UK National Screening Committee

Screening for hypertension in adults

An evidence map to outline the volume and type of evidence related to screening for hypertension for the UK National Screening Committee

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The UK National Screening Committee secretariat is hosted by the Department of Health and Social Care

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About the UK National Screening Committee

The UK National Screening Committee (UK NSC) advises ministers and the NHS in the 4 UK countries about all aspects of population and targeted screening and supports implementation of screening programmes.

Conditions are reviewed against evidence review criteria according to the UK NSC's evidence review process.

Read a complete list of UK NSC recommendations.

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Summary

This document discusses the findings of an evidence map completed by the Bristol Evidence Synthesis for Screening (BESS) Group, hosted at the University of Bristol, on screening for hypertension in adults.

Evidence maps are a way of scanning published literature to look at the volume and type of evidence in relation to a specific topic. They inform whether the evidence is sufficient to commission a more sustained analysis on the topic under consideration.

Question 1: What is the volume and type of evidence on how the prevalence of hypertension varies between people with and without specific risk factors?

We identified thirty-one systematic reviews published between 2020 and 2025, reporting relative prevalence of hypertension among people with versus without a wide range of risk factors. These systematic reviews either investigated established risk factors in understudied countries and regions, or had no geographical restriction but investigated risk factors that are unlikely to be directly applicable to the UK population or context of population health screening.

If further synthesis work is considered, it should focus on identification of the most up to date information, from primary studies or published data sets, on risk factors deemed relevant to the UK population and to the context of population health screening.

Question 2: What is the volume and type of evidence on the effectiveness of a screening programme on hypertension in reducing hypertension-related mortality and morbidity?

We identified two systematic reviews (containing zero and one study, latest search up to 2020) and one additional primary study published after the review search dates. One cluster randomised controlled trial reported a multicomponent cardiovascular disease health promotion programme, where hypertension screening was the primary intervention, to be effective at reducing cardiovascular related hospital admissions. One retrospective cohort analysis reported weak evidence (not reaching statistical significance) of a reduction in cardiovascular mortality associated with hypertension screening.

Question 3: What is the volume and type of evidence available on the effectiveness of interventions in adults with screen-detected hypertension?

We identified one large retrospective cohort study, conducted in Korea. This study suggested a benefit of early versus delayed treatment in people with screen-detected hypertension.

However, the findings may be limited to the Korean context, where treatment pathways and population characteristics may differ from the UK.

Based on the findings of this evidence map, it is not recommended that an evidence summary should be undertaken on screening for hypertension in adults as a stand-alone intervention. However, consideration should be given to whether screening for hypertension should be evaluated as part of a muti-component intervention to screen for cardiovascular risk and/or cardiovascular disease.

Introduction and approach

The UK National Screening Committee (UK NSC) makes recommendations based on careful review of evidence against specific criteria, with regular updates of the evidence that underpins the recommendations. The UK NSC external reviews (also known as evidence summaries or evidence reviews) are developed in keeping with the UK NSC evidence review process to ensure that each topic is addressed in the most appropriate and proportionate manner. Further information on the evidence review process can be accessed online.

The UK NSC has not previously considered screening for hypertension.

Importance of evaluating potential screening programmes

"All screening programmes do harm. Some do good as well and, of these, some do more good than harm at reasonable cost."[1] Screening programmes aim to identify people at risk at a stage that optimises the chances of effective treatment and improved patient outcomes. The UK NSC, a committee of independent experts, plays a critical role in determining whether the benefits of a potential screening programme outweigh the harms and justify the associated costs. UK NSC recommendations are based on careful review of evidence against specific criteria.[2]

Several factors affect whether a screening programme is clinically and/or cost effective. These include people's access to and uptake of screening, test accuracy, ease of use, cost and administration, whether the intervention leads to better outcomes compared with treating once symptoms develop, and any other unintended consequences.[1] It is essential to consider the harms that may result from false positives, false reassurance, overtreatment, and complications from tests or treatments. Critically, it cannot be assumed that screen-detection always leads to improved patient outcomes. Overdiagnosis, where screening detects an abnormality that would not have caused symptoms or harm, is an important risk.[1] Comprehensive evaluation of screening programmes acknowledges key biases that include healthy screenee bias, lead or length time biases, and overdiagnosis bias.[1] Ethical concerns include the need for informed consent, as well as impact on health inequalities, if some groups are less able to access screening,[3] and the potential strain on NHS services if the workload of screening worsens access to care for symptomatic patients.

The definition and classification of hypertension

Hypertension (or high blood pressure) is a chronic medical condition characterised by a sustained elevation of arterial blood pressure. Blood pressure is measured using two numbers, systolic pressure (the higher number) is the arterial pressure when the heart is pumping blood around the body, and diastolic pressure (the lower number) is the arterial pressure when the

heart rests between beats and refills with blood. The threshold used to define hypertension is arbitrary and is based on the potential to benefit from blood pressure lowering treatment.[4, 5]

The National Institute for Health and Care Excellence (NICE) defines hypertension as a systolic blood pressure sustained above or equal to 140 mmHg, and/or diastolic blood pressure sustained above or equal to 90 mmHg,[6] and classifies stages of hypertension as follows:

- Stage 1 hypertension — clinic measured blood pressure ranging from 140/90 mmHg to 159/99 mmHg *and* subsequent Ambulatory Blood Pressure Monitoring (ABPM) daytime average or Home Blood Pressure Monitoring (HBPM) average blood pressure ranging from 135/85 mmHg to 149/94 mmHg.
- Stage 2 hypertension — clinic measured blood pressure of 160/100 mmHg or higher but less than 180/120 mmHg* *and* subsequent ABPM daytime average or HBPM average blood pressure of 150/95 mmHg or higher.
- Stage 3 or severe hypertension (hypertensive crisis) — clinic measured systolic blood pressure of 180 mmHg or higher *or* clinic measured diastolic blood pressure of 120 mmHg or higher.

Most people with hypertension do not experience any symptoms. People with severe hypertension can experience symptoms including: severe headaches, chest pain, dizziness, difficulty breathing, nausea, vomiting, blurred vision or other vision changes, anxiety, confusion, buzzing in the ears, nose bleeds, abnormal heart rhythm.[5]

The prevalence of hypertension in the general population

The 2022 Health Survey for England estimated that around 30% of adults have hypertension, including 13% with untreated hypertension.[7] This aligns closely with the 14.8% estimated prevalence of diagnosed hypertension reported in the 2023/24 Quality and Outcomes Framework.[8] The prevalence of hypertension in the general population has shown little change in the past 25 years.[9]

Risk factors for hypertension

Risk factors for hypertension can be divided into those which are intrinsic to an individual (non-modifiable) and those which can be changed (modifiable). Modifiable risk factors for hypertension include an unhealthy diet (specifically excessive salt, saturated fat and trans fats consumption, or low intake of fruits and vegetables), physical inactivity, consumption of tobacco and alcohol, obesity, mental health and stress.[5, 10] Non-modifiable risk factors include family

* The upper limit of Stage 2 hypertension is variably defined in other guidelines internationally

history of hypertension, older age, ethnicity, sex and co-existing diseases such as diabetes or kidney disease.[5, 10]

Reliable, up-to-date estimates of how prevalence of hypertension varies across readily definable risk groups provide important contextual information and may inform the design (e.g. defining the screen-eligible population or focus of a targeted approach) of any future screening programme.

The Health Survey for England, 2022, reported the prevalence of hypertension by age group, with the highest prevalence reported in the 75+ age group (66% for men and 71% for women).[7] The Office for National Statistics also published an analysis of risk factors for hypertension among adults living in private households, using the Health Survey for England 2015 to 2019.[11] Within this, the prevalence of hypertension in people is reported by sex for a number of characteristics, including but not limited to:

- BMI category: prevalence of hypertension in those not overweight, overweight, and obese reported as 18%, 27%, 44% respectively in females and 24%, 35%, 53% respectively in males.
- Ethnicity: prevalence in White, Black, Asian and Other populations reported as 29%, 46%, 32%, 31% respectively in females and 38%, 48%, 33%, 37% respectively in males.
- Cigarette smoking status: prevalence in current, ex regular and never smokers reported as 30%, 31%, 29% respectively in females and 40%, 40%, 36% respectively in males.

Diagnosis of hypertension

The NICE guideline for the diagnosis and management of hypertension in adults (NG136) states that a diagnosis of hypertension can be made in people with a clinic measured blood pressure of 140/90 mmHg or higher and an ABPM daytime average or HBPM average of 135/85 mmHg or higher.[12]

The guideline provides additional detailed criteria for diagnosing hypertension, which consider intra-individual variation in blood pressure measurements (e.g. diurnal variation), the risk of false positives due to ‘white-coat hypertension’ (elevated readings only in clinical settings) and the risk of false negatives arising from ‘masked hypertension’ (normal clinic readings but elevated ABPM). Recommendations include taking repeat measurements in clinic, measuring blood pressure in both arms and confirming a clinic diagnosis of hypertension using ABPM (average of at least 14 daytime measurements taken twice per hour) or HBPM (twice daily measurements taken over 4 to 7 days, with two seated readings, morning and evening, one minute apart).[12]

In NG136, the only recommendation on when to measure blood pressure in people without a hypertension diagnosis relates to adults with type 2 diabetes: blood pressure should be measured at least annually in those without previously diagnosed hypertension or renal

disease, with preventive lifestyle advice offered and reinforced as appropriate.[12] The NG136 guideline does not include any recommendations on blood pressure monitoring or screening for hypertension in the general adult population.

Treatment of hypertension

Treatment of hypertension involves a combination of non-pharmaceutical interventions and / or anti-hypertensive medications.

For non-pharmaceutical management of hypertension, NICE recommends providing lifestyle advice on improving diet, increasing physical activity, reducing alcohol and caffeine intake, and quitting smoking.[12] Referrals to specialist services may also be recommended to provide additional support in addressing modifiable risk factors, such as smoking cessation. NICE no longer recommends relaxation therapies for the management of hypertension, citing insufficient evidence of effectiveness.[12] This is supported by a recent systematic review (published 2025) suggested that relaxation and stress management techniques might have short term benefits for controlling hypertension, but the overall effectiveness of these interventions remains uncertain.[13]

NICE recommends that antihypertensive treatment is offered alongside non-pharmaceutical interventions for all adults with persistent stage 2 hypertension, and for those with stage 1 hypertension who have additional risk factors, such as target organ damage, established cardiovascular disease, renal disease, diabetes, or an estimated 10-year cardiovascular risk of 10% or more.[12] First-line antihypertensive medications typically include an angiotensin-converting enzyme (ACE) inhibitor, an angiotensin receptor blocker (ARB), or a calcium channel blocker (CCB).[12] CCBs are only recommended as a first-line treatment option for people who do not have type 2 diabetes and who are aged 55 or over, or of Black African or African-Caribbean ethnicity.[12] If blood pressure remains uncontrolled, additional drugs can be introduced stepwise – usually an ACE inhibitor or ARB, a CCB, or a thiazide-like diuretic – depending on current prescriptions.[12] ACE inhibitors and ARBs should not be used together. If hypertension persists despite three drugs, an alpha-blocker or beta-blocker may be considered.[12]

The NG136 guideline also provides a patient decision aid to support discussion of antihypertensive treatment options, emphasising individualized decisions based on cardiovascular risk, patient preferences, and clinical judgment, particularly for people with frailty or multi-morbidity.[12, 14]

Alongside regular measurements to monitor blood pressure in people diagnosed with hypertension, NICE recommends that hypertensive patients receive an annual review to discuss any support needed, lifestyle changes and medication,[12] and are offered blood tests to monitor e.g. cardiovascular and diabetes risk.[15]

The NHS Health Check

The NHS Health Check is a cardiovascular disease risk management programme in England that includes a blood pressure check. It targets adults aged 40 to 74 who do not have any of a specified set of pre-existing conditions (heart disease, chronic kidney disease, hypertension, atrial fibrillation, transient ischaemic attack, familial hypercholesterolemia, heart failure, peripheral artery disease, stroke, currently prescribed cholesterol lowering medication, previous assessment of 10-years risk of cardiovascular disease of >20%).[16]

The NHS Health Check uses the QRISK3 algorithm to estimate the individual patient's 10-year cardiovascular risk.[17, 18] The algorithm's predictor variables include systolic blood pressure, blood pressure variability, and treated hypertension (diagnosed hypertension treated with at least one antihypertensive drug). This indicates that increasing blood pressure and variability in blood pressure are associated with cardiovascular disease risk, independently of a diagnosis of hypertension.[17] During an NHS Health Check, the patient's cardiovascular disease risk score is explained, and modifiable risk factors – including blood pressure – are discussed, along with the potential actions the individual can take to improve their risk score.[16]

The NHS Health Check is not classified as a screening programme by the UK government and has not been evaluated by the UK NSC.

The primary aim of the NHS Health Check is to raise awareness, assess risk, and give personalised advice and support to help people age 40 to 74 reduce their risk of heart disease. The offer is routinely made to all eligible adults with the aim of reducing inequalities by reaching more deprived groups. In contrast, a hypertension screening programme would specifically offer blood pressure measurement and intervention in cases of symptomless hypertension with the aim of reducing risk of adverse outcomes associated with hypertension, including but not limited to cardiovascular disease.

UK NSC recommendation

The UK NSC does not currently recommend screening for hypertension and to date has made no formal assessment of hypertension screening in adults. The need for a vascular risk management programme was identified in 2006, leading to the launch of the NHS Health Check programme in April 2009. This evidence map is the first formal UK NSC assessment of hypertension screening in adults.

Aims of the evidence map

The BESS (Bristol Evidence Synthesis for Screening) Group has been commissioned to produce this evidence map. An evidence map is a rapid evidence product which aims to gauge the volume and type of evidence relating to a specific topic.

This evidence map has been developed to assess whether a more sustained review on screening for hypertension should be commissioned and to evaluate the volume and type of evidence on key issues related to screening for hypertension.

The aim was to address the following questions:

1. What is the volume and type of evidence on how the prevalence of hypertension varies between people with and without specific risk factors?
2. What is the volume and type of evidence on the effectiveness of a screening programme for hypertension in reducing hypertension-related mortality and morbidity?
3. What is the volume and type of evidence available on the effectiveness of interventions in adults with screen-detected hypertension?

The findings of this evidence map will provide the basis for discussion to support decision making on whether there is sufficient evidence to justify commissioning a more sustained review of the evidence on screening for hypertension.

