

MATTERS ARISING

Open Access



Reply to: What evidence is required to justify the NHS Health Check programme?

Zahra Raisi-Estabragh^{1,2}, Stefan Neubauer³, Thomas E. Nichols^{4*} and John Robson⁵

Abstract

Medications that reduce blood pressure and cholesterol are among the most cost-effective healthcare interventions available, but their delivery remains suboptimal. In 2009, the National Health Service (NHS) Health Check was introduced to increase the detection and treatment of major cardiovascular risk factors in people aged 40–74 years. In a prospective observational study using the UK Biobank, we compared health outcomes between NHS Health Check attenders and matched non-attenders. Attenders exhibited higher early rates of new hypertension, hyperlipidaemia, and chronic kidney disease, followed by significantly lower long-term multi-system disease and mortality. A recent critique of our work raises questions regarding observational design limitations, self-selection bias, and discrepancies with randomised controlled trials (RCTs). However, RCTs face ethical and feasibility challenges in large-scale public health interventions and are not immune to self-selection. Furthermore, the argument that self-selection explains our findings is inconsistent with our results. If healthier individuals were disproportionately attending NHS Health Checks, we would expect lower risk across all outcomes. However, we observed an initial increase in new diagnoses suggesting that NHS Health Checks are detecting pre-existing conditions earlier rather than merely attracting healthier individuals. Additionally, the cited RCTs predate modern antihypertensive and statin treatments, and considered heterogenous non-validated interventions. In summary, this critique relies on selective citation of outdated and inappropriate RCTs, an overstatement of selection bias, and an underappreciation of the role of observational research in shaping public health improvements. Our findings indicate that NHS Health Checks contribute to the prevention of multi-system morbidity and mortality, warranting continued investment.

Keywords Population health, Preventive medicine, Cardiovascular disease, National health service, UK biobank

This reply refers to the comment available online at <https://doi.org/10.1186/s12916-025-04081-3>.

*Correspondence:

Thomas E. Nichols
thomas.nichols@bdi.ox.ac.uk

¹ William Harvey Research Institute, NIHR Barts Biomedical Research Centre, Queen Mary University of London, Charterhouse Square, London EC1M 6BQ, UK

² Barts Heart Centre, St Bartholomew's Hospital, Barts Health NHS Trust, West Smithfield, London EC1 A 7BE, UK

³ Division of Cardiovascular Medicine, Radcliffe Department of Medicine, University of Oxford, National Institute for Health Research Oxford Biomedical Research Centre, Oxford University Hospitals NHS Foundation Trust, Oxford, UK

⁴ Big Data Institute, Li Ka Shing Centre for Health Information and Discovery, Nuffield Department of Population Health, University of Oxford, Oxford, UK

⁵ Wolfson Institute of Population Health Queen, Queen Mary University of London, Charterhouse Square, London, UK



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

Cardiovascular disease (CVD) remains the most common cause of death worldwide, with a recent plateauing of declining mortality trends. Medications that lower blood pressure and serum cholesterol are among the most cost-effective preventive interventions [1, 2], but are not being delivered optimally.

In 2009, the National Health Service (NHS) Health Check was established in England, aiming to increase the detection and treatment of major cardiovascular risk factors through a national rolling five-yearly programme, in people aged 40–74 years who do not already have established CVD, diabetes, chronic kidney disease (CKD), or hypertension [3]. The NHS Health Check comprises a standardised and validated clinical consultation in primary care including blood pressure measurement (which includes pulse regularity), a blood test for measurement of serum lipids and where appropriate glycaemic control. Advice on smoking cessation and high alcohol consumption is offered, with referral for management of detected hypertension, statins for CVD risk or diabetes, and tests for CKD and atrial fibrillation where indicated.

In a recent prospective observational analysis, we examined disease and mortality outcomes in UK Biobank participants who had completed an NHS Health Check, compared to matched non-attenders [4]. In the early period after the NHS Health Check, attenders had higher rates of new diagnoses of hypertension, high cholesterol, and CKD. While, in the longer-term, we observed lower rates of multi-system disease and mortality events in attenders, compared to non-attenders.

