



Bias and Biology

How the gender gap in heart disease
is costing women's lives

British Heart Foundation briefing



Inequalities in the way women with heart attacks are cared for compared to men are costing lives.

Research funded by the BHF and others has uncovered that at every stage - diagnosis, treatment and aftercare - women who have heart attacks receive poorer care than men.

Underlying all of this is a common misperception that coronary heart disease and heart attack is a man's disease. Yet 35,000 women are admitted to hospital following a heart attack in the UK each year - an average of 98 women a day, or four per hour.

In this briefing, we are focusing specifically on

the issue of women and heart attacks, an area where we can save more lives by improving awareness and treatment for women.

Inequalities for women are rife in many areas of heart and circulatory health beyond heart attack, and we are committed to reporting on these other issues in future statements.



Awareness

- Coronary heart disease kills **twice as many women** as breast cancer in the UK. However, there is a widespread misperception that it's a man's disease.
- This lack of awareness of their risk could mean women are **less likely to recognise they are having a heart attack**, leading them to delay seeking help.
- **Women typically arrive at hospital later than men** when having a heart attack, contributing to delays in treatment. A heart attack is a medical emergency - delays in receiving treatment are putting women's lives at risk.



Esther Stanhope

When she was 45 and on a work trip to New York, Esther experienced chest pain, and other heart attack symptoms. Despite a family history of coronary heart disease, she dismissed the idea that she could be having a heart attack because she was too young, and a woman. She delayed seeking help until she returned to the UK.

"In New York, I had three speaking engagements. I was walking back from one event where I'd been on stage for 90 minutes and I thought – I'll get a cab. I felt a little bit dizzy, my breathing wasn't that easy and I wasn't feeling great.

I had actually experienced something similar before on a work trip to Amsterdam. It felt like I couldn't catch my breath, and there was a pressure on my chest.

I went to Maine to see my brother, and I went to a cross-fit class with my sister-in-law. Within minutes I started to feel unwell – I was dizzy, I was sweating, I couldn't breathe easily. It was humid so I put it down to that. I felt embarrassed, as if I was very unfit. So I joined in the core exercises at the end.

I never thought it was my heart, partly because I

am a woman. I am relatively healthy and I don't eat loads of fatty food. There was definitely a strange feeling in my left arm. But I didn't take it that seriously.

When I got back to the UK, even my eight-minute walk home from the tube was difficult. I told my husband I didn't feel well and called my GP. The receptionist advised me to go straight to A&E. Even when I was in hospital being tested I was saying to the doctors and nurses, "I have a call at 3 – do you think I'll be done by then?"

When they told me I'd had a heart attack, I couldn't believe it. I thought they'd got it wrong. My dad had died of a heart attack. So I thought if you had a heart attack you died straight away. Or you'd be clutching your chest like you see in the movies."

Symptoms

Symptoms of a heart attack

It's vital to recognise the symptoms of heart attack and seek medical attention fast by dialling 999.

The symptoms of a heart attack can vary from person to person, but the most common signs of a heart attack are:

- **Central chest pain or discomfort in your chest that suddenly occurs and doesn't go away**
- **It may feel like pressure, tightness or squeezing**
- **Pain which radiates down your left arm, or both arms, or to your neck, jaw, back or stomach**
- **Feeling sick, sweaty, light-headed or short of breath**

If you experience the symptoms of a heart attack, you should call 999, rather than visiting a GP or going to A&E. Paramedics may be able to diagnose a heart attack straight away and take you to a hospital where you can be

treated as soon as possible. Going to A&E may lead to delays in your treatment or you may be at a hospital not set up to deliver you the best treatment for your type of heart attack on time.

Symptoms of angina

The symptoms of angina are similar to those of a heart attack but typically occur with exertion. Angina is not the same as a heart attack, but it is a sign that you have coronary heart disease.

How are the symptoms different?

If you have angina, your symptoms will usually ease or go away after a few minutes of rest.

