



Easing the pressure

Impact of British Heart Foundation
support for high blood pressure research

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**British Heart
Foundation**

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Message from our Chief Scientific and Medical Officer



Since British Heart Foundation (BHF) was founded in 1961, it has funded pioneering research that has improved the lives of millions of people affected by cardiovascular diseases. Powered by our supporters and volunteers, BHF-funded researchers have made fundamental discoveries and translated promising science into revolutionary breakthroughs. To crystallise the impact of this research, we are producing reviews that showcase the impact of BHF-supported research in specific areas of cardiovascular medicine. We highlight key research leaders whose work has advanced knowledge, developed new technologies, and improved clinical practice, with the aim of improving the lives of people living with, or at risk of cardiovascular diseases.

The following pages focus on high blood pressure, a major risk factor for heart attacks and strokes that often goes undetected until serious damage has occurred. While it can be managed, millions of people in the UK still live with undiagnosed or uncontrolled high blood pressure. Over the past 60 years, BHF-funded research has transformed our understanding of this condition — from uncovering how it develops to contributing to more effective, personalised treatment strategies. With advances in digital health and precision medicine, we are now closer than ever to ensuring that everyone receives the right treatment at the right time.

I look forward to seeing BHF's continued progress in the decades to come.

Professor Bryan Williams OBE MD FMedSci
Chief Scientific and Medical Officer,
British Heart Foundation

What is high blood pressure?

High blood pressure, also called hypertension, is a condition where the force of blood pushing against the walls of your arteries is consistently too high.

You need a certain amount of pressure to get the blood moving around your body. However, when blood pressure remains high, it can increase the risk of life-threatening complications such as heart attacks and strokes.

Around 50% of heart attacks and strokes in the UK are linked to high blood pressure



Causes and risk factors

In most cases, high blood pressure doesn't have an identifiable cause. This is called **primary hypertension**, and usually develops due to factors like lifestyle, genetics and age. For some people, high blood pressure is linked to an underlying health condition, this is called **secondary hypertension**.

Ethnicity

People of Black African, Caribbean, and South Asian descent can be at higher risk.



Risk factors for high blood pressure include:

Lifestyle factors

A diet high in salt, smoking, being overweight, and excessive alcohol consumption can increase risk.



Age

Risk increases significantly with age.



Family history

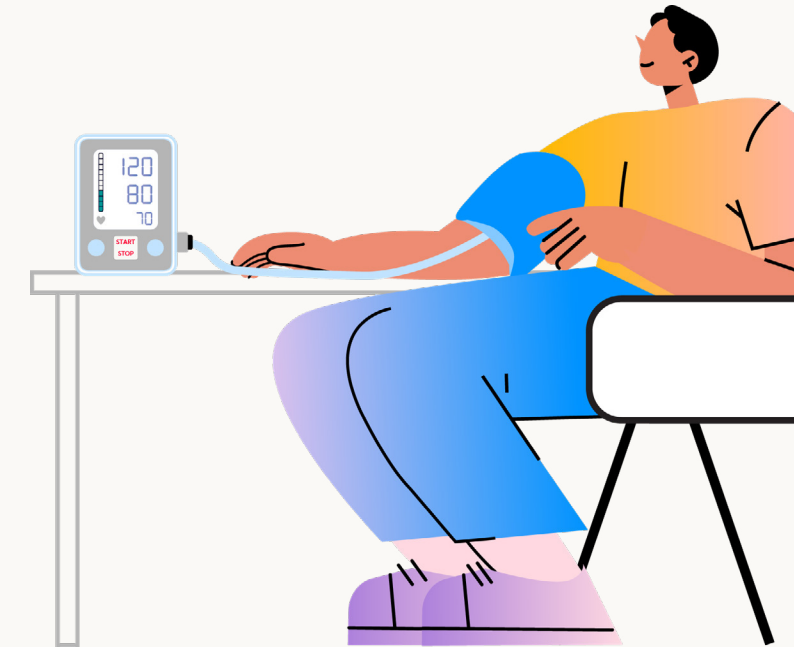
High blood pressure often runs in families.