The aim of this document is to present the information necessary for the UK NSC to decide this.

Search methods and results

Detailed methods, including eligibility criteria and search strategies, are available in Appendix 1.

MEDLINE and Embase databases were searched. For questions 1 and 2, a two-step approach was utilised, with initial literature searches focused on identifying relevant systematic reviews published since January 2020. These focuses were based on scoping searches, to ensure the evidence map could be completed within the specified timeframe. Supplementary searches for primary studies were then conducted for question 2, where the available evidence from systematic reviews was limited. For question 3, the literature search included reports published since January 2015, without applying publication type filters, as scoping searches indicated that fewer results would be returned for this question compared with questions 1 and 2. Deduplication was conducted automatically using Nested Knowledge® (nested-knowledge.org).

Inclusion screening used a two-stage approach. The first stage focused on identification of clear excludes. At the first stage, one reviewer screened all titles and abstracts. A random sample of 20% of records were independently screened by a second reviewer, with the remaining 80% second checked using the AI screening model (Robot Reviewer) integrated in Nested Knowledge®. Disagreements between the AI Screening and the human reviewer were resolved by a human reviewer. At the second stage, the titles and abstracts of all records not excluded at the first stage were independently screened by two reviewers.

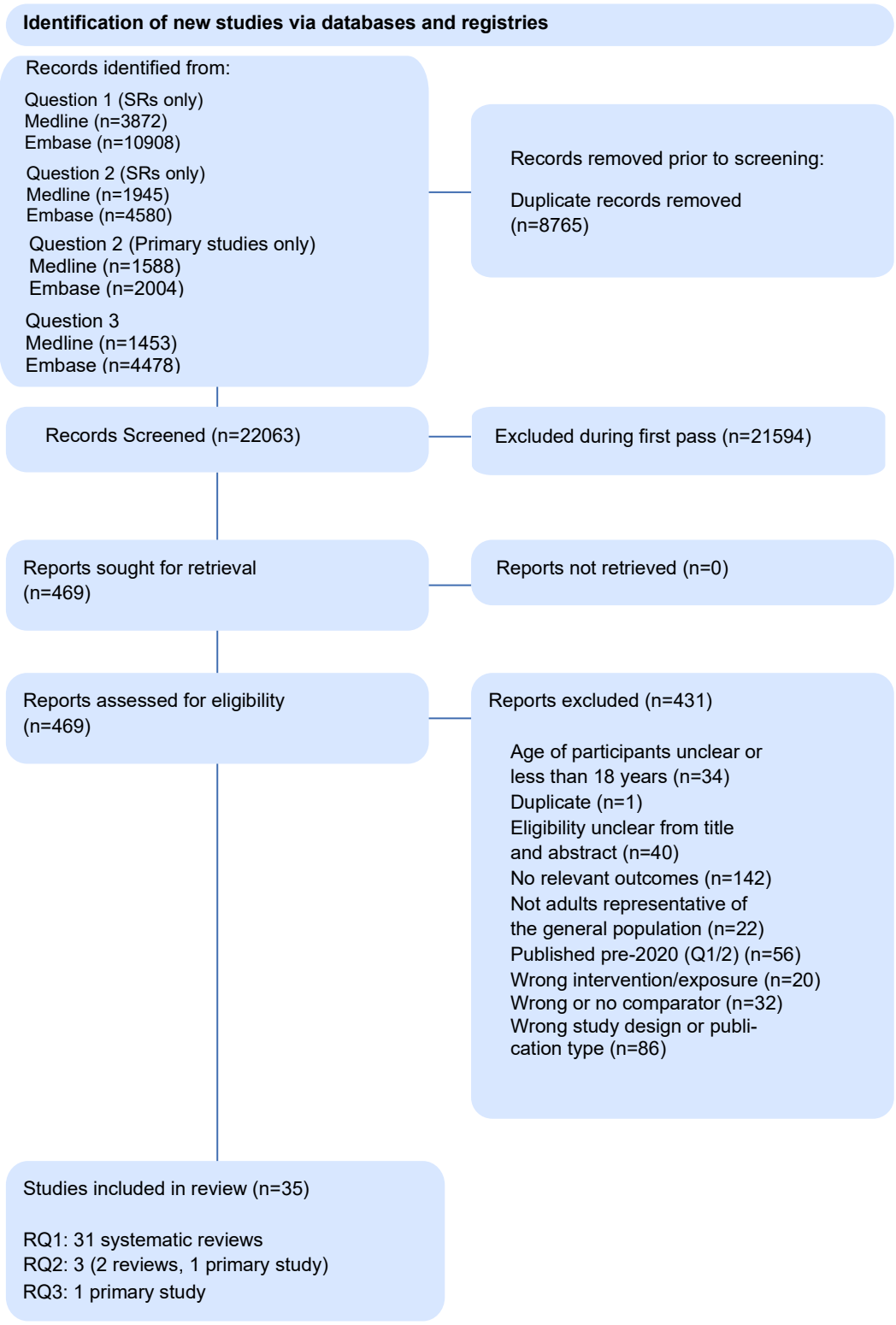
As this was an evidence map, only ‘top level’ study information was extracted. Full texts were only reviewed to clarify uncertain pieces of information, for data extraction only. Full texts were reviewed for a total of 27 publications (25 for question 1, and 1 each for questions 2 and 3). A formal quality appraisal of the evidence was not required, given the remit of the evidence map.

The searches for questions 1, 2 and 3 respectively retrieved 14,780, 6,525 and 5,931 results. The supplementary search for primary studies for question 2 retrieved an additional 3,592 results. After automatic de-duplication, 22,063 unique references were reviewed for relevance to the questions.

A total of 35 reports were included: 31 systematic reviews for question 1, 2 systematic reviews and 1 primary study for question 2, and 1 primary study for question 3.

Abstract reporting tables are available in Appendix 2. A flow diagram summarising the flow of studies through the evidence map is presented in Figure 1.

Figure 1: PRISMA flow diagram



Summary of findings

Question 1: What is the volume and type of evidence on how the prevalence of hypertension varies between people with and without specific risk factors?

Thirty-one systematic reviews were included for this question, published between 2020 and 2025 (Appendix 2).[19-43] A summary of the included studies for this review question is provided in Supplementary Table 1 (Appendix 2). These reviews synthesised studies that compared the risk (i.e. prevalence) or odds of hypertension in people with versus those without specific risk factors. Across the included reviews, the risk factors included:

- Non-modifiable risk factors (sex, age, family history of hypertension)
- Potentially modifiable risk factors (alcohol consumption, dietary patterns, exercise, obesity / being overweight / BMI, quality of sleep, smoking status)
- Socio-economic factors (education, employment, neighbourhood deprivation, urban vs rural residence)
- Environmental exposures (polychlorinated biphenyls, air pollutants, noise, greenspace)

Six reviews reported the relative prevalence of hypertension across multiple risk factors (such as age, obesity, alcohol use, smoking, and exercise). All reviews consistently reported an increased prevalence of hypertension in people with these risk factors compared with those without.[19-24] Four of these also reported relative prevalence by socioeconomic and demographic risk factors, including education, urban-rural residence, and employment.[20, 22-24] However, these six reviews focused on adults in African and Asian countries. Although they met our inclusion criteria as general population studies, contextual differences may limit how applicable their findings are to the UK. Nonetheless, it should be noted that many of the risk factors investigated in these studies (e.g. age, sex, BMI, smoking status, rural-urban classification, education, socio-economic classification) have been studied in the UK and are routinely recorded in UK Office for National Statistics (ONS) datasets.[44]

One review examined prevalence by neighbourhood deprivation without regional restriction. It reported high degree of heterogeneity in the association between neighbourhood deprivation and hypertension across countries.[43]

Five systematic reviews reported on associations between environmental exposures (occupational noise,[45] air pollution,[46] polychlorinated biphenyls,[47, 48] exposure to green space[49]) and hypertension. All reported that higher levels of these exposures were associated with increased risk of hypertension, while greater greenspace was associated with reduced risk, highlighting context-specific risks for hypertension.

Evidence about dietary patterns and sleep quality was examined in 3,[25-27] and 4 reviews,[28-31] respectively. Dietary studies generally reported associations between specific dietary patterns and hypertension. Higher intake or circulation of n-6 polyunsaturated fats and dietary patterns rich in fruit, dairy, or traditional Southern Chinese foods were reported to be associated with lower odds of hypertension, and more pro-inflammatory dietary profiles with higher risk.[25-27] Reviews quantifying prevalence by sleep quality all reported that both short and poor-quality sleep were linked to higher hypertension risk. Other less commonly studied risk factors were famine exposure, insulin resistance, age at menarche, chronic pain, tooth loss, and childhood blood pressure.[32-42]

Overall, recent systematic reviews have reported pooled estimates of the relative prevalence of hypertension among people with a wide range of characteristics or risk factors compared with those without. Included systematic reviews either investigated established risk factors (e.g. age, sex, BMI, family history, smoking status) in understudied countries and regions, or had no geographical restriction but investigated risk factors that are unlikely to be directly applicable to the UK population or context of population health screening (e.g. childhood exposure to famine, tooth loss). Further evidence synthesis could be justified to identify the most up to date information, from primary studies or published data sets (e.g. ONS), on risk factors deemed relevant to the UK population and to the context of population health screening. Such evidence synthesis could consider risk factors that may be relevant if hypertension screening were considered as part of multi-component CVD risk screening.

Question 2: What is the volume and type of evidence on the effectiveness of a screening programme on hypertension in reducing hypertension-related mortality and morbidity?

Two systematic reviews were identified in the initial search. The first of these, published by Cochrane (search up to 09 April 2020), aimed to assess the effectiveness of different screening strategies for hypertension (mass, targeted, or opportunistic) to reduce morbidity and mortality.[50] The second, produced by the US Preventive Services Task Force (USPSTF) (search up to 26 March 2021), aimed to review the benefits and harms of screening and confirmatory blood pressure measurements in adults.[51] The two systematic reviews differed in their inclusion criteria: the Cochrane review had broader inclusion criteria with respect to study design, but focussed specifically on screening for hypertension,[50] whereas the USPSTF review had narrower study design criteria but appears to have included studies where hypertension screening was part of a multi-component intervention.[51]

The Cochrane review identified zero studies.[50] The USPSTF review included one cluster RCT (n = 140,642) that evaluated the effectiveness of a multicomponent cardiovascular disease health promotion programme, where hypertension screening was the primary intervention. The intervention was reported to be effective at reducing cardiovascular related hospital admissions (rate ratio, 0.91 [95% CI: 0.86 to 0.97]). The review also included 13 studies which examined potential harms of hypertension screening, reporting no impact on quality of life and only minor harms (e.g., temporary sleep disturbance or bruising). However, it was unclear from the systematic review if these studies included no-screening comparisons.

Due to the limited evidence from systematic reviews, we ran an additional search to identify relevant primary studies published since March 2021. This identified one additional study: a retrospective cohort study of 86,587 United States (US) adults (2025).[52] This study reported that screening for hypertension was associated with lower cardiovascular mortality when adjusting for age and sex only (adjusted HR 0.52, 95% CI 0.33 to 0.81, p = 0.004), but with the difference no longer reaching statistical significance in the fully adjusted model (adjusted HR 0.65, 95% CI 0.41 to 1.03, p = 0.065).[52] Screening for hypertension was not significantly associated with all-cause mortality (adjusted HR 0.95, 95% CI 0.74 to 1.20, p = 0.647).[52]

Although not fully meeting our inclusion criteria, we additionally note two studies that aimed to evaluate home-based screening using regression discontinuity analyses.[53, 54] These two studies were not eligible for inclusion in this evidence map because all participants were screened, but are described here as additional potentially relevant information. These regression discontinuity analyses estimated local causal effects, among individuals with blood pressure close to 140/90mmHg, of being told they might have hypertension and recommended to seek medical attention,[54] or being provided with health information and referred to the formal healthcare system.[53] The first RD analysis, using cohort study data from 14,592 individuals in Germany, reported no evidence of an effect on cardiovascular mortality (HR 1.17, 95% CI 0.73 to 1.90) or any fatal or non-fatal long-term cardiovascular disease event (HR 1.02, 95% CI 0.64 to 1.64).[54]

The second RD analysis, based on data from 15,574 adults in India, reported no meaningful differences in subsequent systolic or diastolic blood pressure.[53]

In summary, we found limited evidence on the effectiveness of screening for hypertension. We note, however, that it is unclear whether the identified primary study (published since 2021) or studies using regression discontinuity analysis would have been eligible for inclusion in either of the 2 previous systematic reviews. If these alternative study designs are considered relevant, further work may be warranted to identify similar primary studies published before 2021 and to critically appraise the primary studies identified by this review. Exploration of the 13 studies on harms identified by the systematic review for the USPSTF may also be of value.

Question 3: What is the volume and type of evidence available on the effectiveness of interventions in adults with screen-detected hypertension?

No systematic reviews were identified that reported on the effectiveness of interventions in adults with screen-detected hypertension. One primary study was included: a retrospective cohort study, conducted in Korea and published in 2025, which aimed to examine the impact of early versus delayed initiation of anti-hypertensive medication on cardiovascular outcomes in people with screen-detected hypertension.[55]

This study analysed data from 505,212 people who attended general health screening, and who had no history of cardiovascular illness, over a follow-up period of approximately 11 years. Participants were categorised into three groups: normotensive, people with screen-detected hypertension who were treated within 1 year (early treatment), and people with screen-detected hypertension who started medication after 1 year (delayed treatment). Point estimates suggested increased risk of death, stroke and myocardial infarction (MI) in the delayed treatment group relative to the early treatment group, but the strength of the evidence was unclear from the results presented in the abstract. Findings, presented in the main text, from a sensitivity analysis appeared to suggest evidence of a higher risk of death (adjusted hazard ratio [HR] 1.26, 95% confidence interval [CI] 1.07 to 1.48) and stroke (adjusted HR 1.40, 95% CI 1.19 to 1.63) in the delayed treatment group relative to the early treatment group, but no evidence for a difference in MI risk (adjusted HR 1.03, 95% CI 0.85 to 1.25). Detailed review and appraisal of these findings were beyond the scope of this evidence map.

