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european heart network

Early detection of cardiovascular disease – an update from the European Heart Network – 2020

Executive Summary

Cardiovascular disease (CVD) includes all conditions that affect the heart muscle or blood vessels (circulatory system). The burden of CVD is greater than that of any other disease and the leading cause of death in Europe and in the world. More than 1.8 million people in the EU die every year as a result of CVD, accounting for 36% of all deaths with a large proportion being premature (before the age of 65). More than 60 million people live with CVD in the EU, and close to 13 million new cases of CVD are diagnosed every year. CVD is also a major economic challenge to health care systems in the EU that is expected to grow in future years. Recent data estimate that CVD costs the EU economy €210 billion a year. For individuals, the impact of CVD on quality of life is huge. Many people may not die after an acute cardiovascular event, such as a heart attack or stroke. They live with marked, persisting disability, particularly after a stroke, preventing millions of people from enjoying a happy and active life. There are huge geographical and social inequalities in CVD morbidity and mortality across Europe. For example, a man living in Bulgaria is 8 times at greater risk of dying from stroke compared to another living in France.

The COVID-19 pandemic has had a significant impact on people with CVD. Early evidence points to a heightened risk of poor COVID-19 outcomes associated with pre-existing CVD and CVD risk factors. In addition, cardiovascular complications linked to COVID-19 are wide ranging and set to increase CVD morbidity. Complications include: cardiac injury, arrhythmia and heart failure. There is an urgent need to effectively address CVD and reduce the health and economic burden of disease in Europe.

Systematic, population-level screening programmes to detect risk of CVD, in which all members of the public are invited to undertake a health check, could help in reducing risk factors in the short term, but available evidence from high quality randomised control trials, show no effect in lowering CVD mortality in the long term. Nonetheless, the potential value of case-finding within clinical practice, which involves assessing individuals that may be at risk of CVD when they use the healthcare system, cannot be dismissed. Identifying individuals at high risk of CVD should be a standard part of medical consultations in general practice and supported by health care systems. The potential of stratifying the population into risk groups using available data from electronic health records should be further explored.

Evidence from systematic population-level screening programmes to detect abdominal aortic aneurism show positive effect on reducing mortality, yet future programmes must consider the

reduction of risk factors and improved treatment options to target those at higher risk (e.g., family members of persons with AAA, and patients with CVD).

Evidence-based, targeted outreach and screening in selected settings and to specific population groups known to be at high risk are more likely to be effective than systematic population-level screening programmes. In certain cases, such as those with proven familial hypercholesterolaemia, this includes screening of family members (cascade screening). In all cases, programmes for screening cardiovascular risk should be well organised and conducted as a series of sequential steps (including lifestyle interventions) that form a pathway and be sufficiently supported with financial, human, and technological resources.

The European Heart Network (EHN) recommends that the EU establish a joint action/network of Member States, supported by experts, to identify the most effective policies, measures, and programmes for reaching out to and managing individuals at high risk of developing cardiovascular disease and detect those with specific, highly treatable cardiovascular conditions.

Introduction

The world has been heavily hit by the COVID-19 pandemic. By December 2020, almost one third of COVID-19 cases and deaths occurred in Europe. The continuing pandemic presents a severe stress test for healthcare systems.

The pandemic has had a significant impact on people with underlying health conditions and in particular, those with cardiovascular disease (CVD). CVD patients who are exposed to COVID-19 are at increased risk of complications leading to higher rates of mortality due to the added strain on the heart and circulatory system. European data show that CVD is one of the most common comorbidities in deceased COVID-19 patients. Cardiovascular complications linked to COVID-19 are also wide ranging and include cardiac injury, arrhythmia and heart failure.¹ Moreover, COVID-19 triggers an inflammatory response which can damage the heart and blood vessels, and increase the risk of blood clotting, leading to heart attacks, strokes and pulmonary embolism. Existing studies suggest that blood clots arise in 20–30% of critically ill COVID-19 patients.² It is critical to ensure that high-quality, comparable data from hospitals across Europe, treating COVID-19 patients, are gathered and robust research is conducted on how the novel coronavirus affects the cardiovascular system and whether it can trigger cardiovascular complications in the long term. The repercussions of the pandemic on CVD morbidity and mortality risk growing exponentially.

The pandemic has highlighted the importance of keeping people healthy and increasing investment in public health policies and primary prevention. Another important lesson is the need to transform healthcare services so that they are no longer solely reliant on hospitals. Finally, knowing the size of the population at risk of major chronic diseases, such as cardiovascular disease, and therefore also likely to develop complications and need for hospitalisation when exposed to communicable diseases, is key for preparedness.

