



British Heart
Foundation

Turning back the tide

on heart and circulatory diseases

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Foreword

We've come a long way but heart and circulatory diseases – including coronary heart disease, stroke and vascular dementia – still cause nearly a quarter of all early deaths in the UK.¹ It doesn't have to be this way.

The halving of deaths from heart and circulatory diseases since the 1970s has been a major health success for the UK.

The many thousands of lives that would have been cut short or lost to heart attacks and strokes have been prolonged. Advances in interventional and surgical techniques have transformed the way people are treated and every day new research is improving our fundamental understanding of these devastating diseases.

Pioneering British Heart Foundation (BHF) funded research has played a pivotal role and we are proud of these achievements. But we must not let them blind us to the continued human and financial cost of heart and circulatory diseases.

Together they make up the single biggest driver of health inequalities and cost the NHS in England at least £7.4 billion a year.² Behind these numbers lies untold heartbreak for families across the UK, every day.

£7.4bn

Annual cost of heart and circulatory diseases to the NHS in England

There are worrying signs that progress in tackling early deaths is stalling and the number of people suffering could be rising. Obesity rates are stubbornly high, driving an increase in the number of people with type 2 diabetes, as well as high blood pressure and raised cholesterol. If left undetected and untreated, these conditions could lead to a dramatic resurgence of heart attacks and strokes.

Sadly, living with more than one condition is now the norm. Nine in ten heart patients in this country are living with at least one other long-term condition.³ And the depressing reality is that where people live, their ethnicity, gender and their wealth can still have a significant bearing on how long they live and their quality of life.

That's why it's more important than ever that we break new ground by developing better ways to prevent and detect disease earlier. We need to give people access to the best treatments – dealing with the person rather than their illnesses – and empower them to manage their long-term conditions. Now is the time for action.

'Turning back the tide on heart and circulatory diseases' is our framework for beating the heartbreak of these conditions forever. It requires action from medical research funders such as the BHF, from Government, from industry and most importantly from all levels of the NHS.


And alongside this, it needs the engagement of the public right across England.

It is so important that heart and circulatory diseases have been highlighted as a priority for the NHS's long term plan for England and we have welcomed the opportunity to contribute. This is a vital opportunity to transform the lives of millions of people. We're proposing action in five key areas across prevention; earlier detection; access to treatment; recovery; and technology and data science.

There is much at stake but we should not be daunted by this challenge. With focus and determination we can make significant progress. Millions of people's lives depend on it.



Simon Gillespie
Chief Executive



Professor Sir Nilesh Samani
Medical Director



Simon Gillespie
Chief Executive



Professor Sir Nilesh Samani
Medical Director

¹ BHF analysis of UK mortality data, 2017.
² BHF, The CVD Challenge in England, 2017.
³ Tran J, Norton R, Conrad N, Rahimian F, Canoy D, Nazarzadeh M, et al., Patterns and temporal trends of comorbidity among adult patients with incident cardiovascular disease in the UK between 2000 and 2014: A population-based cohort study. PLoS Med. 2018; 15(3):e1002513.

The job is not finished

Heart and circulatory diseases still cause a quarter of all deaths in the UK – on average killing one person every three minutes.

And better heart health outcomes in countries like the US, Canada, France and Sweden make it clear that we can do better.⁴

The number of people living with heart and circulatory diseases also remains high, at 5.9 million in England,⁵ and there are alarming signs that this number could be rising. Diabetes, high blood pressure and raised cholesterol are all risk factors for heart and circulatory diseases – and their burden is growing.

For example, if the number of people living with diabetes continues to rise, it's estimated that by 2035 there could be an additional 9,000 heart attacks and 11,000 strokes in England each year.⁶

Yet the UK remains significantly 'underinvested' in research into heart and circulatory diseases compared to the current disease burden, an imbalance that risks exacerbating the growing health challenges of the future.

People with lower incomes, in certain minority groups and in specific parts of the country are disproportionately disadvantaged.

This inequality is compounded by marked variation in access to vital services.