We read with interest, the commentary by Jørgensen et al. [5], which critiques our study on several grounds, including the reliance on observational data, potential confounding by self-selection, disagreement with randomized controlled trial (RCT) findings, and lack of discussion on harms.

We agree that evaluating the health benefits of programmes designed to identify earlier CVD risk and management is challenging. Individuals who take-up such interventions are in general healthier, more affluent, and have higher educational attainment, than those who do not, with self-selection leading to lower adverse outcomes in attenders due to confounding [6].

In our UK Biobank study, attenders and non-attenders were matched on an extensive range of sociodemographic, lifestyle, and baseline morbidity factors [4]. The argument that self-selection entirely explains our findings is inconsistent with our results. If healthier individuals disproportionately attended NHS Health Checks, this would tend towards *lower* yield of new diagnoses than in non-attenders. However, we observed an initial increase in new diagnoses of major metabolic conditions shortly after attendance, indicating that

NHS Health Checks are detecting previously undiagnosed pre-existing conditions earlier. Our findings corroborate similar study reports of increased diagnoses of diabetes, hypertension, and CKD after the NHS Health Check [7], and extend these to additionally demonstrate associations with significant reductions in long-term multi-system disease and mortality events.

While RCTs are the gold standard for establishing causality in many contexts, they are not always feasible for large-scale population health interventions. Observational studies have long informed public health policy. For example, the association of smoking and lung cancer is based almost entirely on observational data.

Furthermore, the issue of self-selection for health interventions may also hamper RCTs—making trial designs challenging. For example, the Inter99 Copenhagen trial showed that among people invited for a health check, mortality from unrelated causes (e.g. road traffic accidents) was substantially lower among attenders than non-attenders [8]. High quality RCTs at scale with therapeutic intervention in routine primary care settings that include cardiovascular mortality as outcomes are difficult to achieve, even in experimental settings.

Jørgensen et al. cite a meta-analysis of 15 historic RCTs, dated 1963–1999, reporting no mortality benefit of health checks [9]. The interventions used were highly heterogeneous and lacked validation – including general health consultations, blood tests, pelvic examinations, chest radiographs, mammography, and sigmoidoscopy alongside a range of behavioural interventions in a wide variety of clinical and community settings. Outcomes were similarly diverse, largely unvalidated, generally lacking in power and often incomplete. These trials differed fundamentally from the NHS Health Check in aims, interventional design, implementation, scale and outcomes.

Two further studies were cited as evidence against health checks: The Danish DANCAVAS trial [10], which focused on screening with cardiac CT scans and biomarkers rather than the structured, risk-based approach of NHS Health Checks; and the ADDITION-Cambridge trial [11], which was designed for diabetes screening alone and does not reflect the broader cardiovascular prevention in NHS Health Checks.

Importantly, most of the cited studies took place long before effective treatment with antihypertensives and statins were established in routine clinical practice in the late-1990s. In the UK, it was not until 2004 that national guidance on hypertension treatment was published, and 2008 when statin treatment for primary prevention based on multifactorial risk estimation was introduced [5]. It is thus inappropriate and potentially misleading to extrapolate these earlier heterogenous

studies to the NHS Health Check, which started in 2009.

The further suggestion from Jørgensen et al. is that the NHS Health Checks causes harm by diverting resources from more critical services. Early disease detection and management supports cost-effective management, with prevention of costly complications such as ischaemic heart disease, stroke, heart failure, and renal failure. National Institute for Health and Care Excellence (NICE) evaluations recommend treatment of hypertension and use of statins as cost-effective [1, 2]. The assertion that NHS Health Checks are a net burden on the health service is a claim without substance.