Research for this paper was mainly conducted before the pandemic. The paper aims to inform about available strategies and tools; it does not aim to address screening for cardiovascular risk in the context of a health crisis.

¹ <https://www.escardio.org/Education/COVID-19-and-Cardiology>

² F.A. Klok et al., Incidence of thrombotic complications in critically ill ICU patients with COVID-19, *Thrombosis Research*, Volume 191, 2020, Pages 145-147, <https://doi.org/10.1016/j.thromres.2020.04.013>. Lodigiani C. et al., Venous and arterial thromboembolic complications in COVID-19 patients admitted to an academic hospital in Milan, Italy, *Thrombosis Research*, Volume 191, 2020, Pages 9-14, <https://doi.org/10.1016/j.thromres.2020.04.024>.

Aim

The aim of this paper is to provide information on strategies, tools, and interventions for early detection in individuals who are at high risk of developing cardiovascular disease.

1. Background - Basic facts

1.1 The burden of cardiovascular disease

Cardiovascular disease (CVD) includes all conditions that affect the heart muscle or blood vessels (circulatory system). These include ischaemic heart disease, stroke, heart rhythm disturbances, such as atrial fibrillation, heart failure, congenital cardiovascular disease, inherited heart conditions, peripheral artery disease and vascular dementia. CVD remains the number one cause of death in Europe. In the EU³ CVD causes over 1.8 million deaths every year⁴ representing 5000 deaths per day. Ischaemic heart disease itself is the single most common cause of death in the EU, leading to 610 000 deaths per year.⁵ Stroke is the second single most common cause of death in the EU, accounting 410 000 deaths each year.⁶ Moreover, a large proportion of CVD deaths is premature, with 24% of deaths among men and 17% of deaths among women in the EU before the age of 65.⁷ Notably, the rate of decline in CVD mortality rates appear to be tapering off.⁸ Indeed, for the first time in 50 years some European countries have reported an increase in premature mortality.⁹

Many people do not die when they have a heart attack or stroke. They live with marked persisting disability, particularly after a stroke. As a result of this ill health and disability, millions of people are unable to enjoy a happy and active life and many families are left to care for partners or relatives who have been incapacitated by cardiovascular disease. Most recent data from the Global Burden of Disease database estimate that, in the EU, over 60 million EU citizens are afflicted by CVD, and that close to 13 million new cases of CVD occur every year.¹⁰

The burden of CVD is not equally distributed. There are substantial and persistent inequalities in prevalence and death rates between countries in Europe. CVD prevalence and death rates from ischaemic heart disease and stroke are significantly higher in Eastern and Central European countries than in Western, Northern and Southern European countries.¹¹

Cardiovascular disease is also a major economic burden. In the EU, CVD is estimated to cost the EU economy €210 billion a year. Of that cost, around 53% (€111 billion) is for healthcare

³ In this paper, the EU comprises of 28 Member States

⁴ Eurostat, July 2019, https://ec.europa.eu/eurostat/statistics-explained/index.php/Causes_of_death_statistics#Causes_of_death_in_EU_Member_States_in_2016

⁵ Eurostat, July 2019, https://ec.europa.eu/eurostat/statistics-explained/index.php/Causes_of_death_statistics#Causes_of_death_in_EU_Member_States_in_2016

⁶ Eurostat, July 2019

⁷ Wilkins, E. et al. European Cardiovascular Disease Statistics 2017, European Heart Network (2017)

⁸ Raleigh, V. (2019), "Trends in life expectancy in EU and other OECD countries: Why are improvements slowing?", OECD Health Working Papers, No. 108, OECD Publishing, Paris, <https://doi.org/10.1787/223159ab-en>.

⁹ Timmis A. et al, European Society of Cardiology: Cardiovascular Disease Statistics 2019 European Heart Journal, Volume 41, Issue 1, 1 January 2020 and British Heart Foundation Heart & Circulatory Disease Statistics 2019

¹⁰ Institute for Health Metrics and Evaluation, Global Burden of Disease Database 2017 (accessed on 18 March 2020)

¹¹ Wilkins, E. *et al.* European Cardiovascular Disease Statistics 2017. European Heart Network (2017)

costs, 26% (€54 billion) is due to productivity losses and 21% (€45 billion) to the informal care of people with CVD.¹²

The WHO Global Action Plan for the Prevention and Control of Non-Communicable Diseases (NCDs, 2013-2020) recommends that health systems should aim to improve prevention, early detection, treatment and sustained management of people with or at high risk of cardiovascular disease and other chronic diseases.^{13,14} In addition, the 2030 Agenda for Sustainable Development recognised the huge impact of NCDs, including CVD, worldwide and aims to reduce premature death by one third by 2030.

