# Title

# The cost-effectiveness and equity of the NHS Health Checks cardiovascular disease prevention programme: a microsimulation using real-world data from a deprived northern city

# Authors

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# Background

The NHS Health Check Programmes’ stated objective is the early identification of otherwise healthy people at high risk of cardiovascular disease (CVD) and diabetes. However, the programme’s effectiveness, cost-effectiveness, and equity are still contested. This study therefore aimed to determine whether Health Checks (HCs) are cost-effective and equitable in a city with high levels of deprivation and CVD.

# Methods

IMPACTNCD is a previously validated,R-based dynamic stochastic microsimulation policy model. We calibrated this model to Liverpool demographics, risk factor exposures, and CVD epidemiology. We modelled the current implementation of HCs using local and national data on effectiveness, costs, and participant risk profiles. Disease costs and health state utilities were drawn from standard sources and discounted at 3.5% annually using a healthcare perspective. We quantified the uncertainty of model outputs using second-order Monte Carlo simulation, and report 95% uncertainty intervals.

We modelled three fifteen year scenarios from 2017 to 2031:

A) continuing the current implementation of HCs;

B) an optimal implementation of HCs assuming optimal coverage, uptake, treatment and lifestyle change;

C) combining scenario A with structural policies targeting dietary consumption of salt, sugar, fruit and vegetables.

We compared all three scenarios with a counterfactual of no HCs, and conducted a rigorous sensitivity analysis.

# Results

The model suggested that over 15 years the CVD cases prevented or postponed would be approximately 310 (40 – 734) for scenario A, 870 (327 – 1,397) for scenario B, and 1,740 (815 – 2,939) for scenario C.

Cumulative discounted net costs and quality-adjusted life years (QALYs) gained for the three scenarios respectively would be +£2.1m (-£1.5m – +£4.8m) and +90 QALYs (-124 – +376) for A; +£1.4m (-£6.1m – +£6.6m) and +434 QALYs (-76 – +1,133) for B; or -£16.9m (-£33.2m – -£5.9m) and +2,871 QALYs (+1,355 – +4,830) for C.

We estimated the probability of scenarios A and B being cost-effective by 2031 at 25% and 74% respectively, valuing each QALY at £20,000.

Scenario C would become cost saving by 2030.

Scenario A may increase existing health inequalities; B is likely to be neutral, while C would substantially decrease inequalities.

In extensive sensitivity analyses, the direction of the results did not change when the discount rate was varied from 0%-6%, nor when the time horizon was increased to 20 years.

# Conclusions

Current NHS Health Checks implementation appears neither equitable nor cost-effective. The addition of structural policies proved equitable and cost saving. Future research might now seek to identify the optimal combination of structural policies at local level.

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| **Submitting Author:**Dr B Collins**Email Address:**brenc@liv.ac.uk**Authors:**Dr B Collins\*1, Dr C Kypridemos1, Dr P Parvulescu2, Ms R Gosling2, Prof S Capewell1, Prof M O'Flaherty1**Affiliations:**1Department of Public Health and Policy, University of Liverpool, Liverpool, UK,2Public Health Department, Liverpool City Council, Liverpool, UK   |   |   |
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