In summary, Jørgensen et al. raise important questions about the evidence base for NHS Health Checks, but their critique relies on selective citation of outdated and inappropriate RCTs, an overstatement of selection bias, and an underappreciation of the role of observational data in shaping health policy and public health improvement. Our findings suggest that NHS Health Checks contribute to the prevention of cardiovascular and multi-system morbidity and mortality, warranting continued investment and further research into their optimisation.

Abbreviations

CKD	Chronic kidney disease
CVD	Cardiovascular disease
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
RCT	Randomized controlled trial

Acknowledgements

None

Authors' contributions

ZRE and JR produced the first draft. All authors edited and approved the final manuscript.

Funding

ZRE acknowledges the support of the National Institute for Health Research Barts Biomedical Research Centre (NIHR203330). SN was supported by the Oxford NIHR Biomedical Research Centre and the Oxford British Heart Foundation Centre of Research Excellence. TEN is supported by the Li Ka Shing Centre for Health Information and Discovery. JR is in receipt of funding from Barts Charity Real Health grant and the North East London Integrated Care Board.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

There are no restrictions to publish this work.

Competing interests

The authors declare no competing interests.

Received: 23 February 2025 Accepted: 14 April 2025

Published online: 25 April 2025

References

1. Quality and Outcomes Framework Programme NICE cost impact statement Indicator area: Hypertension. 2011. Available from: <https://www.nice.org.uk/Media/Default/standards-and-indicators/qof%20indicator%20key%20documents/NM37%20cost%20statement.pdf>. Accessed 22 Apr 2025.
2. Rabar S, Harker M, O'Flynn N, Wierzbicki AS. Lipid modification and cardiovascular risk assessment for the primary and secondary prevention of cardiovascular disease: summary of updated NICE guidance. *BMJ*. 2014;349: g4356.
3. Robson J, Dostal I, Sheikh A, Eldridge S, Madurasinghe V, Griffiths C, Coupland C, Hippisley-Cox J. The NHS Health Check in England: An evaluation of the first 4 years. *BMJ Open*. 2016;6: e008840.
4. McCracken C, Raisi-Estabragh Z, Szabo L, Robson J, Raman B, Topiwala A, Roca-Fernández A, Husain M, Petersen SE, Neubauer S, et al. NHS Health Check attendance is associated with reduced multiorgan disease risk: a matched cohort study in the UK Biobank. *BMC Med*. 2024;22:1–13.
5. Jørgensen KJ, Johansson M, Woloshin S. What evidence is required to justify the NHS Health Check programme? *BMC Med*. 2025. In Press.
6. Dryden R, Williams B, McCowan C, Themessl-Huber M. What do we know about who does and does not attend general health checks? Findings from a narrative scoping review. *BMC Public Health*. 2012;12:1–23.
7. Robson J, Garriga C, Coupland C, Hippisley-Cox J. NHS Health Checks: an observational study of equity and outcomes 2009–2017. *Br J Gen Pract*. 2021;71: e701.
8. Bender AM, Jørgensen T, Pisinger C. Is self-selection the main driver of positive interpretations of general health checks? The Inter99 randomized trial. *Prev Med*. 2015;81:42–8.
9. Krogsbøll LT, Jørgensen KJ, Gøtzsche PC. General health checks in adults for reducing morbidity and mortality from disease. *Cochrane Database Syst Rev*. 2019;1:CD009009.
10. Lindholt JS, Søgaard R, Rasmussen LM, Mejlidal A, Lambrechtsen J, Steffensen FH, Frost L, Egstrup K, Urbonaviciene G, Busk M, et al. Five-Year Outcomes of the Danish Cardiovascular Screening (DANCAVAS) Trial. *N Engl J Med*. 2022;387:1385–94.
11. Simmons RK, Echouffo-Tcheugui JB, Sharp SJ, Sargeant LA, Williams KM, Prevost AT, Kinmonth AL, Wareham NJ, Griffin SJ. Screening for type 2 diabetes and population mortality over 10 years (ADDITION-Cambridge): A cluster-randomised controlled trial. *Lancet*. 2012;380:1741–8.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.