

Does Switching from Tobacco to Reduced-Risk Products Free up Hospital Resources?

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Editorial

Abstract

Promoting a shift from smoking to Reduced Risk Products (RRPs) has the potential to ease the burden on healthcare resources, particularly health expenditure, if empirical evidence shows that RRP are an effective smoking cessation tool or can help mitigate the risk of disease. Freeing up hospital beds and other resources may help hospital managers address other pressing health issues. However, there is notable variation in needs (e.g., mortality and diseases associated to smoking) and provision of healthcare services (e.g., hospital admissions and costs associated to smoking) across different regions. In this paper, we will investigate such heterogeneity with the aim to understand the different health impact across the English territory of converting from smoking to RRP, ultimately assessing the potential savings for the NHS, and hence contributing to the goal for England to become smoke-free. We will review the state of the art of the literature on the relative risks of RRP and carry an exploratory analysis to look at different sources of variations across regions, offering valuable policy insights to motivate hopefully further research.

Keywords

Smoking, reduced risk products, e-cigarettes, heat-not-burn tobacco, regional variations, hospital admissions, health expenditure

Introduction

Despite the widespread knowledge among smokers about the harmful effects of tobacco smoking, this remains the primary cause of premature death worldwide, claiming over 6 million lives annually due to various diseases such as cancer, heart disease, stroke, chronic bronchitis, and emphysema (GBD, 2020). In recognizing the health risks linked to smoking, the UK Government announced its goal to make England smoke-free by 2030, issuing an ultimatum to industry to make tobacco obsolete with smokers quitting or moving to reduced risk products. As part of this effort, a new Tobacco Control Plan for England was released to implement necessary measures, such as an ultimatum to the tobacco industry to make smoked tobacco obsolete (UK Government, 2017). The plan encourages smokers to either quit or switch to reduced-risk nicotine delivery systems like vaping products. The smoking prevalence among English adults decreased from 13.9% in 2020 to 13.0% in 2021, confirming the decreasing pattern observed since 2011 (Local Tobacco Local tobacco control profiles, 2022). This decline may be due, at least in part, to the increasing use of vaping, e-cigarettes and heat-not-burn products, with the highest use concentrated amongst people aged 16 to 24 years old (Office of National Statistics, 2022).

Nonetheless, significant discrepancies exist through the English territory both in the demand and supply. Understanding heterogeneity in needs, risks, and health care services, we can get

insights into the different health impact across the English territory of converting from smoking to RRP, ultimately assessing the potential savings for the National Health Service.

The remainder of the paper is structured as follows. Section 2 reviews the literature review, Section 3 is devoted to the geographical distribution of demand and supply for smoking and discusses the spatial distribution of needs and supply when switching to RRP, and Section 5 concludes.

Literature review on reduced risk products versus smoking

Although long-term health effects of RRP use are unknown, converting from smoking traditional cigarettes to RRP may result in considerable health benefits as pointed by a number of recent studies. Several recent studies have looked at the positive health outcomes.

Forster et al. (2018) compare the aerosol and smoke generated impact of reduced risk products such as electronic cigarettes and heat-not-burn (HNB) tobacco with those of traditional cigarettes. The authors find an overall average reduction of above 97% both in the list of nine toxicants advanced by the World Health Organization for mandatory reduction in cigarette emissions, and in the toxicants present in the abbreviated list of harmful and potentially harmful constituents specified by the US Food and Drug Administration. Mallock et al. (2018) analyse the emissions of HNB products relative to traditional cigarettes and report an 80-90% reduction in aldehydes and a 97-99% decrease in volatile organic compounds that are major contributors to health risk. Mallock et al. (2019) review the differences between HNBs and traditional cigarettes, emphasizing the pros and cons of using HNBs as a substitute for smoking, concluding that while HNBs may have some advantages over traditional cigarettes, they are not risk-free as the long-term health effects of HTPs are not yet fully understood. The authors recommend that HTPs should be subject to strict regulation and monitoring to protect public health.

A number of recent studies investigate the positive impact of reduced risk products on smoke quitting. Kalkhoran and Glantz (2016) observe 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. Additionally, the study finds that e-cigarettes were linked to a higher probability of reducing cigarette consumption, although the long-term health effects of e-cigarette use remain uncertain. Similar conclusions are reached by Hajek et al. (2019) who, undertaking a randomized trial that compare the effectiveness of e-cigarettes versus nicotine-replacement therapy as a smoking cessation tool, find that e-cigarettes seem to be more effective than nicotine-replacement therapy in helping smokers quit smoking. A recent systematic review by Hartmann-Boyce et al. (2022) concludes that e-cigarettes may be effective as a smoking cessation tool, and that they are likely to be less harmful than traditional cigarettes.