Diagnosis and management

High blood pressure is often called a 'silent killer' because it usually has no symptoms. The only way to find out if you have high blood pressure is to get your blood pressure checked.

How your high blood pressure is managed depends on a range of things such as how long you've had uncontrolled high blood pressure and your overall health. This might include lifestyle changes such as diet and exercise, or taking blood pressure medication.



Around 30% of adults in the UK have high blood pressure

High blood pressure in the UK

High blood pressure is the leading modifiable risk factor for cardiovascular disease in the UK.

Around 16 million adults in the UK have high blood pressure, up to half of them are not receiving effective treatment.

As many as 5 million adults in the UK have undiagnosed high blood pressure and don't know they are at risk.

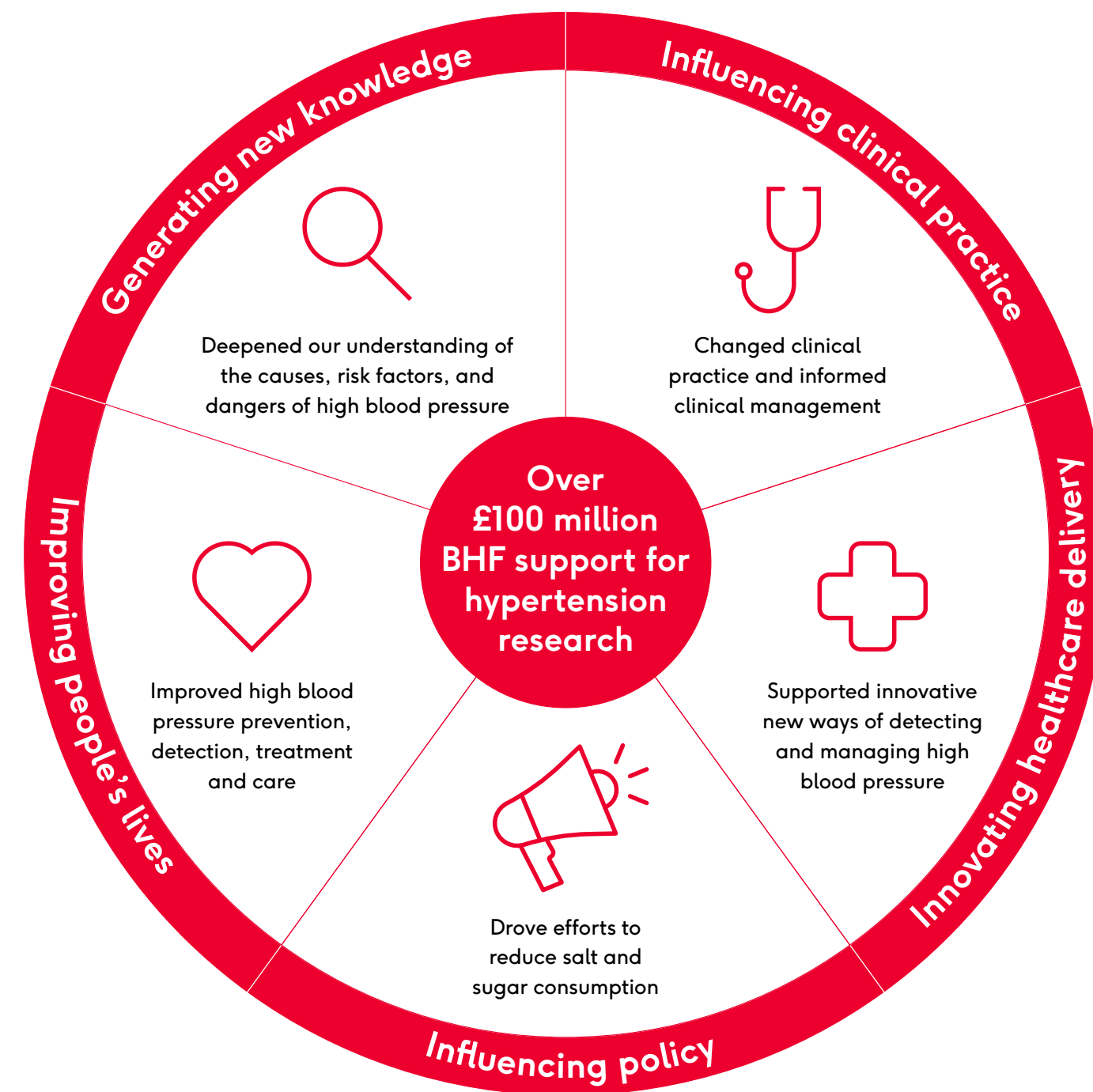
Our support for high blood pressure research