These disadvantaged groups may have poorer access to new treatments as well as to the rehabilitation services that can help people recover from a heart attack, stroke and other related events.

This challenge is further exacerbated by the likelihood that many of these people will be living with more than one, often linked, condition. The proportion of cardiovascular patients in the UK with five or more conditions increased four-fold between 2000 and 2014.⁷

⁴ Institute for Health Metrics and Evaluation, Global Burden of Disease Study 2015 Results, 2016 and The Health Foundation, the Institute for Fiscal Studies, The King's Fund and the Nuffield Trust, How Good is the NHS?, 2018.

⁵ BHF estimate based on Health Survey for England and Office for National Statistics data.

⁶ BHF analysis using Public Health England (2011) projection of 5.1 million living with diabetes in England in 2035.

⁷ Tran J, Norton R, Conrad N, Rahimian F, Canoy D, Nazarzadeh M, et al., Patterns and temporal trends of comorbidity among adult patients with incident cardiovascular disease in the UK between 2000 and 2014: A population-based cohort study. PLoS Med. 2018; 15(3):e1002513.

90%

Over 90% of people with coronary heart disease have at least one other long-term condition

5.9m

An estimated 5.9 million people live with the daily burden of heart and circulatory diseases in England

The good news is that with the right focus we can tackle these issues head on.

We can reduce the risk of developing heart and circulatory diseases for millions more people with population-level interventions that curb the damage currently being caused by toxic air. And we can address the devastating impact of obesity by making the healthy choice the easy choice, and by giving people the support they need to stop smoking.

We can find and diagnose millions more people at high risk of developing heart and circulatory diseases due to high blood pressure, raised cholesterol and atrial fibrillation (AF). And we can make sure that, once diagnosed, the right treatment and support is given so that these conditions can be managed.

We can stamp out unwarranted variation in access to treatments for people with heart and circulatory diseases such as heart failure, which is often associated with multiple other long-term conditions.

We can avoid thousands of cases of readmission to hospital and improve quality of life for millions of people by re-imagining how we support people recovering from critical events such as heart attack and stroke, and those living with the burden of chronic heart failure.

And we can utilise the enormous potential of technology and data science across all these areas, transforming the way we prevent, diagnose, treat and support those at risk of or living with heart and circulatory diseases.

If we act on these challenges and opportunities the UK can again become a world leader in tackling heart and circulatory diseases.

Soma Biswas, 50
Soma has been diagnosed with type 2 diabetes, hypertension and high cholesterol – all risk factors for coronary heart disease.



How do we get there?



1. Tackle the big population health problems

Although there have been major improvements in population health in recent decades, millions of people remain at risk of heart and circulatory diseases, and there is still significant variation in risk factors between different geographical areas.

Air pollution is a growing public health crisis, particularly for heart and circulatory diseases: Public Health England estimates that nitrogen dioxide and fine particulate matter alone will account for an estimated 2.5 million extra cases of disease, including cardiovascular, by 2035.⁸

Smoking and obesity rates remain stubbornly high amongst some population groups and too much salt in diets is also raising the risk of high blood pressure.

The UK will need bold action if it is to halt and reverse the rise in many of the risk factors for heart and circulatory diseases. To tackle these we urge Government, with the support of NHS England, to introduce:

Modern, health-focused air quality legislation

We support the Government's existing commitment to primary legislation which will improve air quality and protect public health.

This must include the lowering of legal limits on air pollution to those suggested by the World Health Organization, the introduction of mandatory charging 'Clean Air Zones' in areas of the country with the worst air quality, and the implementation of a national reporting scheme so that people understand air quality in their area and can protect themselves when it is poor.

A comprehensive plan to tackle obesity and physical inactivity

Chapter 2 of the Government's Childhood Obesity Plan begins to move us in the right direction, but we cannot let it be watered down. Measures to restrict TV and online advertising of junk food to children and banning the promotion of unhealthy food and drink by price and location must be implemented.

