## Tobacco control in England: using microsimulation modelling to quantify the potential impact of a tobacco-free generation or a total ban

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Abstract [word count 400, word limit 400]

Introduction

In 2015, almost one-fifth of English adults continued to smoke. Tobacco control policies in the UK are amongst the strongest in Europe, yet smoking prevalence remains stubbornly high, especially in deprived groups. Novel and radical approaches may be needed to control tobacco effectively. The British Medical Association backs a tobacco ban for those born after 2000, and a population-wide tobacco ban has already been implemented in Bhutan. We use microsimulation modelling to quantify the effectiveness and equity of these two radical tobacco policies.

Methods

IMPACTNCD is a previously validated dynamic stochastic microsimulation developed in R. It simulates the life course and smoking histories of synthetic individuals under alternative scenarios. We used IMPACTNCD to estimate the potential impact of two proposed changes to tobacco control policy in England – a sales ban restricted to those born in or after 2000 and a total sales ban – on a simulated English population over a 30-year time frame. Extrapolating from Bhutan’s implementation, we assumed 50% reductions in smoking initiation rate, active to ex-smoking ratio, and cigarette consumption. We compared both scenarios with a counterfactual that assumed current declining trends in smoking will continue in the future. We conducted a rigorous sensitivity analysis using second-order Monte Carlo simulation, and we report the median and interquartile range of the output distributions.

Results

The model suggested that under the tobacco-free generation caps scenario, smoking prevalence would fall to 12.4% (12.1% to 12.6%) for men and 7.9% (7.7% to 8.1%) for women, by 2045. This could prevent or postpone approximately 3,500 (-4,200 ‒ 11,000) cardiovascular disease cases and some 230 (-3,100 ‒ 3,600) lung cancer cases; resulting in approximately 190 (-2900 ‒ 3400) fewer cardiovascular disease deaths, and 220 (-2,700 ‒ 3,200) fewer lung cancer deaths.

Under the total caps scenario, the English smoking prevalence would fall to 7.2% (7.0% ‒ 7.4%) for men and 4.3 % (4.1 % ‒ 4.5 %) for women, by 2045. This could prevent or postpone approximately 90,000 (70,000 ‒ 120,000) cases of cardiovascular disease, some 79,000 (55,000 ‒ 120,000) cases of lung cancer, approximately 14,000 (3,000 ‒ 25,000) fewer cardiovascular disease deaths and some 54,000 (38,000 ‒ 73,000) fewer lung cancer deaths.

Both scenarios could reduce socioeconomic health inequalities in cardiovascular disease and lung cancer morbidity and mortality.

Conclusions

Strengthening existing English tobacco control policies through limiting access could substantially improve effectiveness and equity. Further research is now needed to explore the political and legal feasibility issues.