For over 60 years, BHF has been at the forefront of research into high blood pressure, helping to transform how we prevent, detect, understand, and treat this major risk factor for cardiovascular disease. Before the 1960s, high blood pressure was poorly understood. Treatment options were limited and often accompanied by significant side effects.

Today, thanks to BHF-funded research, we've helped unravel the complex mechanisms that regulate blood pressure, supported the development of safer and more effective treatments, and shaped clinical guidelines through landmark studies. BHF-funded research has helped doctors around the world better understand which drugs work best and which people benefit most — laying the foundation for more personalised approaches to care.

Our efforts have also extended beyond the lab. From supporting innovative ways to detect and manage high blood pressure to shaping policy around salt and sugar reduction, we've helped improve detection, management, and public awareness of high blood pressure across the UK.

**Over
500 grants**
worth more than £100m
Supporting the training
and development of more
than 150 researchers



Generating new knowledge



Thanks in part to BHF-funded research, we now better understand the mechanisms, risk factors, and dangers of high blood pressure. This research has led to groundbreaking discoveries, including:

- Understanding how multiple organs work together to regulate blood pressure, including the heart, blood vessels, brain, and kidneys. Today, many drugs target these complex interactions to control blood pressure.
- Identifying why some people are more at risk of developing high blood pressure, shaped by factors like diet, ethnicity, biological sex, and genetics. This research supports prevention efforts and helps address health inequalities.
- Revealing the genetic causes of pregnancy-related hypertension, advancing understanding of pre-eclampsia (a pregnancy complication involving high blood pressure), and showing that self-monitoring blood

pressure after birth can improve heart health for mothers.

- Supporting research that has highlighted high blood pressure as a major risk factor for several conditions such as stroke and dementia.