Government must also work with industry to limit the damage caused by high levels of salt and sugar in products, as well as the overall calorie content of foods to ensure that people are supported to eat more healthily.

2.5m

Nitrogen dioxide and fine particulate matter alone will account for an estimated 2.5 million extra cases of disease, including cardiovascular, by 2035



Air pollution

An invisible but deadly problem

Since 2010, the BHF has invested £3.2 million in research to help understand the impact of air pollution on our heart and circulation.

This research has helped to identify that air pollution, especially fine (PM_{2.5}) and ultrafine particulate matter, can cause damage to the heart and circulatory system and make existing heart conditions worse. Particles such as those found in air pollution can enter the circulatory system and accumulate in diseased blood vessels.

Exposure to elevated levels of these pollutants can increase the likelihood of a heart attack or stroke in vulnerable groups within 24 hours.¹¹

If we are to see a marked reduction in the number of people with potentially deadly high blood pressure, we must make a concerted effort to significantly reduce salt content in foods, setting a target of reaching the Government's recommended intake of an average of 6 grams per day for adults by 2023. It's estimated that this reduction in average salt intake would prevent over 8,000 early deaths and save the NHS over £570 million each year.⁹

To encourage greater physical activity, promising initiatives such as the 'Daily Mile' in schools should be expanded. In addition, we need to focus on how built environments can facilitate healthier lifestyles, through measures such as active travel infrastructure.

A new target to achieve a 'smoke-free country'¹⁰ by 2030

Tobacco manufacturers and importers should help pay for activities and services that deal with the harm their products cause.

The introduction of a financial levy could fund a number of important initiatives including mass media campaigns, better prevention of underage sales and illicit trade, and also smoking cessation services that prioritise those areas of greatest unmet need.

The Government should also explore further regulation, including a requirement for retailers to obtain a license in order to sell tobacco products. Tobacco dependence treatment could be strengthened within the NHS with mandatory provision of 'opt-out' services as successfully implemented in Ottawa.

⁸ Public Health England, Estimation of costs to the NHS and social care due to the health impacts of air pollution, 22 May 2018.

⁹ Public Health England data on salt consumption, 2016.

¹⁰ A 'smoke free' country defined as having an adult smoking prevalence of 5% or lower.

¹¹ Miller et al. (2013). Diesel exhaust particulate increases the size and complexity of lesions in atherosclerotic mice, Particle and Fibre Toxicology 10: 61.

Miller et al. (2017) Inhaled Nanoparticles Accumulate at Sites of Vascular Disease, ACS Nano. Committee on the Medical Effects of Air Pollutants (2018). The Effects of Long-Term Exposure to Ambient Air Pollution on Cardiovascular Morbidity: Mechanistic Evidence.

2. Earlier detection of the major risk factors

115,000

If we matched Canada's levels of early detection and treatment for high blood pressure, we could prevent an estimated 115,000 heart attacks, strokes and other cardiovascular events in England over the next decade

Canada

Learning from international success stories

In the late 1980s Canada had poor outcomes for high blood pressure, with diagnosis rates of only 13%.¹² Jump to today and 57% of people with high blood pressure are detected and optimally treated, compared to just 34% in England.¹³

In the 1990s, the Cardiovascular Health Awareness Programme introduced integrated community based cardiovascular health promotion and chronic disease management activities through partnership with primary care providers, community pharmacists, community groups and locally trained volunteers acting as peer health educators.

The programme was associated with a 9% reduction in hospital admissions at population level for stroke, heart attack and heart failure among people aged under 65, compared to communities that did not implement the programme. It is viewed internationally as an innovative and successful programme.¹⁵

The factors that increase risk of heart attack, stroke and vascular dementia include high blood pressure, raised cholesterol, type 2 diabetes and atrial fibrillation. A relentless determination to detect and treat these risk factors as early as possible will help to prevent many more thousands of people suffering acute cardiovascular events and long-term conditions.