In summary, only one study was identified that addressed this research question. We did not identify any studies that compared the effectiveness of interventions for hypertension in people identified through screening vs. any other route of identification, or any studies that compared treatment vs. no treatment in people with screen-detected hypertension. We identified one large study that suggested a benefit of early versus delayed treatment in people with screen-detected hypertension. However, the findings may be limited to the Korean context, where treatment pathways and population characteristics may differ from the UK.

There is an insufficient volume of evidence to justify commissioning an evidence summary for this question. However, a detailed review and critical appraisal of the 2025 Korean study, including an assessment of its applicability to the UK context, may be of value.

Conclusions

We identified 31 systematic reviews that met the inclusion criteria for research question 1. However, these systematic reviews either investigated established risk factors (e.g. age, sex, BMI, family history, smoking status) in understudied countries and regions not directly applicable to the UK, or had no geographical restriction but investigated risk factors that are unlikely to be directly applicable to a screening context (e.g. childhood exposure to famine, tooth loss).

We identified 2 systematic reviews and, following additional searching, 1 primary study published since the last systematic review search date, which met the inclusion criteria for research question 2. The 2 systematic reviews applied differing criteria with respect to eligible study designs and the inclusion of multi-component screening interventions. One systematic review found no eligible studies and the second systematic review included a single cluster RCT. This cluster RCT found that a multicomponent cardiovascular disease health promotion programme, where hypertension screening was the primary intervention, was effective in reducing cardiovascular related hospital admissions. Assessment of this primary study was beyond the scope of our evidence map. The additional primary study found that hypertension screening was associated with a reduction in risk of cardiovascular mortality, however, results were highly uncertain.

With respect to research question 3, we identified a single large observational study which reported a benefit of early versus delayed treatment for people with screen-detected hypertension. However, this study was conducted in Korea which may limit its applicability to the UK context.

Recommendations

Recommendations are developed in collaboration between the BESS Group, the Evidence Team (UK NSC Secretariat) and the UK NSC Adult Reference Group (ARG).

Based on the findings of this evidence map, it is not recommended that an evidence summary should be undertaken on screening for hypertension in adults, as a stand-alone intervention. However, consideration should be given to whether screening for hypertension should be further evaluated as part of a muti-component intervention to screen for cardiovascular risk and/or CVD.

Primary study designs that could inform the effectiveness of screening should additionally be considered. The specification of included study designs should inform the search dates for an evidence summary. For example, if regression discontinuity designs and retrospective cohort studies with regression analyses are considered relevant, then searches should be undertaken to identify primary studies published before 2021.

With respect to risk factors for hypertension, an evidence summary could identify the most up to date information, from primary studies or published data sets (e.g. ONS), on risk factors deemed relevant to the consideration of screening in the UK. If appropriate, risk factors should be considered in the context of their relevance to multi-component screening for cardiovascular risk and/or CVD.

Declaration of interests

None

Appendix 1 — Search strategies for the evidence map

Search limits were applied to identify studies published in the English language. The initial search strategies for questions 1 and 2 focused on identifying systematic reviews. As a substantial number of systematic reviews were identified for question 1, we did not conduct additional searches for primary studies. For question 2, additional searches were conducted to identify primary studies published since March 2021, which was the search date of an included systematic review. For question 3, no publication type limits were applied. The search strategy for question 3 focused on interventions that would be offered at the point when hypertension is identified (i.e. first-line interventions).

Search strategies for Question 1

MEDLINE search

Database, version and platform

Ovid MEDLINE(R) ALL 1946 to October 13, 2025 via OvidSP.

Search date

14 October 2025.

Search filter

Highly specific database publication type filter for systematic reviews.

#	Search terms	Hits
1	Hypertension/ or Essential hypertension/ or Blood Pressure/	491435
2	((high or rais$ or elevat$ or rising or increas$ or chang$) adj2 ("blood pressure$" or "BP" or "hbp" or "arterial pressur$" or "diastolic pressur$" or "dbp" or "systolic pressur$" or "sbp")).ti,ab,kw.	94254
3	(hypertension or hypertensive or prehypertens$).ti,kf.	272188
4	or/1-3	624401
5	Risk Factors/ or exp Heart Disease Risk Factors/ or Risk Assessment/	1283194
6	(risk adj1 (factor$ or marker$ or assess$)).ti,ab,kw.	1002555

#	Search terms	Hits
7	or/5-6	1821522
8	4 and 7	96935
9	(hypertension adj2 risk).ti,ab,kw.	9783
10	8 or 9	101944
11	(meta analysis or review or systematic review).pt.	3764645
12	10 and 11	17745
13	english.lg.	34635534
14	12 and 13	15602
15	14 not ((exp infant/ or exp child/ or adolescent/) not exp adult/)	14959
16	limit 15 to yr="2020-2025"	3872

Embase search

Database, version and platform

Embase 1974 to 2025 October 10 via OvidSP.

Search date

14 October 2025.

Search filter

Highly specific database publication type filter for systematic reviews.

#	Search terms	Hits
1	hypertension/ or essential hypertension/ or blood pressure/ or diastolic blood pressure/ or systolic blood pressure/	1307172
2	((high or rais$ or elevat$ or rising or increas$ or chang$) adj2 ("blood pressure$" or "BP" or "hbp" or "arterial pressur$" or "diastolic pressur$" or "dbp" or "systolic pressur$" or "sbp")).ti,ab,kw.	141311
3	(hypertension or hypertensive or prehypertens$).ti,kf.	381660
4	or/1-3	1455123

#	Search terms	Hits
5	risk factor/ or cardiovascular risk factor/ or heart disease risk factor/ or risk assessment/	2224699
6	(risk adj1 (factor$ or marker$ or assess$)).ti,ab,kw.	1479303
7	or/5-6	2671296
8	4 and 7	321777
9	(hypertension adj2 risk).ti,ab,kw.	15016
10	8 or 9	328137
11	review.pt.	3431284
12	10 and 11	34814
13	english.lg.	39813813
14	12 and 13	31644
15	14 not ((infant/ or child/ or adolescent/) not adult/)	30990
16	limit 15 to yr="2020-2025"	10908

Search strategies for Question 2 – systematic reviews

MEDLINE search

Database, version and platform

Ovid MEDLINE(R) ALL 1946 to October 03, 2025 via OvidSP.

Search date

6 October 2025.

Search filter

Highly specific database publication type filter for systematic reviews.

#	Search terms	Hits
1	Hypertension/ or Essential hypertension/ or Blood Pressure/	491250
2	((high or rais$ or elevat$ or rising or increas$ or chang$) adj2 ("blood pressur$" or "BP" or "hbp" or "arterial pressur$" or "diastolic pressur$" or "dbp" or "systolic pressur$" or "sbp")).ti,ab,kw.	94167
3	(hypertension or hypertensive or prehypertens$).ti,kf.	271848
4	or/1-3	623959
5	Mass Screening/ or Early Diagnosis/	153003
6	(screen$ or detect$).ti,ab,kf.	4042537
7	((health or medical or population or "risk factor$" or general or opportunistic$ or periodic or annual or "primary care" or community or "NHS" or "general practice" or "GP" or "primary healthcare" or pharmacy or kiosk or workplace or "work place") adj2 (screen$ or assess$ or check or checks or "check-up$" or "check up$" or "checkups" or exam$ or review)).ti,ab,kw.	271591
8	("NHS Health Check" or "NHSHC").ti,ab,kw.	142
9	or/5-8	4279415
10	4 and 9	54821
11	english.lg.	34597551
12	10 and 11	49670

#	Search terms	Hits
13	(meta analysis or review or systematic review).pt.	3760060
14	12 and 13	5593
15	14 not ((exp infant/ or exp child/ or adolescent/) not exp adult/)	5235
16	limit 15 to yr="2020-2025"	1945

Embase search

Database, version and platform

Embase 1974 to 2025 October 02 via OvidSP.

Search date

6 October 2025.

Search date

Highly specific database publication type filter for systematic reviews.

#	Search terms	Hits
1	hypertension/ or essential hypertension/ or blood pressure/ or diastolic blood pressure/ or systolic blood pressure/	1305039
2	((high or rais$ or elevat$ or rising or increas$ or chang$) adj2 ("blood pressur$" or "BP" or "hbp" or "arterial pressur$" or "diastolic pressur$" or "dbp" or "systolic pressur$" or "sbp")).ti,ab,kw.	141162
3	(hypertension or hypertensive or prehypertens$).ti,kf.	381158
4	or/1-3	1452803
5	screening/ or early diagnosis/	356561
6	(screen$ or detect$).ti,ab,kf.	5349789
7	((health or medical or population or "risk factor$" or general or opportunistic$ or periodic or annual or "primary care" or community or "NHS" or "general practice" or "GP" or "primary healthcare" or pharmacy or kiosk or workplace or "work place") adj2 (screen$ or assess$ or check or checks or "check-up$" or "check up$" or "checkups" or exam$ or review)).ti,ab,kw.	385154

#	Search terms	Hits
8	("NHS Health Check" or "NHSHC").ti,ab,kw.	182
9	or/5-8	5723965
10	4 and 9	183794
11	english.lg.	39743205
12	10 and 11	174264
13	review.pt.	3426991
14	12 and 13	12160
15	14 not ((infant/ or child/ or adolescent/) not adult/)	11700
16	limit 15 to yr="2020-2025"	4580

Search strategies for Question 2 – primary studies

MEDLINE search

Database, version and platform

Ovid MEDLINE(R) ALL 1946 to October 29, 2025 via OvidSP.

Search date

30 October 2025.

Search filter

Study type terms and human limits used in the literature search of the 2020 Cochrane review: Schmidt B-M, Durao S, Toews I, Bavuma CM, Hohlfeld A, Nury E, Meerpohl JJ, Kredo T. Screening strategies for hypertension. Cochrane Database of Systematic Reviews 2020, Issue 5. Art. No.: CD013212. DOI: 10.1002/14651858.CD013212.pub2.

Publication date limit:

March 2021 to 2025

Based on the last surveillance search from the USPSTF review:
Guirguis-Blake JM, Evans CV, Webber EM, Coppola EL, Perdue LA, Soulsby Weyrich M. Screening for Hypertension in Adults: An Updated Systematic Evidence Review for the U.S.

Preventive Services Task Force: Evidence Synthesis No. 197. AHRQ Publication No. 20-05265-EF-1. Rockville, MD: Agency for Healthcare Research and Quality; 2021. https://www.uspreventiveservicestaskforce.org/home/getfilebytoken/o9VgWpwPWw37rVD8vhBG3H

#	Search terms	Hits
1	Hypertension/di,pc or Essential hypertension/ or *Blood Pressure/	121708
2	((high or rais$ or elevat$ or rising or increas$ or chang$) adj2 ("blood pressur$" or "BP" or "hbp" or "arterial pressur$" or "diastolic pressur$" or "dbp" or "systolic pressur$" or "sbp")).ti,kw.	9242
3	(hypertension or hypertensive or prehypertens$).ti,kf.	272776
4	or/1-3	355537
5	*Mass Screening/ or *Early Diagnosis/	66384
6	(screen$ or detect$).ti,kf.	823149
7	((health or medical or population or "risk factor$" or general or opportunistic$ or periodic or annual or "primary care" or community or "NHS" or "general practice" or "GP" or "primary healthcare" or pharmacy or kiosk or workplace or "work place") adj2 (screen$ or assess$ or check or checks or "check-up$" or "check up$" or "checkups" or exam$ or review)).ti,ab,kw.	273088
8	("NHS Health Check" or "NHSHC").ti,ab,kw.	142
9	or/5-8	1085395
10	4 and 9	9140
11	english.lg.	34711464
12	10 and 11	8286
13	(randomized controlled trial or pragmatic clinical trial or controlled clinical trial).pt.	740696
14	(randomi$ or placebo or randomly).ab.	1363375
15	clinical trials as topic/	206020
16	trial.ti.	349565
17	multicenter study.pt.	382142
18	non-randomized controlled trials as topic/ or interrupted time series analysis/ or controlled before-after studies/	4572

#	Search terms	Hits
19	groups.ab.	2936750
20	(multicenter or multi center or multicentre or multi centre).ti.	100857
21	intervention?.ti.	224995
22	(effect? or impact? or controlled or control group? or (before adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post test)) or quasiexperiment$ or quasi experiment$ or evaluat$ or time series or time point? or repeated measur$).tw.	13032168
23	exp cohort studies/	2808673
24	(cohort adj2 (analys$ or design? or stud$)).tw,kf.	486136
25	or/13-24	15869596
26	12 and 25	5396
27	animals/ not (humans/ and animals/)	5354544
28	26 not 27	5317
29	28 not ((exp infant/ or exp child/ or adolescent/) not exp adult/)	5001
30	(2021 Mar* or 2021 Apr* or 2021 May* or 2021 Jun* or 2021 Jul* or 2021 Aug* or 2021 Sep* or 2021 Oct* or 2021 Nov* or 2021 Dec*).dp.	641387
31	(202103* or 202104* or 202105* or 202106* or 202107* or 202108* or 202109* or 202110* or 202111* or 202112*).ez,dt,ep.	1386001
32	(2022* or 2023* or 2024* or 2025*).dp,ez,dt,ep.	6376240
33	30 or 31 or 32	7571721
34	29 and 33	1588

Embase search

Database, version and platform

Embase 1974 to 2025 October 28 via OvidSP.

Search date

30 October 2025.

Search filter

Study type terms and human limits used in the literature search of the 2020 Cochrane review: Schmidt B-M, Durao S, Toews I, Bavuma CM, Hohlfeld A, Nury E, Meerpohl JJ, Kredo T. Screening strategies for hypertension. Cochrane Database of Systematic Reviews 2020, Issue 5. Art. No.: CD013212. DOI: 10.1002/14651858.CD013212.pub2.