The DNA of hypertension

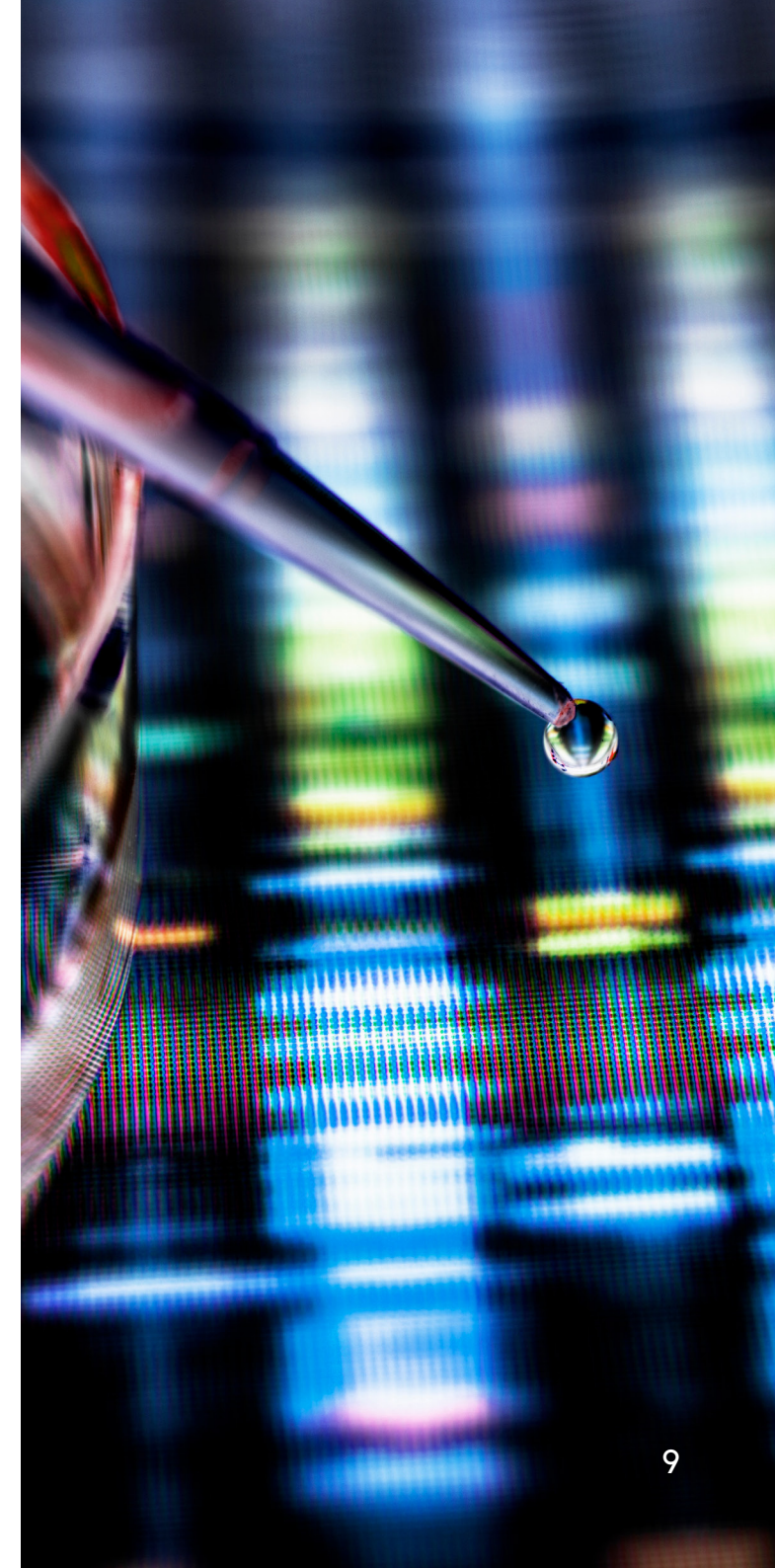
Genetic factors play a crucial role in shaping your blood pressure. For over 20 years, BHF-funded research has been at the forefront of uncovering how our DNA affects blood pressure. This research is opening doors to new ways of preventing and treating high blood pressure. One major study, involving over a million people, identified hundreds of genetic links to high blood pressure.

Now, researchers are using these discoveries to develop personalised treatments. BHF-funded researchers at the University of Glasgow, led by Professor Sandosh Padmanabhan, are studying how our genes might affect how well blood pressure

medicines work for different people. The team have a particular interest in a gene linked to a hormone called uromodulin, which may help control blood pressure by affecting how the kidneys work.

In 2024, his team announced results from a clinical trial that found that people with a genetic variant of the uromodulin gene respond better to torasemide, a drug not commonly used to treat hypertension. Those with two copies of this variant experienced a greater and more sustained drop in blood pressure after using the drug. This research offers hope that personalised blood pressure treatment based on a person's genetic profile could be the key to helping people with uncontrolled hypertension nationwide.

Those with a
genetic variant saw
**twice the blood
pressure drop**
on the drug



Influencing clinical practice



High blood pressure affects nearly one in three adults in the UK, often without symptoms. This makes early diagnosis crucial to prevent serious conditions like heart disease, stroke, and kidney failure. In the past, treatment was more one-size-fits-all, often starting only when blood pressure was dangerously high.

BHF-funded research has contributed significantly to improving how we prevent, diagnose, and treat high blood pressure by:

- Leading a series of clinical trials that pioneered personalised approaches to hypertension treatment. The PATHWAY trials have shaped guidelines across the globe.
- Proving that blood pressure medication is safe and effective for people over 80, leading to worldwide changes in healthcare practices. Treating hypertension in this age group cut death rates by 21%.