If we matched Canada's levels of early detection and treatment for high blood pressure, we could prevent an estimated 115,000 heart attacks, strokes and other cardiovascular events in England over the next decade.¹³

Primary care is usually held up as the answer to this kind of improved detection, and it does have a vital role to play, particularly through better uptake of the NHS health check. But primary care is overstretched and there are many other ways of finding the people most at risk so they can get the help they need. NHS England, in partnership with bodies such as the BHF, should explore and implement innovative ways of detecting those at greatest risk, particularly the estimated 5.7 million people in England with undiagnosed high blood pressure.¹⁴

In addition, nearly 1 in 100 people (525,000) in England may be at risk of living with undiagnosed inherited conditions, including familial hypercholesterolaemia (FH), which puts them at significantly increased risk of coronary heart disease.

By identifying more people who have these conditions, we can help them manage their risk – and save many more lives.



Advances in genomics

The £40 Genomic Risk Score test for coronary artery disease

People at high risk of a heart attack in adulthood could be spotted much earlier in life with a one-off DNA test, according to BHF-supported research carried out by researchers at the University of Leicester, University of Cambridge and the Baker Heart and Diabetes Institute in Australia.

Using UK Biobank data the researchers have developed and tested a powerful scoring system, called a Genomic Risk Score (GRS), which can identify people who are at risk of developing coronary heart disease prematurely because of their genetics.¹⁶

The GRS has the potential to revolutionise our approach to identifying those at risk much earlier when prevention measures may be even more effective. The genetic technology to determine the GRS now costs less than £40 and remains in development.

A national programme - 'Saving Hearts and Minds'

We need a coordinated national programme of activity - 'Saving Hearts and Minds' - to raise awareness and improve detection and management of these risk factors. This should include increasing access to testing services in both healthcare settings, such as community pharmacies, and non-healthcare settings, such as football stadiums, train stations, leisure centres, barber shops and in the workplace. We must also establish new pathways to ensure continued support for self-management of conditions.

We know from the experience of other countries, such as Canada, that mobilising the community in this way can have a dramatic impact on the detection and management of risk factors like high blood pressure.

This programme of activity could be delivered through a number of channels. It could build on existing successful services, such as the Diabetes Prevention Programme, as well as taking advantage of new technologies, such as the detection of multiple risk factors via retinal scans as part of routine sight tests.¹⁶

Better identification of the 'hidden killers' of genetic heart conditions

Of the estimated 230,000 people living with FH in England, only around 6% currently know they have it. Without appropriate treatment, 50% of men with FH will have a cardiovascular event, such as a heart attack or stroke, by the age of 50, and 30% of women by the age of 60.¹⁷

To tackle this, we need investment in technology to help identify the 'hidden killers' of genetic heart conditions and properly resourced implementation of genetic cascade testing of families. We also need full exploitation of advances in genomic medicine and investment in a heart disease genetic testing programme. This testing programme could extend beyond inherited heart diseases that are caused by a single faulty gene that's passed on through families, to common conditions such as heart attacks.

We welcome the initiative by NHS England to make genomics mainstream through their funding of the world-leading 100,000 Genomes project and their recently announced plans for the Genomics Medicine Service. Reducing the burden of heart and circulatory diseases could be a major outcome of this.

For those affected, it can be alarming to hear that they have a heightened risk of a potentially fatal condition. We must therefore ensure that those identified as having genetic risk are not only given appropriate medical treatment, but are also supported and counselled.

¹² Schiffrin et al, Hypertension in Canada: Past, Present and Future, annals of Global Health, Vol 82, No2, 2016.

¹³ Imperial College Health Partners analysis for the BHF using Sheffield/Public Health England CVD Return on Investment tool.

¹⁴ Public Health England using updated figures in the BP: How can we do better guide, Hypertension prevalence estimates for local populations, 2016.

¹⁵ Schiffrin et al, Hypertension in Canada: Past, Present and Future, annals of Global Health, Vol 82, No2, 2016.

¹⁶ Poplin R, Varadarajan V, Blumer K et al, Prediction of cardiovascular risk factors from retinal fundus photographs via deep learning, 2018.