Publication date limit

March 2021 to 2025

Based on the last surveillance search from the USPSTF review:
Guirguis-Blake JM, Evans CV, Webber EM, Coppola EL, Perdue LA, Soulsby Weyrich M. Screening for Hypertension in Adults: An Updated Systematic Evidence Review for the U.S. Preventive Services Task Force: Evidence Synthesis No. 197. AHRQ Publication No. 20-05265-EF-1. Rockville, MD: Agency for Healthcare Research and Quality; 2021. https://www.uspreventiveservicestaskforce.org/home/getfilebytoken/o9VgWpwPWw37rVD8vhBG3H

#	Search terms	Hits
1	hypertension/di,pc or essential hypertension/di,pc or *blood pressure/ or *diastolic blood pressure/ or *systolic blood pressure/	136525
2	((high or rais$ or elevat$ or rising or increas$ or chang$) adj2 ("blood pressur$" or "BP" or "hbp" or "arterial pressur$" or "diastolic pressur$" or "dbp" or "systolic pressur$" or "sbp")).ti,kw.	12293
3	(hypertension or hypertensive or prehypertens$).ti,kf.	382646
4	or/1-3	480377
5	*screening/ or *early diagnosis/	66047
6	(screen$ or detect$).ti,kf.	1024798
7	((health or medical or population or "risk factor$" or general or opportunistic$ or periodic or annual or "primary care" or community or "NHS" or "general practice" or "GP" or "primary healthcare" or pharmacy or kiosk or workplace or "work place") adj2 (screen$ or assess$ or check or checks or "check-up$" or "check up$" or "checkups" or exam$ or review)).ti,ab,kw.	387999
8	("NHS Health Check" or "NHSHC").ti,ab,kw.	182

#	Search terms	Hits
9	or/5-8	1384278
10	4 and 9	13583
11	english.lg.	39918928
12	10 and 11	12414
13	randomized controlled trial/ or crossover procedure/ or double-blind procedure/	1204918
14	(randomi?ed or randomly or crossover$ or cross-over$).tw.	2097340
15	(placebo or assign$ or allocat$ or groups).ab.	4985376
16	(doubl$ adj blind$).tw.	328753
17	time series analysis/	48514
18	(multicenter or multi center or multicentre or multi centre).ti.	199327
19	intervention?.ti.	306197
20	(effect? or impact? or controlled or control group? or (before adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post test)) or quasiexperiment$ or quasi experiment$ or evaluat$ or time series or time point? or repeated measur$).tw.	17115446
21	exp cohort analysis/ or exp longitudinal study/ or exp prospective study/	2423241
22	(cohort adj2 (analys$ or design? or stud$)).tw.	711159
23	or/13-22	20130000
24	12 and 23	8191
25	(exp animal/ or animal.hw. or nonhuman/) not (exp human/ or human cell/ or (human or humans).ti.)	7816446
26	24 not 25	8036
27	26 not ((infant/ or child/ or adolescent/) not adult/)	7656
28	(2021* or 2022* or 2023* or 2024* or 2025*).yr,dc,dd,dp.	10600648
29	27 and 28	3132
30	(Conference Abstract or Conference Paper or Conference Review).pt.	6455056
31	(Clinical Trials Repository or Conference Proceeding).su.	557235
32	30 or 31	7008191
33	29 not 32	2004

Search strategies for Question 3

MEDLINE search

Database, version and platform

Ovid MEDLINE(R) ALL 1946 to October 13, 2025 via OvidSP.

Search date

14 October 2025.

#	Search terms	Hits
1	Hypertension/ or Essential hypertension/ or Blood Pressure/	491435
2	((high or rais$ or elevat$ or rising or increas$ or chang$) adj2 ("blood pressur$" or "BP" or "hbp" or "arterial pressur$" or "diastolic pressur$" or "dbp" or "systolic pressur$" or "sbp")).ti,kw.	9229
3	(hypertension or hypertensive or prehypertens$).ti,kf.	272188
4	or/1-3	594812
5	((pharmacolog$ or pharmacotherapy or "non-pharmacolog$" or "nonpharmacolog$") adj2 (intervention$ or treatment$ or manag$ or therap$ or approach$ or technique$)).ti,ab,kw.	112722
6	Antihypertensive Agents/	75233
7	(antihypertensive$ or "anti-hypertensive$" or "anti hypertensive$").ti,ab,kf,kw.	66347
8	Angiotensin-Converting Enzyme Inhibitors/ or Captopril/ or Enalapril/ or Fosinopril/ or Lisinopril/ or Quinapril/ or Ramipril/	47739
9	("Angiotensin Converting Enzyme Inhibitor$" or "Angiotensin-Converting Enzyme Inhibitor$" or "Angiotensin-Converting Enzyme Antagonist$" or "Angiotensin Converting Enzyme Antagonist$" or "Angiotensin I-Converting Enzyme Inhibitor$" or "Angiotensin I Converting Enzyme Inhibitor$" or "Kininase II Antagonist$" or "Kininase II Inhibitor$" or "ACE Inhibitor$" or "Vasopeptidase Inhibitor$" or "ACE-NEP Inhibitor$" or "ACE NEP Inhibitor$" or "NEP-ACE Inhibitor$" or "NEP ACE Inhibitor$").ti,kw.	11162
10	(Captopril or Enalapril or Fosinopril or Imidapril or Lisinopril or "Perindopril erbumine" or Quinapril or Ramipril or Trandolapril).ti,kf,kw.	11016

#	Search terms	Hits
11	Angiotensin Receptor Antagonists/ or Angiotensin II Type 2 Receptor Blockers/ or Angiotensin II Type 1 Receptor Blockers/ or Irbesartan/ or Losartan/ or Telmisartan/ or Valsartan/	27905
12	("angiotensin receptor antagonist$" or "angiotensin receptor block$" or "ARB" or "angiotensin ii receptor antagonist$" or "angiotensin II receptor antagonist$" or "angiotensin 2 receptor antagonist$" or "angiotensin ii receptor block$" or "angiotensin II receptor block$" or "angiotensin 2 receptor block$" or "angiotensin II type 2 receptor block$" or "angiotensin ii type 2 receptor block$" or "angiotensin 2 type 2 receptor block$" or "angiotensin II type 2 receptor antagonist$" or "angiotensin ii type 2 receptor antagonist$" or "angiotensin 2 type 2 receptor antagonist$" or "type 2 angiotensin receptor antagonist$" or "type 2 angiotensin receptor block$" or "AT2 antagonist$" or "AT2 block$" or "AT2 receptor antagonist$" or "AT2 receptor block$" or "angiotensin AT2").ti,kw.	5925
13	("type 1 angiotensin receptor block$" or "type I angiotensin receptor block$" or "type i angiotensin receptor block$" or "type 1 angiotensin receptor antagonist$" or "type I angiotensin receptor antagonist$" or "type i angiotensin receptor antagonist$" or "angiotensin II type 1 receptor block$" or "angiotensin ii type 1 receptor block$" or "angiotensin 2 type 1 receptor block$" or "angiotensin II type 1 receptor antagonist$" or "angiotensin 2 type 1 receptor antagonist$" or "angiotensin ii type 1 receptor antagonist$" or "angiotensin 1 receptor block$" or "angiotensin I receptor block$" or "angiotensin i receptor block$" or "angiotensin 1 receptor antagonist$" or "angiotensin I receptor antagonist$" or "angiotensin i receptor antagonist$" or "selective angiotensin II receptor antagonist$" or "selective angiotensin ii receptor antagonist$" or "selective angiotensin 2 receptor antagonist$" or "selective angiotensin II receptor block$" or "selective angiotensin ii receptor block$" or "selective angiotensin 2 receptor block$" or "AT1 antagonist$" or "AT1 block$" or "AT1 receptor antagonist$" or "AT1 receptor block$" or "angiotensin AT1" or Sartans or Sartan).ti,kw.	1671
14	(Azilsartan or Candesartan or Eprosartan or Irbesartan or Losartan or Olmesartan or Telmisartan or Valsartan).ti,kf.	11573
15	Calcium Channel Blockers/ or Amlodipine/ or Felodipine/ or Nicardipine/ or Nifedipine/	52565
16	(Amlodipine or Felodipine or Lacidipine or Lercanidipine or Nicardipine or Nifedipine or "calcium channel block$" or "calcium-channel block$" or "calcium channel antagonist$" or "CCB").ti,kf,kw.	18149

#	Search terms	Hits
17	Sodium Chloride Symporter Inhibitors/ or Sodium Potassium Chloride Symporter Inhibitors/ or Chlorthalidone/ or Indapamide/ or Metolazone/ or Xipamide/	7387
18	("Thiazide-like diuretic$" or "thiazide diuretic$" or "sodium chloride symporter inhibitor$" or "sodium potassium chloride symporter inhibitor$" or "loop diuretic$" or Chlortalidone or Indapamide or Metolazone or Xipamide).ti,kf,kw.	2634
19	Life Style/ or Health Behavior/ or Diet/ or Diet Therapy/ or Dietary Approaches To Stop Hypertension/ or exp Exercise/ or Blood Pressure Monitoring, Ambulatory/ or Nutrition Therapy/ or Sodium Chloride, Dietary/ or Sodium, Dietary/ or Sodium/ or Diet, Sodium-Restricted/ or Alcohol Drinking/ or exp Smoking/ or Smoking Cessation/ or "Tobacco Use Cessation"/ or Smoking Reduction/ or Coffee/ or Caffeine/ or exp Dietary Fats/ or Weight Loss/ or Weight Reduction Programs/	1088198
20	(lifestyle$ or "life style$" or behaviour$ or behavior$ or diet$ or nutri$ or slim$ or weight$ or smoker$ or smoking or digital) adj2 (chang$ or treatment$ or modif$ or manag$ or therap$ or approach$ or intervention$ or counsel$ or coach$ or program$ or service$ or train$ or prescription or plan$ or recommendation$).ti,kw.	109171
21	(("DASH" or Cambridge or "low fat" or "low-fat" or "low calorie" or "low-calorie" or "reduc$ calorie" or "reduc$-calorie" or "low-cal" or "low carb" or "low carbohydrate" or "reduc$ fat" or "reduc$-fat" or "fat-free" or "calorie-free" or "zero calorie") adj2 (food$ or eat$ or nutrition$ or diet$)).ti,kw.	3733
22	((exercis$ or physical$ or aerobic$ or "work$ out" or workout or walk$ or run$ or jog$ or sport$ or fitness or "keep fit") adj2 (activ$ or therap$ or approach$ or intervention$ or routine$ or schedule$ or regime$ or program$ or service$ or train$ or coach$ or scheme or prescription or plan$ or recommendation$)).ti,kw.	114848
23	("home blood pressure monitor$" or "self blood pressure monitor$" or "ambulatory blood pressure monitor$" or "Dietary Approaches to Stop Hypertension" or "Dietary Approach to Stop Hypertension" or "slimming world").ti,kw.	3741
24	((reduc$ or low$ or less$ or limit$ or restrict$ or manag$ or curb$ or minimi$ or decreas$ or moderat$ or modif$ or cessation or stop$) adj2 (alcohol$ or beer or liquor or spirit$ or wine or coffee or caffeine or salt or sodium or fat or fats or smoker$ or smoking or tobacco)).ti,kw.	34803

#	Search terms	Hits
25	((weight$ or bodyweight$ or overweight$ or "BMI" or "body mass index") adj2 (reduc$ or low$ or decreas$ or limit or manag$ or lose or losing or loss)).ti,kw.	54369
26	or/5-25	1549193
27	4 and 26	162068
28	Mass Screening/	122858
29	(screen$ adj3 (detect$ or identif$ or diagnos$)).ti,ab,kw.	103291
30	((incidental$ or opportunistic$ or clinical$ or "primary care" or "general practice" or "GP" or "primary healthcare") adj2 (diagnos$ or detect$ or identif$)).ti,ab,kw.	255478
31	((health or medical or population or general or opportunistic$ or periodic or annual or "primary care" or community or "NHS" or "general practice" or "GP" or "primary healthcare" or pharmacy or kiosk or workplace or "work place") adj1 (screen$ or assess$ or check or checks or "check-up$" or "check up$" or "checkups" or exam$ or review)).ti,ab,kw.	114267
32	("NHS Health Check" or "NHSHC").ti,ab,kw.	142
33	or/28-32	564979
34	27 and 33	3549
35	english.lg.	34635534
36	34 and 35	3230
37	36 not ((exp infant/ or exp child/ or adolescent/) not exp adult/)	3092
38	(case report or clinical conference or comment or congress or editorial or historical article or letter or news or newspaper article).pt.	3008401
39	37 not 38	3043
40	limit 39 to yr="2015-2025"	1453

Embase search

Database, version and platform

Embase 1974 to 2025 October 10 via OvidSP.

Search date

14 October 2025.

#	Search terms	Hits
1	hypertension/ or essential hypertension/ or blood pressure/ or diastolic blood pressure/ or systolic blood pressure/	1307172
2	((high or rais$ or elevat$ or rising or increas$ or chang$) adj2 ("blood pressur$" or "BP" or "hbp" or "arterial pressur$" or "diastolic pressur$" or "dbp" or "systolic pressur$" or "sbp")).ti,kw.	12261
3	(hypertension or hypertensive or prehypertens$).ti,kf.	381660
4	or/1-3	1426736
5	((pharmacolog$ or pharmacotherapy or "non-pharmacolog$" or "nonpharmacolog$") adj2 (intervention$ or treatment$ or manag$ or therap$ or approach$ or technique$)).ti,ab,kw.	168738
6	antihypertensive agent/ or antihypertensive therapy/	150420
7	(antihypertensive$ or "anti-hypertensive$" or "anti hypertensive$").ti,ab,kf,kw.	104031
8	dipeptidyl carboxypeptidase inhibitor/ or captopril/ or enalapril/ or fosinopril/ or imidapril/ or lisinopril/ or perindopril/ or quinapril/ or ramipril/ or trandolapril/	215159
9	("Angiotensin Converting Enzyme Inhibitor$" or "Angiotensin-Converting Enzyme Inhibitor$" or "Angiotensin-Converting Enzyme Antagonist$" or "Angiotensin Converting Enzyme Antagonist$" or "Angiotensin I-Converting Enzyme Inhibitor$" or "Angiotensin I Converting Enzyme Inhibitor$" or "Kininase II Antagonist$" or "Kininase II Inhibitor$" or "ACE Inhibitor$" or "Vasopeptidase Inhibitor$" or "ACE-NEP Inhibitor$" or "ACE NEP Inhibitor$" or "NEP-ACE Inhibitor$" or "NEP ACE Inhibitor$").ti,kw.	19124
10	(Captopril or Enalapril or Fosinopril or Imidapril or Lisinopril or "Perindopril erbumine" or Quinapril or Ramipril or Trandolapril).ti,kf,kw.	17012
11	angiotensin antagonist/ or angiotensin receptor antagonist/ or angiotensin 2 receptor antagonist/ or angiotensin 1 receptor antagonist/ or azilsartan/ or candesartan/ or eprosartan/ or olmesartan/ or irbesartan/ or losartan/ or telmisartan/ or valsartan/	131528
12	("angiotensin receptor antagonist$" or "angiotensin receptor block$" or "ARB" or "angiotensin ii receptor antagonist$" or "angiotensin II receptor antagonist$" or "angiotensin 2 receptor antagonist$" or "angiotensin ii receptor block$" or "angiotensin II receptor block$" or "angiotensin 2	10170