The geography of smoking, switching to RRP and potential savings in the NHS

To present a comprehensive overview of the smoking demand and supply for the seven English regions, we have used annual data from 2019 to 2021 on population by age-group, gender and

region from the Annual Population Survey (ONS),¹ and on hospital admissions by age-group, gender, region, by disease category from the Hospital Episode Statistics for England (NHS Digital)² for the same years. For the same time period, we have collected data on smoking habits by gender and age group from the ONS.³ Finally, we have gathered information on mortality attributable to smoking as well as on the risk for a smoker and ex-smoker of developing a disease for 5 major diseases (lung and oral cancer, COPD, cerebrovascular and ischaemic heart diseases) at a national level and split by gender and age group from the Royal College of Physicians⁴ and from Rostron (2013)⁵. Using these data, we have calculated the number of hospital admissions caused by smoking for each disease category by multiplying the number of smokers by the risk that a smoker has of contracting the disease plus the number of ex-smokers multiplied by the risk that an ex-smoker has of contracting the disease.

The years from 2019 to 2021 have seen smoking persist as a major health concern in the England. The illnesses and fatalities caused by smoking not only have tragic impacts on smokers, but also impose significant burdens on the NHS. The smoking prevalence amongst individuals aged 18 and above in England is 13.6% on average, although we observe a decreasing trend over time, with the prevalence moving from 13.9 in 2019 to 13.0% in 2021. Also, smoking prevalence is characterized by strong geographical variation that shows the lowest value in South-East (12.2%), and peaks in Midlands (14.1%) and Northern England (15.0% and 14.6% in the North East & Yorkshire, and the North West, respectively). Data show that smokers are typically males aged between 35 and 44 years old, with a peak of 19.9-21.1% male smokers registered in Midlands and Northern England for this age group, although we observe an unusually high percentage of young male smokers (18 to 24 years old) in the South West (20.2%).

It is interesting to observe that the admission rate for lung cancer, for which traditional smoking is known as the most important risk factor, is concentrated in the Midlands and North East & Yorkshire regions, with the latter having an incidence of lung cancer almost doubling all other areas, resulting in a total cost of over 156 million pounds for treating lung cancer in this region.

Our focus now shifts to examining the impact of smokers transitioning to RRP. Specifically, we compare the *status quo* with two hypothetical scenarios: a conservative estimate where we hypothesize that 10% of traditional smokers convert to RRP and then a more optimistic scenario where we assume a 50% conversion rate. Encouraging smokers to switch can be achieved in several ways, for example by inserting promoting material in tobacco cigarette packaging, or by an on-line promoting that reaches smokers while minimising the risk of young people being exposed to these messages (Dawson and Smith, 2022).

While there is no research on how the reduced exposure to harmful substances translates into reduced risk of developing a smoke-related disease and consequent hospital admission of RRP, existing studies reviewed in Section 2 estimate an average reduction by over 90% in the

¹ Please see

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland>

² Please see <https://digital.nhs.uk/data-and-information/publications/statistical/hospital-admitted-patient-care-activity/2021-22>

³<https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandlifeexpectancies/dataset/s/smokinghabitsintheukanditsconstituentcountries>

⁴ <https://www.rcplondon.ac.uk/projects/outputs/hiding-plain-sight-treating-tobacco-dependency-nhs>

⁵ Smoking-Attributable Mortality by Cause in the United States: Revising the CDC's Data and Estimates | Nicotine & Tobacco Research | Oxford Academic (oup.com)

exposure to chemicals that are major contributors to health risk. In 2020 the U.S. Food and Drug Administration accepted heat-not-burn tobacco as Modified Risk Tobacco Product by accepting empirical evidence of a risk-reduction between 70% and 97% of developing a disease. Hence, in this paper we will take the (conservative) assumption that, for a cigarette smoker, transitioning from traditional cigarettes to RRP will result in a 70% risk reduction of developing a smoke-related disease such as oral or lung cancer and COPD. The estimate that RRP use is 70% safer than smoking is based on the fact that the constituents of cigarette smoke that harm health – including carcinogens are either absent in RRP or, if present, they are mostly at levels much below 5% of smoking doses.

We calculate 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. We observe that, in calculating health expenditure, we assume that the mean length of stay in hospital and hence associated cost is the same for all patients, regardless they are smokers, ex-smokers or have switched to RRP (Guest et al., 2020).