If you have not been diagnosed with angina and experience chest pain, call 999 immediately.





Diagnosis

- Someone who has an incorrect initial diagnosis of heart attack has a **70% higher risk** of death after 30 days compared to someone who receives the correct diagnosis straightaway.
- A woman is 50% more likely than a man to receive the **wrong initial diagnosis** for a heart attack.
- This picture shows that women are **disadvantaged compared to men** at the outset of their treatment.



Simone Telford

Doctors thought Simone's health problems were due to asthma, and later from stress and anxiety at a time of her life when she was changing jobs, even though she had previously brought up her family history of heart disease and high blood pressure. Simone describes the heart attack she had while staying with her sister in Australia. She was 42.

"Arriving at A&E, I had shortness of breath and chest pain. I felt like I needed air and was breathing very deeply.

They [the doctors] took me into a room, where I had an ECG which revealed I was having a STEMI heart attack. Straight away I was wheeled away into a hospital bay where they gave me aspirin, got me to lay down, and were talking to me about my medical history. I was telling them all about the shortness of breath, my asthma – and the doctors were saying 'you've probably had angina for a couple of years, and it's not been picked up because you're female, because you're young, it's not even been looked at at all'.

They took me for an angiogram, which revealed I had critical triple coronary artery disease. There were two blockages in the left arteries of 90 per cent and 70 per cent, my right coronary

artery had two blockages of 100 per cent, and there were two more blockages of 90 per cent elsewhere – so six critical blockages in total. I felt the doctors were looking at me as if to say – we don't know how you're even still here.

They had to take me down to bypass surgery. They kept me stable through the night, until I was taken down early the next morning for the operation.

I was coming to the end of my holiday and suddenly – to be told you're having a massive heart attack – it was scary for us all. My brother and sister live in Australia but my dad was in the UK, and I was saying they had to let Dad know. Hearing the risks and pros and cons involved with the bypass surgery was terrifying. I was 42 years old, and I had to make phone calls to my dad saying, I love you - I hope it all works out."



Treatment

- BHF-funded research suggested that between 2002 and 2013, **8,243 women's lives were needlessly lost in England and Wales** because they didn't receive the same standard of care as men.
- Small differences across their pathway of care added up to create **significant gender gaps** in the treatment of heart attack.
- Understanding the root causes of these disparities will be a vital way to **improve heart attack care** for women.



Risk factors

- The risk factors for heart attack are well established; high blood pressure, high cholesterol levels, a family history of coronary heart disease, smoking, obesity and diabetes.
- Women who have similar risk factors to men may have a **greater chance** of developing coronary heart disease.
- Women's lack of awareness of this so-called 'excess risk', combined with a low uptake of health checks, means that women may be dramatically **underestimating their personal risk** of heart attack.
- Women who have established coronary heart disease are **less likely than men** to reduce the chances of a second heart attack by managing their risk factors.



Shernaz Engineer

Shernaz had a heart attack when she was 55 years old, and hadn't previously been aware of her blood pressure reading, cholesterol level or the symptoms of a heart attack.

"I never had my over-40s health check – I just wasn't aware of it. I was rarely ill and never went to the GP, so I think I slipped through the net. When I was told I was having a heart attack and they checked my cholesterol it was really high – so at the back of my mind I keep thinking it could have been avoided.

The day before my heart attack, I'd gone to bed, but when I tried to sleep, I couldn't – I was in pain that radiated all around my chest, back and arm. By 8am the pain was so excruciating it woke me up. It felt like someone

was pressing on my chest. I got myself to A&E and the doctor told me he thought I was having a heart attack. I told him he was being ridiculous.

I was taken by ambulance to another hospital, where I had a lot of tests. It was the troponin test which confirmed I was having a heart attack. I was whisked into the cath lab for a stent.

I would strongly impress on women over 40 to get their numbers checked – blood pressure and cholesterol – and to be aware of heart attack symptoms.'