¹⁷ Marks D, Thorogood M, Neil HA and Humphries SE, A review on the diagnosis, natural history, and treatment of familial hypercholesterolaemia, 2003.

¹⁸ Inouye M, Samani N et al., Journal of American College of Cardiology, Genomic Risk Prediction of Coronary Artery Disease in 480,000 Adults, 2018.

3. Improve timely access to the best treatments

Across the NHS there are clear evidence-based guidelines on the most effective clinical treatment to ensure people survive heart attack and strokes, or are identified as having heart failure or heart valve disease early. The extent to which these guidelines are followed has a significant impact on re-admission, recurrence and recovery.

Unfortunately, there is considerable variation in how these guidelines are applied, particularly in relation to the timely transfer of patients who have had a heart attack or cardiac arrest to specialist centres, where the best specialised care can be given and patient outcomes are known to be better.

In addition, inconsistent access to specialist cardiac screening, including echocardiography, computerised tomography (CT) scans and MRI, risks denying some patients with symptoms such as chest pain a potentially life saving diagnosis.

Similarly, standards in the detection and management of long-term conditions like heart valve disease and heart failure vary to an unacceptable degree, leading to marked inequalities in the quality of life of people affected by these conditions, as well as survival rates.

Ensuring access to specialist cardiac care

We can improve outcomes for people who've experienced a heart attack or cardiac arrest by ensuring they are taken to specialist centres and by mandating that all cardiac arrest services are commissioned to a standard specification.

Specialist cardiac centres may also be able to increase access to specialist imaging, including CT scans and MRI.

Extending access to cutting-edge stroke treatment

Mechanical thrombectomy is a highly effective treatment for strokes, and yet only 5% of patients who could benefit from it receive it. By extending access to this treatment, including the flexible use of the current workforce, we could prevent up to 2,000 people developing life-altering disability every year.¹⁹

Raising standards for patients with heart valve disease and heart failure

We urgently need to raise standards in the early diagnosis and management of these debilitating and progressive conditions. Efficient access to echocardiography can be achieved by delivering more routine access to brain natriuretic peptide (BNP) testing for those suspected of heart failure. And easier access to hand-held echocardiography in the community for those suspected of heart valve disease could reduce referrals to hospital.

We also need to provide timely access to specialist assessment, to ensure all patients are treated optimally, and also to provide those at the end of their life with the palliative care and support they need. Fully implementing these approaches for heart failure patients could prevent up to 230,000 hospital admissions and 30,000 cardiovascular deaths over the next decade.²⁰

¹⁹ McMeekan, P, White, P, James, MA, Price, CI, Flynn, D and Ford, GA (2017) Estimating the number of UK stroke patients eligible for endovascular thrombectomy, European Stroke Journal 2017, Vol 2(4) 319-326
²⁰ Mortality and hospital admissions estimates based on Bottle A et al. Routes to diagnosis of heart failure: observational data using linked data in England. Heart 2018; 104: 600-605
²¹ NHS England Ambulance Quality Indicators, 2017/18.
²² Lindner TW et al. Good outcome in every fourth resuscitation attempt is achievable. Resuscitation 2011; 82:1508-13.

Cardiac arrest

A whole system approach

The immediate response to cardiac arrests that occur out of hospital is crucial to survival. International evidence from places such as Norway, where survival rates as high as 25% have been reported compared with just 1 in 11 in England,²¹ shows a clear correlation between the teaching of basic resuscitation skills in schools and survival rates.²²

The BHF and other bodies joined forces and lobbied over many years to have life saving skills taught in schools. Current Government plans to include CPR as part of the curriculum from 2020 will mean that we will have achieved this aim and all young people will be given the skills to help save a life.

But we know it's not enough just to teach CPR skills. This year, in partnership with Microsoft and the NHS, the BHF is developing an ambitious programme (The Circuit: the National Defibrillator Network) to ensure that life saving equipment is also available to those who need it. This programme recognises that the timely use of defibrillators can mean the difference between life and death. It helps ambulance services guide members of the public to the nearest public access defibrillator.