#	Search terms	Hits
	receptor block$" or "angiotensin II type 2 receptor block$" or "angiotensin ii type 2 receptor block$" or "angiotensin 2 type 2 receptor block$" or "angiotensin II type 2 receptor antagonist$" or "angiotensin ii type 2 receptor antagonist$" or "angiotensin 2 type 2 receptor antagonist$" or "type 2 angiotensin receptor antagonist$" or "type 2 angiotensin receptor block$" or "AT2 antagonist$" or "AT2 block$" or "AT2 receptor antagonist$" or "AT2 receptor block$" or "angiotensin AT2").ti,kw.	
13	("type 1 angiotensin receptor block$" or "type I angiotensin receptor block$" or "type i angiotensin receptor block$" or "type 1 angiotensin receptor antagonist$" or "type I angiotensin receptor antagonist$" or "type i angiotensin receptor antagonist$" or "angiotensin II type 1 receptor block$" or "angiotensin ii type 1 receptor block$" or "angiotensin 2 type 1 receptor block$" or "angiotensin II type 1 receptor antagonist$" or "angiotensin 2 type 1 receptor antagonist$" or "angiotensin ii type 1 receptor antagonist$" or "angiotensin 1 receptor block$" or "angiotensin I receptor block$" or "angiotensin i receptor block$" or "angiotensin 1 receptor antagonist$" or "angiotensin I receptor antagonist$" or "angiotensin i receptor antagonist$" or "selective angiotensin II receptor antagonist$" or "selective angiotensin ii receptor antagonist$" or "selective angiotensin 2 receptor antagonist$" or "selective angiotensin II receptor block$" or "selective angiotensin ii receptor block$" or "selective angiotensin 2 receptor block$" or "AT1 antagonist$" or "AT1 block$" or "AT1 receptor antagonist$" or "AT1 receptor block$" or "angiotensin AT1" or Sartans or Sartan).ti,kw.	2814
14	(Azilsartan or Candesartan or Eprosartan or Irbesartan or Losartan or Olmesartan or Telmisartan or Valsartan).ti,kf.	21344
15	calcium antagonist/ or calcium channel blocking agent/ or amlodipine/ or felodipine/ or nicardipine/ or nifedipine/ or lacidipine/ or lercanidipine/	176019
16	(Amlodipine or Felodipine or Lacidipine or Lercanidipine or Nicardipine or Nifedipine or "calcium channel block$" or "calcium-channel block$" or "calcium channel antagonist$" or "CCB").ti,kf,kw.	29010
17	thiazide diuretic agent/ or loop diuretic agent/ or chlorthalidone/ or indapamide/ or metolazone/ or xipamide/	45313
18	("Thiazide-like diuretic$" or "thiazide diuretic$" or "sodium chloride symporter inhibitor$" or "sodium potassium chloride symporter inhibitor$" or "loop diuretic$" or Chlortalidone or Indapamide or Metolazone or Xipamide).ti,kf,kw.	4346

#	Search terms	Hits
19	*lifestyle/ or lifestyle modification/ or lifestyle coaching/ or *diet/ or DASH diet/ or healthy diet/ or diet restriction/ or low calorie diet/ or low fat diet/ or caloric restriction/ or diet therapy/ or *exercise/ or *physical activity/ or blood pressure monitoring/ or sodium restriction/ or alcohol abstinence/ or smoking cessation/ or smoking reduction/ or smoking cessation program/ or body weight loss/ or weight loss program/ or body weight management/	989185
20	(lifestyle$ or "life style$" or behaviour$ or behavior$ or diet$ or nutri$ or slim$ or weight$ or smoker$ or smoking or digital) adj2 (chang$ or treatment$ or modif$ or manag$ or therap$ or approach$ or intervention$ or counsel$ or coach$ or program$ or service$ or train$ or prescription or plan$ or recommendation$ or guid$).ti,kw.	144027
21	(("DASH" or Cambridge or "low fat" or "low-fat" or "low calorie" or "low-calorie" or "reduc$ calorie" or "reduc$-calorie" or "low-cal" or "low carb" or "low carbohydrate" or "reduc$ fat" or "reduc$-fat" or "fat-free" or "calorie-free" or "zero calorie") adj2 (food$ or eat$ or nutrition$ or diet$)).ti,kw.	5000
22	((exercis$ or physical$ or aerobic$ or "work$ out" or workout or walk$ or run$ or jog$ or sport$ or fitness or "keep fit") adj2 (activ$ or therap$ or approach$ or intervention$ or routine$ or schedule$ or regime$ or program$ or service$ or train$ or coach$ or scheme or prescription or plan$ or recommendation$ or guid$)).ti,kw.	147873
23	("home blood pressure monitor$" or "self blood pressure monitor$" or "ambulatory blood pressure monitor$" or "Dietary Approaches to Stop Hypertension" or "Dietary Approach to Stop Hypertension" or "slimming world").ti,kw.	6962
24	((reduc$ or low$ or less$ or limit$ or restrict$ or manag$ or curb$ or minimi$ or decreas$ or moderat$ or modif$ or cessation or stop$) adj2 (alcohol$ or beer or liquor or spirit$ or wine or coffee or caffeine or salt or sodium or fat or fats or smoker$ or smoking or tobacco)).ti,kw.	44420
25	((weight$ or bodyweight$ or overweight$ or "BMI" or "body mass index") adj2 (reduc$ or low$ or decreas$ or limit or manag$ or lose or losing or loss)).ti,kw.	74477
26	or/5-25	1809803
27	4 and 26	381991
28	screening/	213793
29	(screen$ adj3 (detect$ or identif$ or diagnos$)).ti,ab,kw.	151657

#	Search terms	Hits
30	((incidental$ or opportunistic$ or clinical$ or "primary care" or "general practice" or "GP" or "primary healthcare") adj2 (diagnos$ or detect$ or identif$)).ti,ab,kw.	377371
31	((health or medical or population or general or opportunistic$ or periodic or annual or "primary care" or community or "NHS" or "general practice" or "GP" or "primary healthcare" or pharmacy or kiosk or workplace or "work place") adj1 (screen$ or assess$ or check or checks or "check-up$" or "check up$" or "checkups" or exam$ or review)).ti,ab,kw.	161445
32	("NHS Health Check" or "NHSHC").ti,ab,kw.	182
33	or/28-32	856754
34	27 and 33	12368
35	english.lg.	39813813
36	34 and 35	11953
37	36 not ((infant/ or child/ or adolescent/) not adult/)	11450
38	(Conference Abstract or Conference Paper or Conference Review or Editorial or Letter or Note).pt.	9683769
39	(Clinical Trials Repository or Conference Proceeding).su.	537792
40	38 or 39	10217422
41	37 not 40	7000
42	limit 41 to yr="2015-2025"	4478

Inclusions and Exclusions

Evidence for all questions was restricted to full reports available in English. Conference abstracts, commentaries and editorials were not included.

Evidence for questions 1 and 2 was restricted to reports published since January 2020. For question 1, this date limit was selected to optimise the relevance of included studies, as the UK NSC briefing document emphasised the importance of data recency, and to ensure the evidence map could be completed within the specified timeframe, based on scoping searches yielding very high numbers of records. For question 2, the restriction to 2020 onwards was made in light of awareness of a Cochrane review addressing this question, which was published in 2020. [50]

Evidence for question 3 was restricted to reports published since January 2015. The wider time period considered for this question was based on scoping searches retrieving a more manageable number of records.

Systematic reviews were eligible for all questions. Where we found a relevant systematic review or component of a review that fulfils all inclusion criteria for a particular question, the review for that question was initially limited to systematic reviews only. As a large number of systematic reviews were identified for question 1, we did not extend to include primary studies. For question 2, where evidence from systematic reviews did not fully answer the research question, primary studies published after the search dates of included systematic reviews were also eligible for inclusion.

Inclusion criteria for each question are summarised below:

Question 1: What is the volume and type of evidence on how the prevalence of hypertension varies between people with and without specific risk factors?

Population	Adults who are representative of the general population.
Exposure	Any potential risk factor for hypertension, for example: • Age group • Ethnicity • Family history of hypertension • Obesity / being overweight / BMI • Sex • Smoking status Diabetes and kidney disease were not considered eligible risk factors for inclusion, as NICE Guidelines state that usual care for these conditions will include hypertension monitoring (NG136, NG28).
Comparator	Absence of the specified risk factor
Outcomes	Relative prevalence of hypertension, or data allowing calculation of this.
Study designs	Comparative cohort or case-control studies. Systematic reviews of primary studies with these designs.

Question 2: What is the volume and type of evidence on the effectiveness of a screening programme for hypertension in reducing hypertension-related mortality and morbidity?

Population	Adults with no prior diagnosis of hypertension, and unaware of any hypertension-related symptoms, representative of the general population. Studies conducted in secondary care settings or in accident and emergency settings were not eligible for inclusion.
Intervention	Screening for hypertension
Comparator	No screening, or usual care
Outcomes	As defined in the included studies, for example: Primary outcomes: • hypertension-related morbidity (e.g. stroke, TIA, MI) • mortality • hospital admission / referral Secondary outcomes: • changes in blood pressure • quality of life • intervention adherence
Study designs	Randomised controlled trials (RCTs), cluster RCTs, comparative observational studies (e.g. 'before and after' studies of screening implementation). Systematic reviews of primary studies with these designs.

Question 3: What is the volume and type of evidence available on the effectiveness of interventions in adults with screen-detected hypertension?

Population	Adults with hypertension
Intervention	Treatment with any intervention for hypertension, following identification of hypertension through screening or any systematic population health check programme.
Comparator	Treatment with the same intervention, following detection of hypertension by any other route (i.e. not screening or population health check) **OR**

	Delayed treatment with the same intervention, following identification of hypertension through screening or any systematic population health check programme **OR** No treatment, following identification of hypertension through screening or any systematic population health check programme
Outcomes	As defined in the included studies, for example: Primary outcomes: • hypertension-related morbidity (e.g. stroke, TIA, MI) • mortality • hospital admission / referral Secondary outcomes: • changes in blood pressure • quality of life • intervention adherence
Study designs	RCTs, cluster RCTs or comparative observational studies. Systematic reviews of primary studies with these designs.

Appendix 2 – Abstract reporting

Question 1: What is the volume and type of evidence on how the prevalence of hypertension varies between people with and without specific risk factors?

Citation 1: Ahn et al (2024)

Objectives: To investigate the relationship between working hours and hypertension

Country: Not reported

Last search date: Up to 12 March 2023

Number of included studies: 15

Risk factors: Other (working hours)

Comparisons: Long working hours vs. normal working hours

Outcome type: Associations

Results reported in abstract: The pooled OR for the association between long working hours and risk of hypertension was 1.09 (95% CI: 0.88 to 1.35) in the 15 studies that used hypertension as the outcome... In subgroup analysis, the pooled OR for the association between long working hours and risk of hypertension was 1.28 (95% CI: 1.14 to 1.44) and 1.00 (95% CI: 0.64 to 1.56) in women and men, respectively.

Conclusions: Although this study could not clearly confirm the relationship between long working hours and hypertension, the subgroup analysis suggests that long working hours may be associated with hypertension, particularly among women.

Full text check: Yes - age of population and search dates

Citation 2: Ambaw Kassie et al (2023)

Objectives: To synthesise the prevalence of undiagnosed hypertension and its associated factors in Ethiopia.

Country: Ethiopia

Last search date: Up to December 2022

Number of included studies: 10

Risk factors: Multiple (older age, family history of hypertension, obesity)

Comparisons: Presence vs. absence of each risk factor

Outcome type: Associations

Results reported in abstract: Being older (OR 3.8, 95% CI: 2.56 to 5.66), having a body mass index > 25 kg/m2 (OR 2.71, 95% CI:2.1 to 3.53), having a family history of hypertension (OR 2.22, 95% CI:1.47 to 3.36), were significantly associated with hypertension.

Conclusions: Being older, having a BMI > 25 kg/m2, having a family history of hypertension... were found to be risk factors for undiagnosed hypertension.

Full text check: No

Citation 3: Barozet et al (2024)

Objectives: To investigate the prevalence of hypertension in various inflammatory autoimmune diseases (IAD)

Country: Not reported

Last search date: Between January 2000 and March 2020

Number of included studies: 122

Risk factors: Other (Inflammatory autoimmune disease)

Comparisons: IAD vs. no IAD

Outcome type: Associations

Results reported in abstract: The prevalence of hypertension was higher among patients with IAD than controls, unadjusted OR 1.67 (95% CI: 1.58 to 1.76).

Conclusions: The prevalence of hypertension is higher among patients with inflammatory auto-immune diseases.

Full text check: Yes - age of population

Citation 4: Bolm-Audorff et al (2020)

Objectives: To assess the association between occupational noise exposure and arterial hypertension

Country: Not reported

Last search date: Up to May 2019

Number of included studies: 24

Risk factors: Environmental

Comparisons: Occupational noise >80 decibels vs. occupational noise <80 decibels

Outcome type: Associations

Results reported in abstract: Pooled effect size for hypertension due to noise exposures >=80 dB(A): 1.81 (95% CI: 1.51 to 2.18).

Conclusions: Occupational noise exposure increases the risk of hypertension.

Full text check: Yes - age of population and search dates

Citation 5: Bu et al (2024)

Objectives: To assess the relationship of greenspace with BP/hypertension

Country: Not reported

Last search date: Up to April 2023

Number of included studies: 27

Risk factors: Environmental

Comparisons: Exposure to greenspace (incremental analysis)

Outcome type: Associations

Results reported in abstract: For every 10% increase of Normalized Difference Vegetation Index (NDVI) 500-m and NDVI 1000-m, OR 0.95 (95% CI: 0.90 to 0.99)

Conclusions: This study indicated that higher exposure to greenspace might be associated with lower levels of BP and risk of hypertension.

