Background The current strategy of the Department of Health for cardiovascular disease (CVD) prevention in England promotes identification and treatment of high risk individuals through health checks. The aim of this study was to estimate the effect of health checks on CVD burden (coronary heart disease and stroke) and socioeconomic inequality vs. a population wide intervention.

Methods IMPACTNCD is a stochastic, dynamic, microsimulation model. It draws information from Health Survey for England, Office for National Statistics, large cohorts and meta-analyses to simulate over time a close-to-reality synthetic population of England. Socioeconomic indicators (area deprivation), behavioural factors (diet, smoking, physical activity), and biological risk factors (body mass index, systolic blood pressure, total cholesterol) were included in this simulation.

Three scenarios were considered. The baseline scenario projects secular trends in risk factors based on recent trends. The 'health checks' scenario ('HC') assumes 30% of high risk individuals are identified, optimally treated and adopt a healthier lifestyle. Finally, the population wide intervention scenario ('PWI') assumes a drop of 5 mmHg of systolic blood pressure, 0.5 mmol/l drop of total cholesterol, plateauing of body mass index, increasing fruit and vegetable consumption by 2 portions per day, increasing physical activity by one active day per week and a 10% relative drop in smoking prevalence. All scenarios were simulated from 2011, had a diffusion period of 5 years and a lag time between exposure and effect of five years.

Cases and deaths prevented or postponed (CPP and DPP respectively), the slope and relative index of inequality (SII and RII respectively) for CVD incidence were estimated for years 2015 to 2025. Uncertainty was estimated with Monte Carlo simulation and is presented as 95% uncertainty intervals. Analysis was performed in R.

Results Compared to the baseline scenario, the 'HC' scenario might result in approximately 56,000 (39,000 to 73,000) CPP and 2,500 (~8,000 to 12,000) DPP; SII reduced by approximately 9% (~29% to 38%) and RII reduced by approximately 1% (~16% to 17%). Under the 'PWI' scenario 200,000 (185,000 to 218,000) CPP and 11,000 (1,500 to 21,000) DPP were estimated; SII reduced by approximately 30% (~1% to 53%) and RII reduced by approximately 3% (~15% to 18%).

Conclusion Our model suggests that NHS health checks appear weaker than population wide interventions, both for primary CVD prevention and for reducing absolute and relative socioeconomic inequalities. Further research is now needed to prioritise the interventions which will achieve the fastest reductions in these unacceptable inequalities.