Research

- Women have been historically **under-represented** in clinical research, including cardiovascular trials.
- As a result, many diagnostic tests and treatments have been based on **data gathered from men**.
- Women are still **not taking part in clinical trials** to the same level as men. We need to understand the barriers that prevent women from taking part in clinical trials.



The change we want to see

The reasons for the gender gap in heart attack care that disadvantages women are numerous and complex. They won't be fixed overnight, and they will require changes in public awareness and perceptions, as well as changes in heart attack treatment and care.

The BHF has identified three main areas of change:

Raise awareness

We need to change the perception of coronary heart disease and heart attack as a man's disease, and we're committed to raising public awareness so that women know their risk and take action to look after their heart health.

Understand and tackle inequality

We want to work with the NHS and healthcare professionals to discover the barriers that prevent women receiving the same quality of cardiovascular diagnosis, treatment and aftercare as men so that we find ways to surmount them.

Fund more research

We need increased support for research into heart and circulatory diseases in women. To make sure that research is as effective as possible we need to ensure participants are representative, including by encouraging better representation of women in clinical trials.

References

1. Wilkinson C, Bebb O, Dondo TB et al. Sex differences in quality indicator attainment for myocardial infarction; a nationwide cohort study. *Heart*. 2018;105(7): 516-523. doi: 10.1136/heartjnl-2018-313959. Epub 2018 Nov 23.
2. Smolina K, Wright LF, Rayner M, Goldacre MJ. Determinants of the decline in mortality from acute myocardial infarction in England between 2002 and 2010: linked national database study. *BMJ*. 2012; 344. doi: 10.1136/bmj.d8059
3. Moser DK, Kimble LP, Alberts MJ, et al. Reducing delay in seeking treatment by patients with acute coronary syndrome and stroke: a scientific statement from the American Heart Association Council on cardiovascular nursing and stroke council. *Circulation*. 2006;114(2):168-82. 10.1161/CIRCULATIONAHA.106.176040 Epub 2006 Jun 26.
4. Berger PB, Ellis SG, Holmes DR Jr, et al. Relationship between delay in performing direct coronary angioplasty and early clinical outcome in patients with acute myocardial infarction: results from the global use of strategies to open occluded arteries in Acute Coronary Syndromes (GUSTO-IIb) trial. *Circulation*. 1999; 100(1): 14-20. DOI:10.1161/01.cir.100.1.14
5. Institute for Health Metrics and Evaluation (IHME). Findings from the Global Burden of Disease Study 2017. Seattle, WA: IHME, 2018.
6. Mosca L, Benjamin EJ, Berra K, et al. Effectiveness-based guidelines for the prevention of cardiovascular disease in women—2011 update: a guideline from the American Heart Association [published correction appears in *J Am Coll Cardiol* 2012;59:1663]. *J Am Coll Cardiol*. 2011;123(11):1243-62. doi: 10.1161/CIR.0b013e31820faaf8. Epub 2011 Feb 14.
7. Mosca L, Linfante AH, Benjamin EJ, et al. National study of physician awareness and adherence to cardiovascular disease prevention guidelines. *Circulation*. 2005;111(4):499-510. DOI:10.1161/01.CIR.0000154568.43333.82
8. Leifheit-Limson EC, D'Onofrio G, Daneshvar M, et al. Sex Differences in Cardiac Risk Factors, Perceived Risk, and Health Care Provider Discussion of Risk and Risk Modification Among Young Patients With Acute Myocardial Infarction: The VIRGO Study. *JACC*. 2015;66(18):1949-1957. doi: 10.1016/j.jacc.2015.08.859
9. Lehto HR, Lehto S, Havulinna AS, Jousilahti P, Salomaa V. Gender differences in the prevalence, causes and treatment of high cardiovascular risk: findings from the FINRISK Survey. *Eur J Prev Cardiol*. 2012;19(5):1153-60. doi: 10.1177/1741826711422454. Epub 2011 Sep 2
10. Bugiardini R, Ricci B, Cenko E, et al. Delayed Care and Mortality Among Women and Men With Myocardial Infarction. *J Am Heart Assoc*. 2017;21;6(8)
11. Nguyen HL, Saczynski JS, Gore JM, Goldberg RJ. Age and sex differences in duration of prehospital delay in patients with acute myocardial infarction: a systematic review *Circ Cardiovasc Qual Outcomes* (2010) Jan;3(1):82-92. pii: e005968. doi: 10.1161/JAHA.117.005968
12. Rawles JM. Quantification of the Benefit of Earlier Thrombolytic Therapy: Five-Year Results of the Grampian Region Early Anistreplase Trial (GREAT). *J Am Coll Cardiol*. 1997;30(5):1181-6. DOI:10.1016/s0735-1097(97)00299-4
13. Lichtman JH, Leifheit-Limson EC, Watanabe E, et al. Symptom recognition and healthcare experiences of young women with acute myocardial infarction. *Circ Cardiovasc Qual Outcomes*.