Full text check: No

Citation 6: Hajihashemi et al (2023)

Objectives: To assess the association of omega-6 polyunsaturated fatty acids (n-6 PUFAs) levels in diets or blood with blood pressure

Country: Not reported

Last search date: Up to June 2021

Number of included studies: 22

Risk factors: Dietary

Comparisons: Highest category of circulatory/dietary n-6 PUFAs vs. Lowest category of circulatory/dietary n-6 PUFAs

Outcome type: Associations

Results reported in abstract: Combining 14 extracted effect sizes showed that higher circulatory/dietary n-6 polyunsaturated fats (PUFAs) tended to be associated with 10% lower risk of hypertension (95% CI: 0.81 to 1.00), whereas combining 23 effect sizes illustrated no difference

in circulatory/dietary n-6 PUFAs mean levels between normotensive and hypertensive subjects. According to subgroup analysis based on fatty acid types, total n-6 PUFAs (OR 0.82, 95% CI: 0.70 to 0.97) and linoleic acid (OR 0.56, 95% CI: 0.39 to 0.82) were inversely related to the risk of HTN.

Conclusions: Higher circulatory/dietary n-6 polyunsaturated fats tend to be associated with lower odds of hypertension.

Full text check: Yes - age of population

Citation 7: Hamzavi et al (2025)

Objectives: To investigate the association between polychlorinated biphenyls (PCB) exposure and hypertension

Country: Not reported

Last search date: Up to July 2024

Number of included studies: 21

Risk factors: Environmental

Comparisons: Exposure to PCBs vs. no exposure to PCBs

Outcome type: Associations

Results reported in abstract: Exposure to total PCBs correlated with an elevated risk of hypertension, OR 1.78 (95% CI: 1.30 to 2.44). Dioxin-like PCBs were also associated with a heightened risk, OR 1.54 (95% CI: 1.24 to 1.90), while non-dioxin-like PCBs were not significantly linked, OR 1.16 (95% CI: 0.81 to 1.66).

Conclusions: Findings indicate a positive correlation between PCB exposure and hypertension, particularly with dioxin-like PCBs and certain PCB congeners.

Full text check: Yes - age of population

Citation 8: Hidayat et al (2020)

Objectives: To examine the association between foetal and childhood exposure to famine and the risk of hypertension in adulthood

Country: Not reported

Last search date: Up to October 2019

Number of included studies: 47

Risk factors: Other (famine)

Comparisons: Foetal/childhood exposure to famine vs. no foetal/childhood exposure to famine

Outcome type: Associations

Results reported in abstract: Both foetal and childhood exposure to famine were associated with increased risk of hypertension, RR 1.30 (95% CI: 1.07 to 1.57) and RR 1.33 (95% CI: 1.02 to 1.74).

Conclusions: Foetal and childhood exposure to famine may confer greater risks of developing certain cardiometabolic conditions in adulthood.

Full text check: Yes - age of population and search dates

Citation 9: Hossain et al (2025)

Objectives: To explore how social status inequalities impact hypertension risk in Bangladesh

Country: Bangladesh

Last search date: Not reported (full text checked)

Number of included studies: 12

Risk factors: Multiple (female sex, urban dwelling, socioeconomic [education, wealth, employment])

Comparisons: Unclear (assume presence vs. absence of each risk factor)

Outcome type: Associations

Results reported in abstract: Females had a pooled OR of 1.15 (95% CI: 1.02 to 1.27) for hypertension compared to males. Urban residents showed an OR of 1.11 (95% CI: 1.03 to 1.19) versus rural residents. By education level, the pooled ORs were 1.02 (95% CI: 0.89 to 1.14) for primary, 1.07 (95% CI: 0.94 to 1.21) for secondary, and 1.25 (95% CI: 1.03 to 1.47) for higher secondary education. For wealth status, the ORs were 1.08 (95% CI: 0.87 to 1.29) for the poorer class, 1.13 (95% CI: 1.04 to 1.22) for the middle class, 1.38 (95% CI: 0.68 to 2.07) for the richer class, and 1.49 (95% CI: 0.97 to 2.00) for the richest class. Working individuals had an OR of 0.61 (95% CI: 0.43 to 0.80) compared to nonworking individuals.

Conclusions: Females and urban residents were at greater risk of hypertension. The risk increased with higher education and wealth levels, while employment was linked to a lower risk.

Full text check: Yes - search dates (not reported in text)

Citation 10: Ma et al (2020)

Objectives: To assess the relationship between snoring and metabolic syndrome, and its components (including hypertension)

Country: Not reported

Last search date: Up to 15 July 2020

Number of included studies: 40

Risk factors: Sleep

Comparisons: Self-reported snoring vs. no self-reported snoring

Outcome type: Associations

Results reported in abstract: Increased odds of hypertension in people who self-report snoring, OR 1.07 (95% CI, 1.01 to 1.13).

Conclusions: Snoring was a risk factor of metabolic syndrome (of which hypertension is one of the five components).

Full text check: Yes - age of population

Citation 11: Mokhtari et al (2022)

Objectives: To evaluate the association of serum vitamin D status and high blood pressure

Country: Not reported

Last search date: Up to March 2021

Number of included studies: 70

Risk factors: Other (vitamin D levels)

Comparisons: High serum vitamin D vs. low serum vitamin D

Outcome type: Associations

Results reported in abstract: In prospective studies, high versus low serum vitamin D was associated with a 16% lower risk of hypertension (RR 0.84, 95% CI: 0.73 to 0.96), and each 25 nmol/L increase corresponded to a 5% lower risk (RR 0.95, 95% CI: 0.90 to 1.00), with a significant nonlinear relationship ($p < 0.001$). In cross-sectional studies, the highest versus lowest vitamin D levels were linked to lower odds of hypertension (OR 0.84, 95% CI: 0.79 to 0.90) and pre-hypertension (OR 0.75, 95% CI: 0.68 to 0.83), while each 25 nmol/L increase was associated with 6% lower odds in all populations (RR 0.94, 95% CI: 0.90 to 0.99) and 3% lower odds in representative populations (RR 0.97, 95% CI: 0.95 to 0.99).

Conclusions: This meta-analysis of epidemiologic studies disclosed that serum vitamin D concentrations were inversely related to the risk of hypertension in adults.

Full text check: Yes - age of population

Citation 12: Niu et al (2021)

Objectives: To evaluate the association between self-reported snoring and hypertension.

Country: Not reported

Last search date: Up to 12 November 2020

Number of included studies: 11

Risk factors: Sleep

Comparisons: Self-reported snoring vs. no self-reported snoring

Outcome type: Associations

Results reported in abstract: Snoring significantly increased the risk of hypertension in both men and women (OR 1.32, 95% CI 1.23 to 1.42; men OR 1.32, 95% CI 1.18 to 1.49; women OR 1.26, 95% CI 1.14 to 1.40). The risk of hypertension was significantly increased among participants who snored ≥4 nights per week (OR 1.42, 95% CI 1.21 to 1.66) and among those who snored more than 0 but fewer than 4 nights per week (OR 1.23, 95% CI 1.13 to 1.34).

Conclusions: Snoring is considered as an independent predictor of hypertension in both men and women, which may play a role in the prevention and control of hypertension.

Full text check: Yes - age of population

Citation 13: Nurrobi et al (2024)

Objectives: To elucidate the impact of short sleep duration on hypertension risk within the adult Asian population.

Country: Not reported (Asian population)

Last search date: Up to 04 January 2024

Number of included studies: 6

Risk factors: Sleep

Comparisons: Short sleep duration vs. normal sleep duration

Outcome type: Associations

Results reported in abstract: Short sleep duration is associated with a higher hypertension risk when compared to normal sleep duration (OR 1.36, 95% CI: 1.13 to 1.64, p = 0.0010). Subgroup analysis based on sex showed that the association is evident across males (OR 1.12, 95% CI: 1.01 to 1.25, p: 0.03, I squared: 64%) and females (OR 1.22, 95% CI: 1.10 to 1.35, p: 0.0003, I squared: 82%).

Conclusions: Short sleep duration is associated with a higher mild risk of hypertension, irrespective of sex.

Full text check: No

Citation 14: Nwankwo et al (2025)

Objectives: To estimate the pooled prevalence of hypertension and identify its major determinants among adult populations in East Africa

Country: East Africa

Last search date: Between January 2007 and December 2024

Number of included studies: 21

Risk factors: Multiple (obesity, smoking status, alcohol consumption)

Comparisons: Unclear (assume presence vs. absence of each risk factor)

Outcome type: Associations

Results reported in abstract: The risk of hypertension was associated with overweight OR 1.85 (95% CI: 1.53 to 2.22), general obesity OR 3.05 (95% CI: 2.51 to 3.69), abdominal obesity OR 2.01 (95% CI: 1.44 to 2.80), alcohol consumption OR 1.23 (95% CI: 1.01 to 2.01) and tobacco smoking OR 1.48 (95% CI: 1.13 to 1.94).

Conclusions: Overweight, obesity, general obesity, WHR [data not reported in abstract] and age are associated with onset of hypertension.

Full text check: Yes - age of population

Citation 15: Qin et al (2021)

Objectives: To assess the association between long-term exposure to ambient air pollution and risk of hypertension in adults

Country: Not reported

Last search date: Up to August 2020

Number of included studies: 53

Risk factors: Environmental

Comparisons: Long-term exposure to ambient air pollution (incremental analysis)

Outcome type: Associations

Results reported in abstract: The risk of hypertension was significantly increased in adults with each 10-mug/m3 increase in exposure to particulate matter (PM) 2.5, OR 1.10 (95% CI: 1.07 to 1.14, I2 = 93.1%, n = 37), PM10, OR 1.04 (95% CI: 1.02 to 1.07, I2 = 44.8%, n = 22), and sulphur dioxide (SO_2), OR 1.21 (95% CI: 1.08 to 1.36, I2 = 96.6%, n = 3). Hypertension was not significantly associated with PM1 (n = 2), PM2.5 - 10 (n = 16), nitrogen dioxide (NO_2) (n = 27), or nitrogen oxides (Nox) (n = 17).

Conclusions: Long-term ambient air pollution is a potential risk factor for hypertension in adults.

Full text check: No

Citation 16: Raffetti et al (2020)

Objectives: To investigate the association between exposure to polychlorinated biphenyls (PCBs) and the risk of hypertension

Country: Not reported

Last search date: Up to March 2020

Number of included studies: 17

Risk factors: Environmental

Comparisons: High exposure to PCBs vs. low exposure to PCBs

Outcome type: Associations

Results reported in abstract: A pooled excess risk of hypertension was found for total PCBs (OR 1.70, 95% CI 1.28 to 2.26), dioxin-like (DL)-PCBs (OR 1.46, 1.19 to1.79), but not for non-dioxin like (NDL)-PCBs (OR 1.19, 0.81 to 1.73) comparing the highest with the lowest quartile of the distribution.

Conclusions: This meta-analysis suggests that exposure to PCBs, particularly to DL-PCBs, may be a risk factor for hypertension, independently of other risk factors.

Full text check: Yes - age of population and search dates

Citation 17: Rao et al (2023)

Objectives: To assess the association between metabolic score for insulin resistance (METS-IR) and hypertension)

Country: Not reported

Last search date: Up to October 2022

Number of included studies: 8

Risk factors: Other (insulin resistance)

Comparisons: Highest category of METS-IR vs. lowest category of METS-IR

Outcome type: Associations

Results reported in abstract: RR for highest versus lowest category metabolic score for insulin resistance: 1.67 (95% CI: 1.53 to 1.83)

Conclusions: A high METS-IR is associated with hypertension in general adult population.

Full text check: No

Citation 18: Sani et al (2024)

Objectives: To explore the evidence regarding rural-urban differences in the prevalence of hypertension in West Africa

Country: West Africa

Last search date: Between 2000 and 2021

Number of included studies: 22

Risk factors: Multiple (urban dwelling, sex)

Comparisons: rural vs. urban dwelling and female vs. male sex

Outcome type: Absolute prevalence data and associations

Results reported in abstract: The prevalence of hypertension was 27.4% (9.7% to 60%) in rural areas, 33.9% (15.5% to 59.2%) in urban areas. The odds of hypertension were lower in rural compared to urban dwellers (OR: 0.74, 95% CI: 0.66 to 0.83, $p < 0.001$). The pooled prevalence of hypertension was 32.6% in males, and 30.0% in females, with no significant difference in the odds of hypertension between the sexes (OR: 0.91, 95% CI: 0.8 to 1.05, $p = 0.196$).

Conclusions: The odds of hypertension were lower in rural compared to urban dwellers. There was no significant difference in the odds of hypertension between the sexes.

Full text check: Yes - age of population

Citation 19: Satapathy et al (2024)

Objectives: To elucidate the association between neighbourhood deprivation and the risk of hypertension

Country: Multiple

Last search date: Up to 25 December 2023

Number of included studies: 26

Risk factors: Socioeconomic (neighbourhood deprivation)

Comparisons: Neighbourhood deprivation vs absence of neighbourhood deprivation

Outcome type: Associations

Results reported in abstract: The pooled RR of hypertension in deprived neighbourhoods was 1.139 (95% CI: 1.006 to 1.290), $p=0.04$. Subgroup analyses showed variability by country and deprivation assessment methods. RR varied from 1.00 in Japan (95% CI: 0.93 to 1.08) to 1.60 (95% CI: 1.07 to 2.39) in France and 1.57 (95% CI: 0.67 to 3.70) in Germany, with significant heterogeneity observed in measures of neighbourhood deprivation.

Conclusions: Our analysis confirms a significant association between neighbourhood deprivation and hypertension.

Full text check: Yes - age of population

Citation 20: Satapathy et al (2025)

Objectives: To assess the association between depression and the risk of developing hypertension by synthesising evidence from observational studies

Country: Not reported

Last search date: Up to 20 December 2024

Number of included studies: 36

Risk factors: Other (depression)

Comparisons: Unclear (assume depression vs. no depression)

Outcome type: Associations

Results reported in abstract: Positive association between depression and hypertension (pooled OR 1.198, 95% CI: 1.086 to 1.321).

Conclusions: This study provides evidence supporting a positive association between depression and an increased risk of hypertension.

Full text check: Yes - age of population

Citation 21: Shrestha et al (2021)

Objectives: To analyse published literature on prevalence and risk factors for hypertension in Nepal.

