**Title: Health impacts of a more equal society: a microsimulation study**

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Moeez Subhani was an early career researcher

**Abstract**

**Background**

Socioeconomic health inequalities persist in England. The gaps in life and healthy life expectancies are more than 15 years between the least and most deprived fifth of areas. The gaps can be explained largely by socioeconomic gradients in diet, smoking, alcohol, physical activity and disease case fatalities. We aimed to quantify the health impact of a more equal society.

**Methods**

We used IMPACTNCD, a stochastic dynamic microsimulation that explicitly models the causal relations between exposures (fruit & veg consumption, smoking histories, environmental tobacco smoking, alcohol consumption, physical activity, body mass index, systolic blood pressure, and total cholesterol) and diseases (cardiovascular disease, post-stroke dementia, type 2 diabetes mellitus, chronic obstructive pulmonary disease, common cancers). We simulated three theoretical scenarios for the years 2021-2040 in England: 1) Baseline: recent trends in exposures and mortality continue; 2) Scenario A: in 2021, exposures in the most and second most deprived quintile groups (index of multiple deprivation) match those of the middle quintile; and 3) Scenario B: as above, but additionally, case-fatality rates of the modelled diseases and mortality rates from any other cause match those of the middle quintile group.

**Findings**

Preliminary results suggest that under scenario A, approximately 250,000 (95% uncertainty intervals 220,000 to 280,000) disease cases would be prevented or postponed, resulting in approximately 1·7m (1·4m to 1·9m) case-years prevented or postponed and some 67,000 (44,000 to 88,000) fewer deaths. This is 1·7% (1·5% to 1·9%) of all incident cases, 0·80% (0·66% to 0·91%) of all case-years, and 0·94% (0·61% to 1·20%) of all deaths. Overall, 390,000 (300,000 to 490,000) quality-adjusted life-years (QALYs) would be gained.

Under scenario B, the improved survival rates would prevent or postpone approximately 210,000 (180,000 to 220,000) disease cases but would likely lead to an increase in prevalent disease cases of approximately 330,000 (-110,000 to 690,000) case-years. Overall, 1·4m (1·1m to 1·7m) QALYs would be gained.

**Interpretation**

Successful levelling-up policies would improve health but might increase healthcare demand if they lead to improved survival despite the expected incidence reduction. Nevertheless, achieving these gains is politically and socially challenging and likely to be a multigeneration sustained effort.

**Funding**:

We are thankful to Health Foundation for funding this study.

**Contribution:**

All authors designed the modelling scenarios. CK developed the microsimulation, and MS performed the analysis supervised by CK. MS wrote the first draft, and all authors critically revised it.

**Conflicts of Interest:**

We declare that none of the authors has any conflict of interest.