References

- 2015 8(2 Suppl 1):S31-8. doi: 10.1161/CIRCOUTCOMES.114.001612. Epub 2015 Feb 24.
14. MINAP (2016 – 2017) Males with heart attack tend to be younger than females – a difference in median age for STEMI of 10 years and for NSTEMI of 7 years.
15. Chakrabarti S, Morton JS, Davidge ST. Mechanisms of estrogen effects on the endothelium: an overview. *Can. J. Cardiol.* 2014;30(7):705-12. doi: 10.1016/j.cjca.2013.08.006. Epub 2013 Nov 16.
16. Mehta LS, Beckie TM, DeVon HA, et al. Acute myocardial infarction in women: a scientific statement from the American Heart Association. *Circulation.* 2016;133(9):916-47. doi: 10.1161/CIR.0000000000000351. Epub 2016 Jan 25.
17. Lichtman JH, Leifheit EC, Safdar B, et al. Sex differences in the presentation and perception of symptoms among young patients with myocardial infarction: evidence from the VIRGO Study (Variation in Recovery: role of Gender on Outcomes of Young AMI Patients). *Circulation.* 2018; 137(8):781–790. doi: 10.1161/CIRCULATIONAHA.117.031650.
18. Arora S, Stouffer GA, Kucharska-Newton AM, et al. Twenty year trends and sex differences in young adults hospitalized with acute myocardial infarction: the ARIC Community Surveillance Study. *Circulation.* 2019; 139(8):1047–1056. doi: 10.1161/CIRCULATIONAHA.118.037137
19. Cenko E, Yoon J, Kedev S, Stankovic G, et al. Sex differences in outcomes after STEMI: effect modification by treatment strategy and age. *JAMA Intern Med.* 2018; 178(5):632-639. doi: 10.1001/jamainternmed.2018.0514.
20. Hayes SN. Spontaneous coronary artery dissection (SCAD): new insights into this not-so-rare condition. *Tex Heart Inst J.* 2014;41(3):295–298. Published 2014 Jun 1. doi:10.14503/THIJ-14-4089
21. Wagers TP, Stevens CJ, Ross KV, Leon KK, Masters KS. Spontaneous Coronary Artery Dissection (SCAD): FEMALE SURVIVORS' EXPERIENCES OF STRESS AND SUPPORT. *J Cardiopulm Rehabil Prev.* 2018;38(6):374–379. doi:10.1097/HCR.0000000000000330
22. Rubini GM, Reiter M, Twerenbold R, et al. Sex-Specific Chest Pain Characteristics in the Early Diagnosis of Acute Myocardial Infarction. *JAMA Internal Medicine.* 2014. 174(2):241-9. doi: 10.1001/jamainternmed.2013.12199.
23. Ferry AV, Anand A, Strachan FE, Mooney L, Stewart SD, Marshall L, Chapman AR, Lee KK, Jones S, Orme K, Shah ASV, Mills NL. Presenting symptoms in men and women diagnosed with myocardial infarction using sex-specific criteria. *J Am Heart Assoc.* 2019;8(17):e012307. doi: 10.1161/JAHA.119.012307. Epub 2019 Aug 20.
24. Roffi M, Patrono C, Collet JP, et al. 2015 ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: Task Force for the Management of Acute Coronary Syndromes in Patients Presenting without Persistent ST-Segment Elevation of the European Society of Cardiology (ESC). *Eur Heart J.* 2016;37:267-315. 10.1093/eurheartj/ehv320
25. Wu, J, Gale CP, Hall M, et al. Impact of initial hospital diagnosis on mortality for acute myocardial infarction: A national cohort study. *Eur Heart J Acute Cardiovasc Care.* 2018;7(2):139-148 doi: 10.1177/2048872616661693. Epub 2016 Aug 29.
26. Shah ASV, Griffiths M, Lee KK, McAllister DA, et al. High sensitivity cardiac troponin and the under-diagnosis of myocardial infarction in women: prospective