- Debunking the myth that paracetamol is a safer alternative to anti-inflammatory drugs for treating pain in people with high blood pressure. The study prompted a rethink of its use, especially for those at risk of heart disease.
- Confirming that blood pressure medication is equally effective in preventing heart complications including heart attacks and strokes, whether taken in the morning or evening. This gives people the freedom to take their medication whenever is best for them.

A PATHWAY to better blood pressure management

People with hypertension are often prescribed up to three different kinds of medication to lower their blood pressure. However, it's not always clear which combination works best for each person.

Of the estimated 1.3 billion adults worldwide living with high blood pressure, only around half are diagnosed, and as few as one in five manage to keep their blood pressure under control. To tackle this, researchers across the UK launched the groundbreaking PATHWAY trials (2009-2014), funded by BHF. Their mission was to develop new, more personalised approaches to treating high blood pressure.

The results from these trials have had a major impact, shaping clinical guidelines around the world. Thanks to these findings, doctors now have clearer, more personalised strategies to help people lower their blood pressure faster, reducing the risk of heart attacks and strokes.



PATHWAY-1:

Optimising initial treatment

Discovered that starting with at least two blood pressure medicines—rather than just one—**can lower blood pressure more effectively, by at least 5 mmHg.**

PATHWAY-2:

Effective add-on treatments

Found that spironolactone, a low-cost water pill, is the most effective add-on treatment for resistant hypertension. **It lowered blood pressure by nearly 9 mmHg more than a placebo, and could reduce the risk of complications by up to 25%.**

PATHWAY-3:

Safer drug combinations

Found that combining two types of water pills, one that lowers potassium and one that doesn't, **was more effective at lowering high blood pressure than using either alone.** This combination also helped keep blood sugar levels stable, which could reduce the risk of developing diabetes.

Innovating healthcare delivery



In 2017, BHF launched the Blood Pressure Award Programme to encourage new ideas for improving how the UK detects and manages high blood pressure.

The awards aimed to:

- Boost detection and management of undiagnosed hypertension.
- Improve community access to blood pressure testing.
- Strengthen support for people to manage their blood pressure.
- Empower people to test their blood pressure routinely.
- Build evidence on effective hypertension care and innovation adoption.

From 2017 to 2021, £1.5m was awarded to **14 sites across the UK**, including local councils, NHS groups and public health partnerships.



The impact

- Improved access to blood pressure testing for communities involved.
- Increased awareness and confidence around what high blood pressure is and how to manage it.
- Changed behaviour and improved management of risk factors associated with hypertension.
- Increased awareness of high blood pressure and its management amongst care staff.

Although the programme concluded in 2021 due to the challenges posed by the pandemic, its influence has been far-reaching. It played a pivotal role in shaping health policy by demonstrating the value of community-based blood pressure checks.

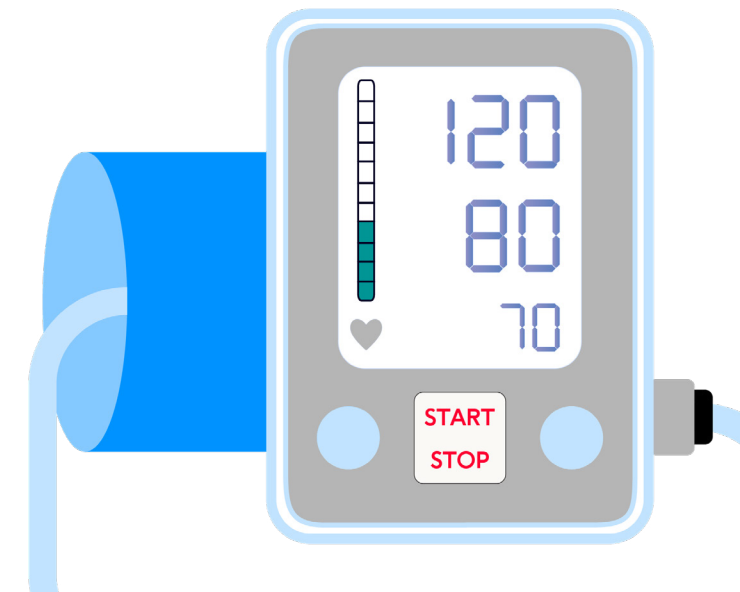
This impact is now embedded in the national pharmacy contract, which includes NHS-funded services and reimbursement for blood pressure testing and diagnosis in local pharmacies.