Jadyn Briggs, 16
When Jadyn was six he collapsed with a cardiac arrest.



4. Reimagine rehabilitation services

People recovering from a heart or circulatory event should be offered the support to help them live healthier, more active lives, protect against further harmful events and improve their quality of life.

What's more, rehabilitation services for cardiac, respiratory and stroke patients are separately delivered. Yet there are considerable synergies, and many patients have more than one of these conditions.

We should explore more joined up models like the 'breathlessness rehabilitation service' being trialled in Leicester.²⁷ Common themes such as psychological support, return to work support and lifestyle adjustments could be developed into a more accessible recovery programme across a broader set of conditions.

Such services are proven to reduce hospital readmissions, and deliver better outcomes as well as value for money.²³ But only just over half of those eligible take up these services.²⁴ This compares poorly to some other countries in Europe where figures are as high as 90%.²⁵ And we know uptake is particularly low among certain groups.

Achieving an uptake rate for cardiac rehabilitation of 85% in England could lead to nearly 20,000 fewer deaths and nearly 50,000 fewer hospital admissions over the next ten years, as well as saving tens of millions of pounds in future care costs.²⁶

But to do this we need a new offer, based around the person not the institution.

Personalised recovery services

Most cardiac rehabilitation is group-based and undertaken in a hospital setting. We know that certain groups (women, socially deprived communities, people from black and minority ethnic (BAME) communities, and people with heart failure) are less likely to take up services of this kind. An expansion of new models of delivery including digitally supported, home-based and more personalised 'menu-based' approaches could help tackle this problem.

Innovation in digital recovery programmes

Activate Your Heart, University Hospitals of Leicester NHS Trust

Traditional cardiac rehabilitation is based on structured, group-based programmes, usually set in hospitals and leisure centres. Many patients are not accessing these services, despite evidence demonstrating their benefits.

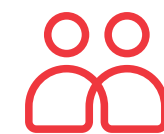
Activate Your Heart is an interactive web-based cardiac rehabilitation service being trialled with 250 patients in Scotland. The programme offers 24/7 access to classes through patients' computers or mobile devices, cutting out the need to travel to existing sites.²⁸

An evaluation of the programme in 2016 found that although recruitment could be challenging, for some patients it provides an effective option.²⁹ A further study observed important improvements in exercise capacity, quality of life and dietary habits in participants.³⁰



Achieving an uptake rate for cardiac rehabilitation of

85%



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20,000

fewer deaths



and nearly

50,000

fewer admissions over the next ten years, as well as saving tens of millions of pounds in future care costs.

²³ Cardiac rehabilitation BMJ 2015; 351.

²⁴ NACR Annual Statistical Report 2017.

²⁵ European Society of Cardiology, various country reports.

²⁶ Hinde, S., Bojke, L., Harrison, A., and Doherty, P. (2018) Improving Cardiac Rehabilitation Uptake: Potential health gains by socioeconomic status. Submitted for publication.

²⁷ Chartered Society of Physiotherapy press release (2018) about University Hospitals of Leicester NHS Trust breathlessness rehabilitation service.

²⁸ Activate Your Heart, University Hospitals of Leicester NHS Trust.

²⁹ Evaluation of Web based Cardiac Rehabilitation (18-month trial using 'Activate Your Heart'), in Scotland, 2016.

³⁰ Evaluating the Interactive Web-Based Program, Activate Your Heart, for Cardiac Rehabilitation Patients: A Pilot Study, Journal of Medical Internet Research, 2014.

5. Exploit the potential of technology and data science

From prevention and detection, through to treatment and recovery, new technologies and data science offer transformational opportunities for the NHS to address the challenges of heart and circulatory diseases on a larger and faster scale than ever before.

This isn't just future-gazing: advances are happening now. Wearable devices are helping us to detect and manage risk factors; developments in genomic medicine are bringing the prospect of personalised medicine ever closer; and the use of remote-monitoring and self-management tools could help to reduce the burden on the health system. In addition, artificial intelligence is already being applied in some clinical settings, supporting analysis of medical images, clinical decision-making, and patient risk stratification.