References

- cohort study. *BMJ*. 2015; 350:g7873. doi: 10.1136/bmj.g7873.
- 27.** Jackson AM, Zhang R, Findlay I, et al. Healthcare disparities for women hospitalized with myocardial infarction and angina. *Eur Heart J - Quality of Care and Clinical Outcomes*. 2019. 0. 1–10. doi:10.1093/ehjqcco/qcz040
- 28.** Millett ERC, Peters SAE, Woodward M, Sex differences in risk factors for myocardial infarction: cohort study of UK Biobank participants, *BMJ*, 2018;363:k4247. doi: 10.1136/bmj.k4247.
- 29.** NHS England health check data, Public Health England, <https://fingertips.phe.org.uk/profile/nhs-health-check-detailed/data#> . Accessed 23.09.2019
- 30.** BHF estimates based on latest UK health survey data (NHS Digital & Scottish Government)
- 31.** Zhao M, Vaartjes I, Graham I, et al. Sex differences in risk factor management of coronary heart disease across three regions. *Heart* 2017; 103(20):1587-1594. doi: 10.1136/heartjnl-2017-311429. Epub 2017 Sep 20
- 32.** Kostis WJ, Cheng JQ, Dobrzynski JM, Cabrera J, Kostis JB, Meta-Analysis of Statin Effects in Women Versus Men. *JACC*. 2012; 59(6):572-82. doi: 10.1016/j.jacc.2011.09.067.
- 33.** National Audit of Cardiac Rehabilitation (NACR) Quality and Outcomes Report 2018, <https://www.bhf.org.uk/informationsupport/publications/statistics/national-audit-of-cardiac-rehabilitation-quality-and-outcomes-report-2018>
- 34.** Nguyen QD, Peters E, Wassef A, Desmarais P, Rémillard-Labrosse D, Tremblay-Gravel M. Evolution of Age and Female Representation in the Most-Cited Randomized Controlled Trials of Cardiology of the Last 20 Years. *Circ Cardiovasc Qual Outcomes*. 2018;11(6):e004713. doi: 10.1161/CIRCOUTCOMES.118.004713.
- 35.** Scott PE, Unger EF, Jenkins MR, Southworth MR, McDowell TY, Geller RJ, Elahi M, Temple RJ, Woodcock J. Participation of Women in Clinical Trials Supporting FDA Approval of Cardiovascular Drugs. *J Am Coll*. 2018;71(18):1960-1969. doi: 10.1016/j.jacc.2018.02.070.
- 36.** BHF analysis of latest UK mortality statistics: ONS/NRS/NISRA (2017 data)
- 37.** UK hospital statistics, 2017-18; NHS Digital/ISD Scotland/NHS Wales/DH Northern Ireland