The programme helped catalyse the launch of the NHS England Blood Pressure @ Home initiative. Since October 2020, the initiative has distributed over 220,000 home blood pressure monitors, empowering individuals to proactively manage their health.

Over 31,000 people
got their blood pressure checked
through the programme

85% of participants
said the programme boosted their
awareness of their blood pressure

2 in 3 participants
made positive lifestyle changes
following a blood pressure check



Improving people's lives



Although high blood pressure often doesn't cause symptoms itself, untreated it can lead to life-threatening complications like heart attacks and strokes. The World Health Organization (WHO) forecasts that up to 76 million deaths could be avoided globally by 2050 if treatments for high blood pressure improve. BHF-funded research is helping to advance how we prevent, diagnose, and manage high blood pressure, contributing to better outcomes for people.

Preventing life-threatening events

BHF-supported research has shown that lowering blood pressure, even in those without diagnosed hypertension, could significantly reduce the risk of strokes, heart attacks, and heart failure.

Each 5 mmHg reduction
in blood pressure has
the potential to **reduce
the risk of major cardiac
events by 10%**

It's estimated that up to
**9 million
UK adults**
are taking blood
pressure medication

Creating better, more personalised treatments

Blood pressure lowering medications are among the most widely prescribed in the UK. BHF has played a pivotal role in advancing research that has led to the development of several life-saving blood pressure medications, including beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, and angiotensin receptor blockers (ARBs). These breakthroughs have transformed the way hypertension is treated worldwide.

Recognising that no two people are the same, BHF-funded researchers are now focused on personalising treatment, aiming to tailor therapies to each individual's unique biology and lifestyle. This approach promises more effective blood pressure control and better long-term outcomes for millions.

Supporting new mothers

During pregnancy, some women develop a serious condition called pre-eclampsia, which can be dangerous for mother and baby. It is characterised by high blood pressure and high levels of protein in the urine. Women who have had pre-eclampsia have three to four times the risk of high blood pressure and double the risk for heart disease and stroke.

Since 2006, BHF has been funding Professor Paul Leeson and his team at the University of Oxford who have been working to understand:

1. how pre-eclampsia develops to discover new treatments
2. how to better support new mothers to monitor their blood pressure after they have given birth

Professor Leeson's team has investigated the role of a molecule called BH4 which helps keep blood vessels healthy during pregnancy. In women with pre-eclampsia, BH4 levels drop. The team found that a special form of folate, 5-MTHF, could restore BH4 and help control blood pressure. A clinical trial is now testing if this simple supplement could protect mothers and babies.

After women with pre-eclampsia give birth, blood pressure can remain high, and the

damage can be long term. Professor Leeson's team showed that giving new mums a blood pressure monitor and app to track and manage their blood pressure at home helped keep it lower for years. Following a larger trial to confirm these findings, this approach could soon be offered across the NHS to support more women after birth.