Big data will drive this transformation, along with the digitisation of the health service and growth in awareness and understanding of personal data among the public. But for this potential to be realised, we need to overcome a number of barriers, which are currently limiting progress.

In big data, size matters – the more data we can feed algorithms, the more accurate and useful the insights will be.

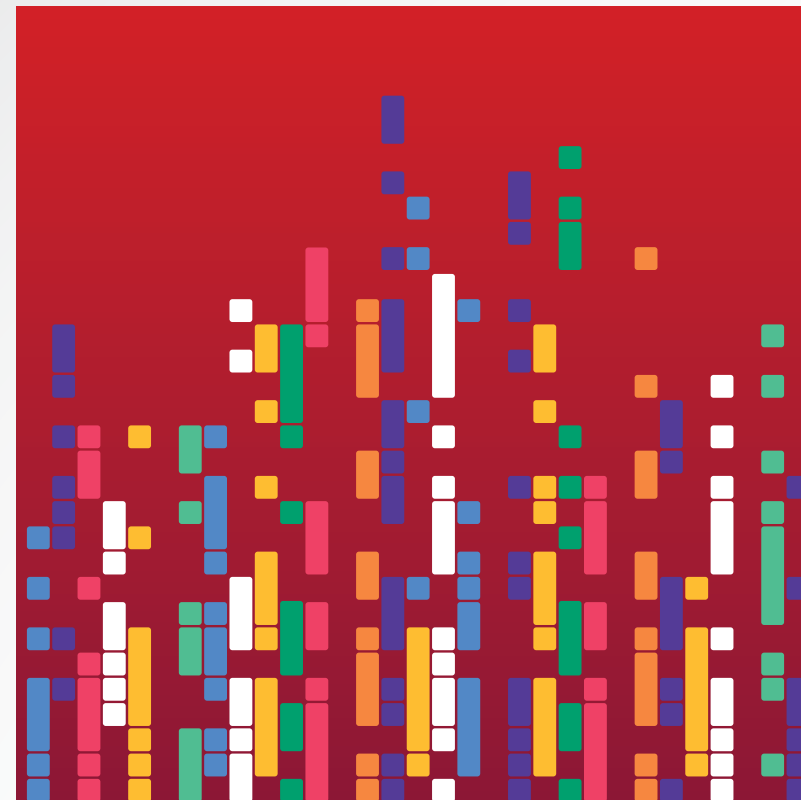
Linking up different data sets (genomic information with health records, for example) and pooling data across regions and countries, could bring tremendous benefits, both in terms of advancing understanding of disease and management at a population level, but also for ensuring optimal treatment and continuity of care for individual patients.

However, there are currently numerous barriers to effective data-sharing and data-linkage, both nationally and internationally. These include regulatory boundaries; a lack of standardisation in data collection, quality and annotation; technical limitations; proprietary considerations; and privacy issues, among others.

There is also a widely recognised skills gap. Analytical capacity in the UK is lacking, and this is particularly evident in healthcare settings. Limited analytical capacity and capability – and associated problems – has been recognised by the National Information Board in England, and a working group has been created to explore potential solutions to this issue.

The issue of public trust is also paramount. We need to ensure that the public are engaged with and informed about the use of data science in the delivery of their healthcare. Misinformation about data-driven technologies such as artificial intelligence can stop innovations being diffused throughout the system.

A concerted effort will be required on the part of all the major players in England's health and care ecosystem to ensure the potential benefits of big data are realised.



Unlocking the power of big data

UK Biobank, part funded by the BHF
The UK Biobank links the genetic data of more than 500,000 participants with electronic health records, providing a valuable dataset available to researchers seeking to improve the prevention, diagnosis and treatment of wide-ranging serious and life threatening illnesses including heart and circulatory diseases.

