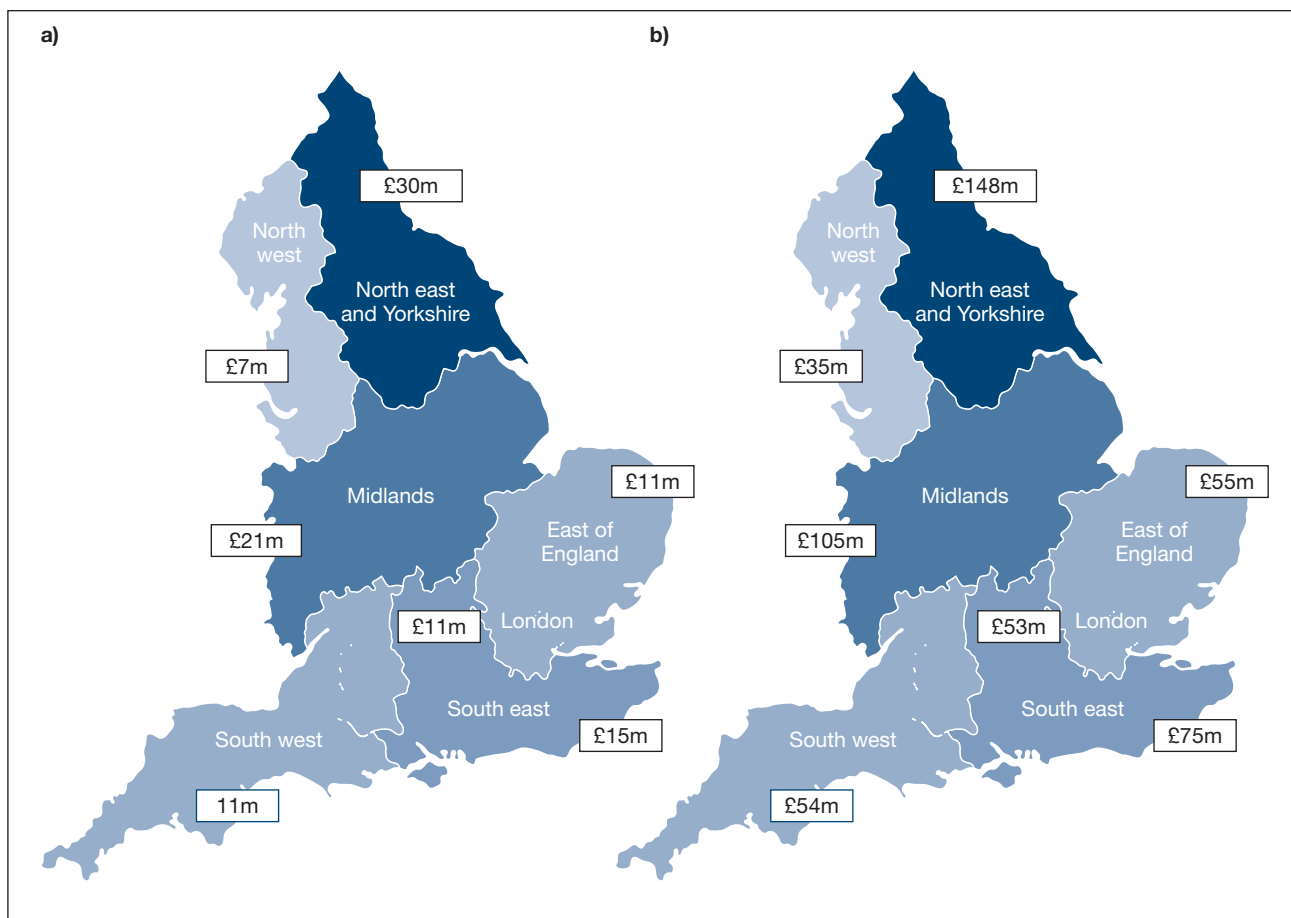
In a scenario where 50% of people who smoke switched to reduced-risk products, the analysis projected a 13.0% reduction in hospital admissions and a 12.4% reduction in health expenditure across the five disease categories. These reductions would translate into savings of £518 million, with £131 million of attributable to lung cancer savings.

**Figures 1a** and **1b** show the projected health expenditure savings by region for the five disease groups under the two proposed scenarios. These projections indicate that switching to reduced-risk products could lead to substantial savings, particularly in areas such as the north east and Yorkshire, which had the highest rates of smoking-related disease in 2019–21.

## Limitations

In this analysis, each geographical region of England was taken as one statistical unit. In reality, it is reasonable to expect a large degree of variability within these geographical areas. Subsequent analysis would benefit from more disaggregated data (such as at a council level), with a regression analysis approach, in order to factor in non-smoking-related risk factors for the considered diseases, such as pollution and socioeconomic deprivation.

Comparing the cost savings and admissions associated with switching to reduced-risk products vs quitting smoking altogether, including an in-depth feasibility analysis of a full-blown cessation strategy based on historical trends, was outside the scope of this study. Such analysis should be the focus of future work. It is also worth emphasising that further research is necessary to explore the potential risks associated with reduced-risk products. While the general consensus suggests that they are unlikely to be worse than smoking, caution should be used when promoting these products reduced-risk products particularly if such messages may be seen by young people and those who have never smoked before. Investigating the risks for these groups is crucial. These considerations extend beyond the scope of the current analysis but should be noted as points for future research and careful consideration.



**Figure 1.** Projected health expenditure savings by region in two scenarios: a) 10% of adults who smoke switch to reduced-risk products; b) 50% of adults who smoke switch to reduced-risk products. m=million.

### Key points

- Encouraging people who smoke to switch to reduced-risk products could lead to substantial reductions in hospital admissions and health expenditure.
- The greatest savings were projected in the north east and Yorkshire, where admission rates for lung cancer are particularly high.
- Switching to reduced-risk products could help to achieve the UK government's aim of making England smoke-free by 2030.

### Conclusions

This analysis indicated that people who smoke switching to reduced-risk products could lead to substantial savings, with a reduction in total health expenditure ranging from 2.5% to 13.0%, depending on the proportion of people who switched. In both scenarios, the north east and Yorkshire region would see the greatest savings. This suggests that interventions to encourage switching from smoking traditional cigarettes to reduced-risk products could help England progress towards the goal of becoming smoke-free by 2030, while also freeing up hospital resources. This would be particularly beneficial for regions such as the north east and Yorkshire, which is currently facing high admission rates for lung cancer.

#### Author details

<sup>1</sup>Brunel Business School, Brunel University, London, UK

<sup>2</sup>Universita Ca' Foscari, Venice, Italy

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### Conflicts of interest

The author declares that there are no conflicts of interest.

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