Women who
self-monitored after birth
had diastolic blood pressure
6.8 mmHg lower than those
who received usual care

Pre-eclampsia
affects up to
1 in 25
pregnancies
in the UK



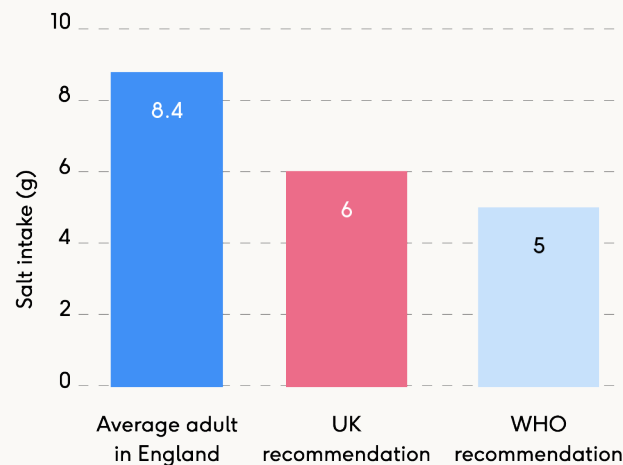
Influencing policy



BHF is leading national efforts to tackle hypertension by driving policy change that targets one of its biggest preventable causes: unhealthy diets.

Reducing the UK's salt intake

Eating too much salt may raise your blood pressure. On average the UK population is eating too much salt. BHF has been at the forefront of efforts to reduce salt consumption across the UK to improve heart health.



A 2023 poll* showed that **65% of British adults** are not confident estimating their daily salt intake

*Polling conducted by YouGov on behalf of BHF

As part of BHF's mission to tackle high rates of salt consumption, we commissioned a study to assess the potential health and economic benefits of reducing salt intake across the UK. The research revealed that if all UK adults met the WHO salt intake guidelines by 2030, by 2035 we could prevent:

- up to 1.4 million new cases of high blood pressure
- up to 135,000 cases of coronary heart disease
- up to 49,000 strokes.

The economic impact could be equally significant, with potential savings of up to £11.4 billion – £6.7 billion of which would be direct healthcare cost reductions, 70% linked to hypertension.

To drive change, BHF is calling for:

- Mandatory policies that make healthier food more accessible, affordable, and appealing.
- Mandatory policies to incentivise companies to reduce salt and sugar in their products.
- Greater public awareness of salt-related health risks.

Supporting the soft drink levy

Just as excess salt contributes to high blood pressure, so too does excess sugar, primarily through its role in driving obesity. Findings from the Framingham Heart Study in the US revealed that 78% of primary hypertension cases in men and 65% in women were linked to obesity. To tackle this, BHF works in partnership with the Obesity Health Alliance to prevent obesity and improve public health.

BHF-funded research played a key role in the introduction of the UK's sugar levy. In 2016, Associate Professor Peter Scarborough and his team in Oxford demonstrated how

reducing sugar—especially in soft drinks—could lower obesity and heart disease rates. Their findings helped shape the decision to introduce the Soft Drinks Industry Levy (SDIL). The levy came into effect in 2018, incentivising companies to reduce sugar in soft drinks and reducing sugar in diets across the population.



BHF is a member of the **Recipe for Change** campaign, which is calling for the UK government to build on the success of the SDIL by introducing a levy on unhealthy food to encourage businesses to make products healthier, and invest the revenue in children's health and access to good food.

Looking to the future

Over the past six decades, BHF-funded research has transformed our understanding of high blood pressure, from uncovering its complex biological mechanisms to pioneering more effective and personalised treatments. Yet, despite this progress, high blood pressure remains one of the most significant and preventable causes of heart attacks and strokes worldwide. Today, up to 8 million people in the UK are living with undiagnosed or uncontrolled hypertension.

Looking ahead, research will focus on finding the right treatment for each person by looking at factors like their genes,

lifestyle, and environment. New digital tools and advanced data analysis will help doctors spot people at risk of high blood pressure earlier, so they can step in sooner. Researchers are also studying how high blood pressure develops differently in men and women, how the immune system might be involved, and how our environment and life experiences can affect our health over time.

With continued innovation, BHF is working towards a future where high blood pressure is detected earlier, treated more precisely, and prevented more widely.

For references, supplementary information and more on the impact of BHF-funded research into high blood pressure please visit bhf.org.uk/impactofhighbloodpressure





bhf.org.uk

British Heart Foundation is a registered charity in England and Wales (225971), Scotland (SC039426) and the Isle of Man (1295).