100,000 UK Biobank participants are also being given the chance to take part in the world's largest health imaging study in a project funded by the BHF, Medical Research Council and Wellcome Trust. The project will create the biggest collection of scans of internal organs and transform the way scientists study illnesses and events such as heart attacks and strokes.

Promote effective data-sharing and linkage

Policies that mandate data-sharing and standardisation, while maintaining patient confidentiality, should be created and adopted across the healthcare and research sectors. The transition to electronic health records, which are able to exchange and make use of information, will support faster integration of the health and care system.

As a consequence, patients will receive far greater continuity of care, and healthcare professionals and researchers will have access to large quantities of real-world evidence.

Data-sharing agreements will need to be put in place across and between the public, private and third sectors. Health Data Research UK and the BHF are working towards the establishment of a new cardiovascular data science centre that will aim to propel the NHS to the largest and best learning cardiovascular health system in the world. The centre will bring together data from a wide variety of sources and make it available to clinicians and researchers for the purposes of accelerating transformational advances in the understanding of heart and circulatory diseases, as well as supporting more effective clinical decision-making and the delivery of precision medicine.

Development of a global data governance or ethical framework (supplemented by local memoranda of understanding) will also facilitate more effective international data-sharing.

Work in partnership

The NHS should be working with others – including through public-private partnerships – as a matter of course to develop, test and roll out innovative solutions to heart and circulatory problems. This should include investment in health technology and digital tools that facilitate remote-monitoring and self-management, and allow more holistic data capture.

Invest in capability

In order to build data science capability, there needs to be greater investment in education, training and career development. We should provide the right environment to ensure data scientists are incentivised to work in healthcare, and should upskill researchers and healthcare professionals to improve data literacy across the board.

Partnerships such as that between the Alan Turing Institute and the BHF that provide funding to support collaborative research between cardiovascular investigators and data scientists will create additional informatics capability in biomedicine, and could generate ground-breaking solutions to key cardiovascular problems.

Bring the public with us

Charities and other trusted organisations can play an instrumental role by informing and engaging the public on how emerging technologies use data, and the risks and benefits this can bring them.

"I was diagnosed with an inherited heart condition called arrhythmogenic right ventricular cardiomyopathy (ARVC) when I was 34. I'd been out for a run and started feeling breathless and dizzy. I began to feel very unwell and went to A&E. After a few tests I received my diagnosis and was told my condition could lead to a cardiac arrest.

I was so lucky it was spotted early. I stayed in hospital for 11 days, during which time I had an ICD fitted. Now, if my heart starts to beat in a dangerously fast rhythm, the ICD will shock it back to a normal rhythm. It will save my life."

Rebecca Shorrocks, 36
Inherited heart condition

Rebecca's condition is inherited, which means other family members may be at risk. They've all been genetically tested and the good news is her mum and sisters don't have the condition. They're now just waiting for her dad's results, so that they'll know if he will need to have any potentially life saving treatment too.

A woman with blonde hair, wearing a red jacket, is looking upwards with a hopeful expression. She is standing outdoors, with cherry blossom branches in the background. The image is partially covered by a red diagonal overlay on the left and a dark red circular overlay on the bottom right, which contains the text.

**It's vital
we get
this right.**

Heart transplants. Clot busting drugs. Pacemakers.
Breakthroughs born from visionary medical research.
Research you fund with your donations.

Heart and circulatory diseases kill 1 in 4 people in the UK.
They cause heartbreak on every street. But if research can
invent machines to restart hearts, fix arteries in newborn
babies, build tiny devices to correct heartbeats, and give
someone a heart they weren't born with – imagine what's next.

We fund research into all heart and circulatory diseases
and their risk factors. Heart attacks, heart failure, stroke,
vascular dementia, diabetes and many more. All connected,
all under our microscope. Our research is the promise of future
prevention, cures and treatments.

The promise to protect the people we love. Our children.
Our parents. Our brothers. Our sisters. Our grandparents.
Our closest friends.

**You and the British Heart Foundation.
Together, we will beat heartbreak forever.**

Beat heartbreak forever

Beat heartbreak from  heart diseases  and all circulatory diseases