Country: Nepal

Last search date: Between January 2000 and October 2020

Number of included studies: 40

Risk factors: Multiple (male sex, obesity, smoking status, alcohol consumption, physical activity, education)

Comparisons: Unclear (assume presence vs. absence of each risk factor)

Outcome type: Associations

Results reported in abstract: Hypertension was associated with male gender, smoking, alcohol use, high BMI, no education and inadequate exercise: 25.99% (CI: 21.81 to 30.65) of females and 34.25% (CI: 30.49 to 38.21) of male were hypertensive (p = 0.007). Pooled estimates indicated that smokers have 1.43 times (CI: 1.1429 to 1.7889); and alcohol users have 2.073

times (CI: 1.7154 to 2.5050) higher risk of having hypertension. Individuals with normal BMI had 53.15% (OR 0.4685, CI: 0.3543-0.6195); with formal educated have 37.27% (OR: 0.6273, CI: 0.5485 to 0.7175) and with adequate exercise have 31.6% (OR 0.6839, CI: 0.5203 to 0.8991) lower chance of having hypertension.

Conclusions: Hypertension was associated with male gender, smoking, alcohol use, high BMI, no education and inadequate exercise.

Full text check: Yes - age of population

Citation 22: Song et al (2025)

Objectives: To investigate the dose-response relationship between dietary inflammation index (DII) score and the risk of hypertension

Country: Not reported

Last search date: Up to January 2024

Number of included studies: 6

Risk factors: Dietary

Comparisons: Highest DII score vs. lowest dietary DII score

Outcome type: Associations

Results reported in abstract: The pooled RR for hypertension risk was 1.15 (95% CI: 1.06 to 1.26) for the highest DII score compared with the lowest, and 1.10 (95% CI: 1.03 to 1.18) for higher DII score compared with the lower.

Conclusions: Pro-inflammation dietary increases the risk of hypertension.

Full text check: Yes - age of population

Citation 23: Tada et al (2022)

Objectives: To investigate the association between tooth loss and hypertension.

Country: Not reported

Last search date: Between 2001 and 2021

Number of included studies: 24

Risk factors: Other (tooth loss)

Comparisons: Tooth loss vs. no tooth loss

Outcome type: Associations

Results reported in abstract: OR of hypertension in people with tooth loss versus no tooth loss: 2.22 (95% CI: 2.00 to 2.45), OR of hypertension in people no natural teeth versus those with some natural teeth 4.94 (95% CI: 4.04 to 6.05).

Conclusions: In cohort studies, subjects with more tooth loss had a greater incidence of hypertension than those with less tooth loss during the follow-up period.

Full text check: Yes - age of population

Citation 24: Taylor et al (2025)

Objectives: To establish whether chronic pain is associated with a diagnosis of hypertension

Country: Not reported

Last search date: Up to 08 January 2025

Number of included studies: 23

Risk factors: Other (chronic pain)

Comparisons: Chronic pain vs. no chronic pain

Outcome type: Associations

Results reported in abstract: The pooled odds ratio for hypertension in people with chronic pain compared with controls was 1.66 (95% CI: 1.28 to 2.15). In people with chronic, widespread pain, the OR was 1.38 (95% CI: 1.20 to 1.58) and in people with chronic headache the OR was 1.56 (95% CI:1.37 to 1.79). There was no association between hypertension and musculoskeletal pain, lower back pain, or gender (data not reported in abstract).

Conclusions: This systematic review and meta-analysis confirms an association between chest pain and hypertension.

Full text check: Yes - age of population

Citation 25: Tesfa et al (2021)

Objectives: To generate representative data on the prevalence of and risk factors for hypertension among the Ethiopian adult population

Country: Ethiopia

Last search date: Between January 2010 and August 2020

Number of included studies: 35

Risk factors: Multiple (age, family history of hypertension, obesity, alcohol consumption, urban dwelling, socioeconomic [education])

Comparisons: Unclear (assume presence vs. absence of each risk factor)

Outcome type: Associations

Results reported in abstract: Older age (>=40 years), adjusted OR 3.46 (95% CI: 2.67 to 4.49), urban residence adjusted OR 1.47 (95% CI: 1.28 to 1.70), educational status less than grade 12, adjusted OR 1.67 (95% CI: 1.38 to 2.01), family history of hypertension, adjusted OR 4.33 (95% CI: 2.95 to 6.34), body mass index (BMI) >=25, adjusted OR: 3.79 (95% CI: 2.61 to 5.50), central obesity, adjusted OR 1.91 (95% CI: 1.09 to 3.36), and alcohol consumption, adjusted OR 1.72 (95% CI: 1.26 to 2.34) were the identified risk factors for hypertension.

Conclusions: Older age, urban residence, lower educational coverage, family history of hypertension. BMI >=25, alcohol consumption, and central obesity were the risk factors for hypertension.

Full text check: Yes - age of population

Citation 26: Wang et al (2021)

Objectives: To evaluate the association between triglyceride-glucose (TyG) index for insulin resistance and hypertension risk in the general adult population

Country: Not reported

Last search date: Up to March 2021

Number of included studies: 8

Risk factors: Other (insulin resistance)

Comparisons: Highest category of TyG index vs. lowest category of TyG index

Outcome type: Associations

Results reported in abstract: Compared with those with the lowest category of TyG index, subjects with the highest category of TyG index were associated with higher odds of hypertension, adjusted RR 1.53, (95% CI: 1.26 to 1.85, I2 = 54%, P < 0.001).

Conclusions: Higher TyG index may be associated with higher odds of hypertension in the general adult population.

Full text check: Yes - age of population

Citation 27: Wang et al (2023)

Objectives: To systematically explore the association between age at menarche (AAM) and blood pressure (BP) and the potential modifiers in developing countries

Country: Not reported (Developing countries)

Last search date: Up to March 2022

Number of included studies: 20

Risk factors: Other (age at menarche)

Comparisons: Oldest age group vs. Middle or youngest age group

Outcome type: Associations

Results reported in abstract: In studies with participants' mean age at BP assessment <55 years, women in the oldest group as compared with the middle or the youngest group of AAM had a higher risk of hypertension in those studies without adjustment for confounders (RR 1.79, 95% CI: 1.41 to 2.28, I2=97.0%). In studies with participants' mean age at BP assessment >=55 years, no significant differences were found for studies without adjustment for confounders (RR 1.07, 95% CI: 0.78 to 1.47, I2=90.3%).

Conclusions: Late menarche was associated with a higher risk of BP and this association was modified by age and adiposity in developing countries.

Full text check: Yes - age of population

Citation 28: Wu et al (2025)

Objectives: To evaluate how various dietary patterns relate to hypertension risk in the Chinese population

Country: Not reported (Chinese population)

Last search date: Between 01 January 2004 and 14 March 2024

Number of included studies: 22

Risk factors: Dietary

Comparisons: Highest vs. lowest category for each dietary pattern

Outcome type: Associations

Results reported in abstract: People who followed a traditional Southern Chinese diet had lower odds of hypertension compared to people who did not follow this dietary pattern (OR 0.95, 95% CI: 0.92 to 0.97, p<0.001). People who followed a dietary pattern high in fruity and dairy also had lower odds of hypertension (OR 0.75, 95% CI: 0.64 to 0.89, p = 0.001). There was no association between the animal food dietary pattern and hypertension (OR 1.06, 95% CI: 0.98 to 1.15, p = 0.171).

Conclusions: The traditional southern Chinese pattern as well as the fruit and dairy pattern was a protective factor for hypertension.

Full text check: Yes - for more information about the dietary patterns

Citation 29: Yang et al (2020)

Objectives: To quantitatively assess the strength of the association between elevated BP in childhood and hypertension in adulthood

Country: Not reported

Last search date: Up to November 2019

Number of included studies: 16

Risk factors: Other (childhood blood pressure)

Comparisons: Elevated blood pressure in childhood vs. no elevated blood pressure in childhood

Outcome type: Associations

Results reported in abstract: Elevated BP in childhood (3 to 18 years in the included studies) was significantly associated with hypertension in adulthood (18 to 57 years in the included studies), with a summary OR of 2.02 (95% CI: 1.62 to 2.53). An increase of 1 standard deviation in systolic BP and diastolic BP, respectively, in childhood (3 to 19 years in the included studies) was also found to be associated with hypertension in adulthood (21 to 49 years in the included studies), with summary ORs of 1.71 (95% CI: 1.50 to 1.95) and 1.57 (95% CI: 1.37 to 1.81).

Conclusions: Meta-analyses showed a significant association between elevated BP in childhood and hypertension in adulthood.

Full text check: No

Citation 30: Yang et al (2025)

Objectives: To examine the association between bullous pemphigoid and hypertension

Country: Not reported

Last search date: Up to July 2024

Number of included studies: 20

Risk factors: Other (autoimmune disease)

Comparisons: Bullous pemphigoid (autoimmune skin disorder) vs. no bullous pemphigoid

Outcome type: Associations

Results reported in abstract: Random-effects meta-analysis indicated a significant association between bullous pemphigoid and hypertension, OR 1.13 (95% CI: 1.07 to 1.20). No significant association was observed in studies conducted in Asia (OR 1.05) or Europe (OR 1.07). However, a significant relationship was found in studies from the United States, OR 1.29 (95% CI: 1.12 to 1.48).

Conclusions: This study found a significant relationship between bullous pemphigoid and hypertension, particularly in the US.

Full text check: Yes - age of population

Citation 31: Yang et al (2025)

Objectives: To further elucidate the relationship between sleep duration and hypertension risk in young and middle-aged individuals

Country: Not reported

Last search date: Between January 2003 and 05 November 2023

Number of included studies: 16

Risk factors: Sleep

Comparisons: Short sleep duration vs. long sleep duration

Outcome type: Associations

Results reported in abstract: Meta-analysis indicated an association between sleep duration (short[<7 hours] and long [9 hours or more]) and the development of hypertension in young and middle-aged adults, particularly in Asian populations: Both long sleep duration (OR, 1.10; 95 % CI: 1.05 to 1.15) and short sleep duration (RR: 1.10, 95 % CI: 1.05 to 1.15) were associated with hypertension in young and middle-aged individuals, particularly in Asian populations.

Conclusions: This meta-analysis revealed an association between sleep duration (short [<7 h] and long [>=9 h]) and the development of hypertension in young and middle-aged adults, particularly in Asian populations.

Full text check: Yes - age of population

Supplementary Table 1: Summary of included studies for review question 1

Citation	Latest search date	No. of studies	Focus on specific country, region or population?	Key numerical results reported in abstract (associations between risk factor and hypertension)	Conclusions
Multiple risk factors					
Ambaw Kassie et al (2023) [19]	Dec 2022	10	Ethiopia	**Older age:** OR = 3.8 (95% CI 2.56 to 5.66); **BMI** > 25 kg/m2: OR = 2.71 (95% CI 2.1 to 3.53); **Family history of hypertension:** OR = 2.22 (95% CI 1.47 to 3.36)	"Being older, having a BMI > 25 kg/m2, having a family history of hypertension... were found to be risk factors for undiagnosed hypertension."
Tesfa et al (2021) [20]	Aug 2020	35	Ethiopia	**Older age** (>=40 years): aOR = 3.46 (95% CI 2.67 to 4.49); **Urban residence**: aOR = 1.47 (95% CI 1.28 to 1.70); **Educational status** < grade 12: aOR = 1.67 (95% CI 1.38 to 2.01); **Family history** of hypertension: aOR = 4.33 (95% CI 2.95 to 6.34); **BMI** >=25: aOR = 3.79 (95% CI 2.61 to 5.50); **Central obesity:** aOR = 1.91 (95% CI 1.09 to 3.36); **Alcohol consumption:** aOR =1.72 (95% CI 1.26 to 2.34)	"Older age, urban residence, lower educational coverage, family history of hypertension... BMI >=25, alcohol consumption, and central obesity were the risk factors for hypertension."
Nwankwo et al (2025)[21]	Dec 2024	21	East Africa	**Overweight:** OR = 1.85 (95% CI 1.53 to 2.22); **General obesity:** OR = 3.05 (95% CI 2.51 to 3.69); **Abdominal obesity:** OR = 2.01 (95% CI: 1.44 to 2.80); **Alcohol consumption:** OR = 1.23 (95% CI: 1.01 to 2.01); **Tobacco smoking:** OR 1.48 (95% CI: 1.13 to 1.94)	"Overweight, obesity, general obesity, WHR [data not reported in abstract] and age are associated with onset of hypertension"
Shrestha et al (2021) [22]	Oct 2020	40	Nepal	**Smoking:** OR = 1.43 (95% CI 1.14 to 1.79); **Alcohol use:** OR = 2.07 (95% CI 1.72 to 2.51); **Normal BMI:** OR = 0.47 (95% CI 0.35 to 0.62); **Formal educated:** OR = 0.627 (95% CI 0.55 to 0.72); **Adequate exercise:** OR = 0.68 (95% CI 0.52 to 0.90)	"Hypertension was associated with male sex, smoking, alcohol use, high BMI, no education and inadequate exercise"
Sani et al (2024) [23]	2021	22	West Africa	**Rural dweller** (vs urban): OR = 0.74 (95% CI 0.66 to 0.83); **Female** (vs male): OR = 0.91 (95% CI: 0.8 to 1.05)	"The odd of hypertension were lower in rural compared to urban dwellers… no significant difference in the odds... between the sexes"
Hossain et al (2025) [24]	Not reported	12	Bangladesh	**Female:** OR = 1.15 (95% CI 1.02 to 1.27); **Urban resident**: OR = 1.11 (95% CI 1.03 to 1.19); **Education:** primary OR = 1.02 (95% CI: 0.89 to 1.14), secondary OR = 1.07 (95% CI 0.94 to 1.21), higher secondary OR = 1.25 (95% CI 1.03 to 1.47); **Wealth status:** poorer class OR = 1.08 (95% CI 0.87 to 1.29), middle class OR = 1.13 (95% CI 1.04 to 1.22), richer class OR = 1.38 (95% CI 0.68 to 2.07), richest class OR = 1.49 (95% CI 0.97 to 2.00); **Employment** (vs nonworking): OR = 0.61 (95% CI 0.43 to 0.80)	"…females had a significantly higher risk of developing hypertension compared to males"; "…an increasing risk with higher education levels"; "…a greater risk of hypertension among wealthier individuals"
Dietary risk factors					
Hajihashemi et al (2023)[25]	Jun 2021	22	No	**Circulatory/dietary n-6 polyunsaturated fats:** OR = 0.90 (95% CI 0.81 to 1.00)	"Higher circulatory/dietary n-6 polyunsaturated fats tend to be associated with lower odds of hypertension"
Song et al (2025)[26]	Jan 2024	6	No	**Dietary inflammation** (DII) index score: RR (highest DII score vs lowest) = 1.15 (95% CI 1.06 to 1.26); RR (higher DII score vs lowest) = 1.10 (95% CI 1.03 to 1.18)	"Pro-inflammation dietary increases the risk of hypertension."
Wu et al (2025) [27]	Mar 2024	22	Chinese population	**Dietary patterns:** Traditional Southern Chinese diet (highest vs lowest category): OR = 0.95 (95% CI 0.92 to 0.97); Dietary pattern high in fruit and dairy (highest vs lowest category): OR = 0.75 (95% CI: 0.64 to 0.89); Animal food dietary pattern: OR = 1.06 (95% CI: 0.98 to 1.15)	"The traditional southern Chinese pattern as well as the fruit and dairy pattern was a protective factor for hypertension."
Environmental risk factors					
Bolm-Audorff et al (2020) [45]	May 2019	24	No	**Occupational noise:** Effect size (>80 decibels vs <80 decibels) = 1.81 (95% CI 1.51 to 2.18)	"…high quality of evidence that occupational noise exposure increases the risk of hypertension"
Raffetti et al (2020) [47]	Mar 2020	17	No	**Exposure to polychlorinated biphenyls (PCBs):** Total PCBs (highest vs lowest quantile): OR =1.70 (95% CI 1.28 to 2.26); Dioxin-like polychlorinated biphenyls (highest vs lowest quantile): OR = 1.46 (95% CI 1.19 to 1.79); Non-dioxin-like PCBs (highest vs lowest quantile): OR = 1.19 (95% CI 0.81 to 1.73)	"… suggests that exposure to PCBs, particularly to DL-PCBs, may be a risk factor for hypertension, independently of other risk factors."
Hamzavi et al (2025) [48]	Jul 2024	21	No	**Exposure to polychlorinated biphenyls (PCBs):** Total PCBs: OR = 1.78 (95% CI 1.30 to 2.44); Dioxin-like PCBs: OR = 1.54 (95% CI 1.24 to 1.90); Non-dioxin-like PCBs: OR 1.16 (95% CI 0.81 to 1.66)	"…findings indicate a positive correlation between PCB exposure and hypertension, particularly with dioxin-like PCBs and certain PCB congeners."