Under a 10% conversion rate scenario (Scenario 1) and assuming a 70% risk reduction of developing a smoke-related disease, we estimate a reduction by 2.62% and 2.47% in total admission and total health expenditure due to smoking, respectively, for the 5 major diseases lung and oral cancer, COPD, cerebrovascular and ischaemic heart diseases, across the entire population. This reduction would result in saving over 103 million pounds, of which 26 million pounds saved only for lung cancer, and with the greatest savings seen in the Midlands and North East and Yorkshire regions.

When simulating a 50% conversion rate (Scenario 2), we project a reduction by over 13% in hospital admissions and 12.36% for total health expenditure for the five diseases categories. Such reduction would translate into saving 518 million pounds, of which 131 only for lung cancer.

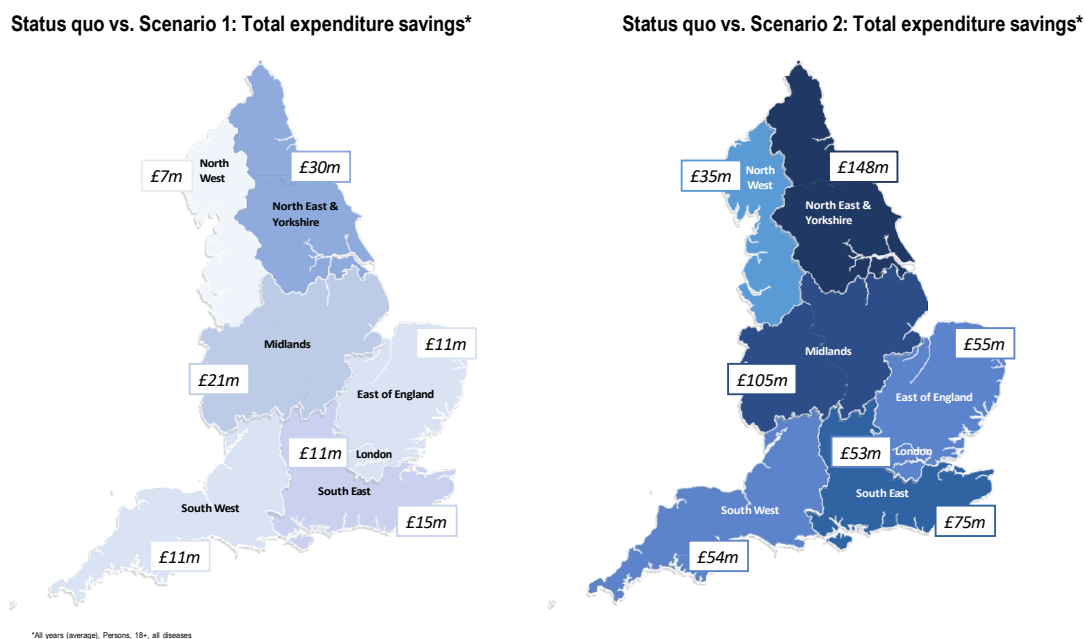


Figure 1: Expenditure savings under the two scenarios

Figure 1 visually represents the breakdowns of expenditure savings by English region for the five disease groups we have considered under the two proposed scenarios. The maps clearly

suggests that a conversion to RRPs could lead to significant savings in health expenditure, particularly for regions such as the North East and Yorkshire, which are currently experiencing the highest rates of smoking-related illnesses.

Concluding remarks

This paper discussed the potential savings in health expenditure for lung cancer and all other considered diseases if a conversion to reduced-risk products (RRPs) is made, assuming a 70% risk reduction and under two scenarios of conversion rates by 10% and by 50%. The estimates suggest that a conversion to RRPs could lead to significant savings, with a reduction in total health expenditure that ranges between 2.5% and 13%, depending on the assumed conversion rate. The North East and Yorkshire region is likely to see the greatest savings in both scenarios. This would aid in the country's efforts to eradicate smoking by 2030, while also freeing up hospital resources for other interventions. This would be particularly beneficial for regions such as the North East and Yorkshire that are currently facing significant challenges.

Given that in our empirical exercise the statistical unit is the region, it is reasonable to expect a large degree of variability within such geographical areas. Subsequent analysis would benefit from more disaggregated data (e.g.: at a council level) within the context of a regression analysis approach to better condition on non-smoke related risk factors, such as pollution and deprivation.

Key points

- Potential savings in health expenditure if a conversion to reduced-risk products is made
- Switching to reduced-risk products will make more feasible the aim of eradicating smoking by 2030 in the UK

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