Qin et al (2021) [46]	Aug 2020	53	No	**Long-term exposure to ambient air pollution:** OR per 10=mug/m3 increase in exposure: PM2.5 (particulate matter): OR = 1.10 (95% CI 1.07 to 1.14); PM10: OR = 1.04 (95% CI 1.02 to 1.07); Sulphur dioxide: OR = 1.21 (95% CI: 1.08 to 1.36). "No significant association" of hypertension with PM1, PM2.5 - 10, nitrogen dioxide, or nitrogen oxides.	"Long-term ambient air pollution is a potential risk factor for hypertension in adults."
Bu et al (2024) [49]	Apr 2023	27	No	**Exposure to green space:** Normalized difference vegetation index (NDVI) 500-m (per 10% increase): OR = 0.95 (95% CI 0.90 to 0.99); NDVI 1000-m (per 10% increase): OR = 0.95 (95% CI 0.90 to 0.99)	"…higher exposure to greenspace might be associated with lower levels of BP and risk of hypertension"
Socioeconomic risk factors					
Satapathy et al (2024) [43]	Dec 2023	26	No	**Deprived neighbourhoods**: RR = 1.139 (95% CI: 1.006 to 1.290). Heterogeneity in association between countries, ranging from RR = 1.00 (95% CI 0.93, 1.08) in Japan to RR = 1.60 (95% CI 1.07 to 2.39) in France and RR = 1.57 (95% CI 0.67 to 3.70) in Germany.	"Our analysis confirms a significant association between neighbourhood deprivation and hypertension."
Sleep related risk factors					
Ma et al (2020) [28]	Jul 2020	40	No	**Self-reported snoring** vs no self-reported snoring: OR = 1.23 (95% CI 1.15 to 1.31).	"Snoring was a risk factor of metabolic syndrome"…"and a dose-response relationship existed between the two"
Niu et al (2021) [29]	Nov 2020	11	No	**Self-reported snoring** vs no self-reported snoring: OR = 1.32 (95% CI 1.23 to 1.42); Self-reported snoring ≥4 nights per week: OR = 1.42 (95% CI 1.21 to 1.66); self-reported snoring 1-3 nights per week: OR = 1.23 (95% CI 1.13 to 1.34).	"Snoring is considered as an independent predictor of hypertension in both men and women."
Nurrobi et al (2024) [30]	Jan 2024	6	Asian population	**Sleep duration**, short vs normal: OR = 1.36 (95% CI 1.13 to 1.64).	"Short sleep duration is associated with a higher mild risk of hypertension, irrespective of sex."
Yang et al (2025) [31]	Nov 2023	16	Young and middle-aged individuals	**Sleep duration:** Short (<7 hours): RR = 1.10 (95% CI 1.05 to 1.15); Long (≥ 9 hours): OR = 1.10 (95% CI 1.05 to 1.15)	"…association between sleep duration… and the development of hypertension in young and middle-aged adults, particularly in Asian populations."
Other risk factors					
Wang et al (2023) [32]	Mar 2022	20	Developing countries	**Age at menarche** (oldest, vs middle/youngest group): Participants with mean age at BP assessment <55 years: RR = 1.79 (95% CI 1.41 to 2.28) Participants with mean age at BP assessment ≥ 55 years: RR = 1.07 (95% CI 0.78 to 1.47)	"Late menarche was associated with a higher risk of BP and this association was modified by age and adiposity in developing countries."
Barozet et al (2024) [33]	Mar 2020	122	No	**Inflammatory and autoimmune diseases:** Unadjusted OR = 1.67 (95% CI 1.58 to 1.76)	"The prevalence of hypertension is higher among patients with inflammatory autoimmune diseases."
Yang et al (2025) [34]	Jul 2024	20	No	**Bullous pemphigoid (autoimmune skin disorder):** Overall OR = 1.13 (95% CI: 1.07 to 1.20), Asia OR = 1.05 (not significant), Europe OR = 1.07 (not significant), United States OR = 1.29 (95% CI 1.12 to 1.48)	"…a significant relationship between bullous pemphigoid and hypertension, particularly in the United States."
Taylor et al (2025) [35]	Jan 2025	23	No	**Chronic pain:** Overall OR = 1.66 (95% CI 1.28 to 2.15). Results for specific conditions: Chronic widespread pain: OR = 1.38 (95% CI 1.20 to 1.58); Chronic headache: OR = 1.56 (95% CI 1.37 to 1.79); Musculoskeletal pain, lower back pain, and sex: no association.	"…confirms an association between chest pain and hypertension."
Satapathy et al (2025) [36]	Dec 2024	36	No	**Depression:** OR = 1.198 (95% CI 1.086 to 1.321)	"…evidence supporting a positive association between depression and an increased risk of hypertension."
Yang et al (2020) [37]	Nov 2019	16	No	**Elevated blood pressure in childhood:** OR = 2.02 (95% CI 1.62 to 2.53).	"…demonstrated a significant association between elevated BP in childhood and hypertension in adulthood."
Hidayat et al (2020) [38]	Oct 2019	47	No	**Foetal or childhood exposure to famine:** Foetal exposure RR = 1.30 (95% CI 1.07 to 1.57); Childhood exposure RR = 1.33 (95% CI 1.02 to 1.74).	"…foetal and childhood exposure to famine may confer greater risks of developing certain cardiometabolic conditions in adulthood, particularly in women."
Rao et al (2023) [39]	Oct 2022	8	No	**Insulin resistance:** Highest category metabolic score for insulin resistance (vs lowest): aRR = 1.67 (95% CI 1.53 to 1.83)	"A high metabolic score for insulin resistance is associated with hypertension in general adult population."
Wang et al (2021) [40]	Mar 2021	8	No	**Insulin resistance:** Highest category triglyceride-glucose index for insulin resistance (vs lowest): aRR =1.53 (95% CI 1.26 to 1.85)	""Higher triglyceride-glucose index may be associated with higher odds of hypertension in the general adult population."
Ahn et al (2024) [41]	Mar 2023	15	No	**Long working hours** vs normal working hours: overall OR = 1.09 (95% CI: 0.88 to 1.35); Females OR = 1.28 (95% CI: 1.14 to 1.44); Males OR = 1.00 (95% CI: 0.64 to 1.56)	"Although this study could not clearly confirm the relationship between long working hours and hypertension, the subgroup analysis suggests that long working hours may be associated with hypertension, particularly among women."
Tada et al (2022) [42]	2021	24	No	**Tooth loss** vs no tooth loss: OR = 2.22 (95% CI 2.00 to 2.45); No natural teeth vs those with some natural teeth: OR = 4.94 (95% CI 4.04 to 6.05)	"…subjects with more tooth loss had a greater incidence of hypertension than those with less tooth loss during the follow-up period."

Mokhtari et al (2022) [56]	Mar 2021	70	No	**Serum vitamin D**: RR (high vs low) = 0.84 (95% CI: 0.73 to 0.96); RR (per 25 nmol/L increase) = 0.95 (95% CI 0.90 to 1.00)	"…serum vitamin D concentrations were inversely related to the risk of hypertension in adults, in a dose-response manner in both prospective cohort and cross-sectional studies"

Abbreviations: OR = odds ratio, aOR = adjusted odds ratio, RR = risk ratio, aRR = adjusted risk ratio, CI = confidence interval, SD = standard deviation, BMI = body mass index, WHR = waist to hip ratio

Question 2: What is the volume and type of evidence on the effectiveness of a screening programme for hypertension in reducing hypertension-related mortality and morbidity?

Citation 1: Guirguis-Blake et al (2021)

Objectives: To systematically review the benefits and harms of screening and confirmatory blood pressure measurements in adults, to inform the US Preventive Services Task Force.

Country: Not reported

Study design: Systematic review

Last search date: 26 March 2021

Number of included studies: 52 overall, 1 clearly relevant to this evidence map from abstract (cluster RCT), 13 potentially relevant if full text were examined.

Population: Adults representative of the general population

Intervention: Screening for hypertension

Comparator: No screening for hypertension

Outcome type: Harms of screening; Hypertension related morbidity - cardiovascular-related hospital admissions

Results reported in abstract: One cluster RCT (n = 140,642) of a multicomponent intervention including hypertension screening reported fewer annual cardiovascular-related hospital admissions for cardiovascular disease in the intervention group compared with the control group (difference, 3.02 per 1000 people; rate ratio, 0.91 [95% CI, 0.86-0.97]). Thirteen studies (n = 5,150) suggested that screening was associated with no decrement in quality of life or psychological distress; evidence on absenteeism was mixed. Ambulatory blood pressure measurement was associated with temporary sleep disturbance and bruising.

Conclusions: Screening using office-based blood pressure measurement had major accuracy limitations, including misdiagnosis; however, direct harms of measurement were minimal. Research is needed to determine optimal screening and confirmatory algorithms for clinical practice

Full text check: No

Citation 2: Schmidt et al (2020)

Objectives: To assess the effectiveness of different screening strategies for hypertension (mass, targeted, or opportunistic) to reduce morbidity and mortality associated with hypertension.

Country: Not reported

Study design: Systematic review

Last search date: 09 April 2020

Number of included studies: 0

Population: Healthy adolescents, adults, and elderly people.

Intervention: Screening for hypertension

Comparator: No screening for hypertension

Outcome type: Not applicable - no studies identified

Results reported in abstract: The review identified 54 potentially eligible studies for full-text screening. However, no studies met the eligibility criteria.

Conclusions: High-quality evidence from RCTs or programmatic evidence from NRCTs on the effectiveness and costs or harms of different screening strategies for hypertension (mass, targeted, or opportunistic) to reduce hypertension-related morbidity and mortality is lacking.

Full text check: No

Citation 3: Zhang et al (2025)

Objectives: To examine the association of screening for hypertension, diabetes, and high cholesterol with all-cause and cardiovascular mortality.

Country: US

Study design: Prospective cohort: Multivariable Cox regression analysis

Study size: n = 86,587

Population: Adults in the US

Intervention: Screening for hypertension: As part of a composite screen which also included screening for diabetes and high cholesterol

Comparator: No screening for hypertension

Outcome type: All-cause and cardiovascular mortality

Results reported in abstract: There were no hypertension specific results reported in the abstract. In the full text, the following results were extracted: '1 screening' (blood pressure screening only) was initially associated with lower cardiovascular mortality when adjusting for age and sex only (HR 0.52, 95% CI 0.33 to 0.81, p = 0.004), but after full adjustment (age, sex, race, marital status, education level, physical activity, smoking status, drinking status, body mass index, family income, kidney failure, pulmonary disease, cancer, and health insurance) the association was no longer statistically significant (HR 0.65, 95% CI 0.41 to 1.03, p = 0.065). '1 screening' (blood pressure screening only) was not significantly associated with all-cause mortality (adjusted HR 0.95, 95% CI 0.74 to 1.20, p = 0.647).

Conclusions: Overall, in this population of US general adults, there was no evidence that screening for hypertension, diabetes, and high cholesterol could lead to lower all-cause or cardiovascular mortality.

Full text check: Yes - to extract hypertension specific results.

Question 3: What is the volume and type of evidence available on the effectiveness of interventions in adults with screen-detected hypertension?

Citation 1: Kang et al (2025)

Country: Korea

Study design: Retrospective cohort

Study size: n = 505,212

Follow-up: 11.34 years (+/- 0.67 years)

Intervention: Immediate intervention from screen detection / health check: 'Newly diagnosed with hypertension and treated in the same year'

Comparator: Delayed intervention from screen detection / health check (same intervention): 'Newly diagnosed but started medication after a year'

Results reported in abstract: The hazard ratios for myocardial infarction in the early and delayed treatment groups were 1.52 (1.36 to 1.69) and 1.56 (1.38 to 1.76), respectively (p for trend <0.0001). For stroke, the hazard ratios were 1.46 (1.35 to 1.59) in the early treatment group and 1.58 (1.43 to 1.74) in the delayed treatment group (p for trend <.0001). The risk of death was higher in the delayed treatment group with an hazard ratio of 1.79 (1.64 to 1.97) compared to 1.47 (1.35 to 1.60) in the early treatment group (p for trend <0.0001).

Conclusions: Delayed consideration of medication in primary health screenings may be associated with higher risks of MI, stroke, and death.

Full text check: Yes - population eligibility information

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