1.2 Risk factors and strategies for prevention

Well-established factors associated with risk of cardiovascular events are smoking, unhealthy diet, physical inactivity, excess use of alcohol, elevated blood pressure, elevated blood cholesterol, raised blood sugar, overweight and obesity. These risk factors are modifiable. Non-modifiable risk factors are age, sex, genetics, and ethnicity. Further risk factors, or structural determinants, are income, education, living and working conditions.

Small reductions in cholesterol concentrations, blood pressure, or smoking across populations translate into substantial reductions in cardiovascular events and deaths.¹⁵ Public policy interventions that target reductions in intake of salt (sodium) and saturated fat, provide smoke-free environments, sufficient statutory number of lessons of physical exercise in school curricula, and facilitate physical activity in everyday life through, amongst others, sensible urban planning are needed to achieve these reductions.^{16, 17}

Reductions in CVD mortality over the past 50 years have been brought about by a combination of disease prevention interventions and improved treatment, e.g. new drugs to control high blood pressure and to lower cholesterol levels in the blood, and arterial stents to treat heart attacks.¹⁸ Despite the gains, CVD remains by far the leading cause of death in Europe and recent trends show a slowdown in the rate of decline in CVD death rates – a trend which is more pronounced in younger age groups. These adverse trends have been attributed to an insufficient awareness of CVD, limited and geographically varied investment in cardiovascular prevention and treatment, and the rising prevalence of obesity, diabetes, hypertension, dyslipidaemia and atherosclerosis.¹⁹

Boosting public awareness on CVD risk factors is a key objective of heart foundations and associations. They organise campaigns and initiatives at local or national levels, such as “heart

¹² Wilkins, E. et al. European Cardiovascular Disease Statistics 2017, European Heart Network (2017)

¹³ Global Action Plan for the Prevention and Control of NCDs (2013-2020),

http://www.who.int/nmh/events/ncd_action_plan/en/

¹⁴ Tools for implementing WHO PEN (Package of essential noncommunicable disease interventions),

https://www.who.int/ncds/management/pen_tools/en/

¹⁵ Rose G.; Br Med J (Clin Res Ed). June 6, 1981, 282(6279):1847-51

¹⁶ European Guidelines on cardiovascular disease prevention in clinical practice, European Heart Journal, Volume 37, Issue 29, 1 August 2016, <https://doi.org/10.1093/eurheartj/ehw106>

¹⁷ Physical Activity Policies for Cardiovascular Health, European Heart Network (2020)

¹⁸ Jakab, M. et al. Health systems respond to noncommunicable diseases. Time for ambition 2018 (WHO)

¹⁹ OECD/The King's Fund (2020), Is Cardiovascular Disease Slowing Improvements in Life Expectancy?: OECD and The King's Fund Workshop Proceedings, OECD Publishing, Paris, <https://doi.org/10.1787/47a04a11-en>. Raleigh, V. (2019), "Trends in life expectancy in EU and other OECD countries: Why are improvements slowing?", OECD Health Working Papers, No. 108, OECD Publishing, Paris, <https://doi.org/10.1787/223159ab-en>.

weeks”, online self-evaluation of risk²⁰ and “know your numbers”. Such initiatives aim primarily at increasing awareness of modifiable risk factors and the benefits of prevention. They should not be confused with risk detection or medical screening programmes.

It is generally recognised that prevention should be both at a population level and an individual level.²¹

This paper focuses on strategies for prevention at an individual level and early identification of so-called high-risk individuals, that is people who are at high risk of developing or dying from CVD.

In 2019, the World Health Organisation Regional Office for Europe (WHO Europe) initiated a European initiative aimed at improving policy-makers’ decisions related to screening for non-communicable diseases (NCDs) to maximize benefits and minimise harms.²² In 2020, WHO Europe published a policy paper and a short guide on screening programmes based on latest evidence for effectiveness.²³ While WHO Europe focuses only on nationally organised population-level screening programmes, this paper also comments on targeted screening strategies in specific population groups known to be at risk or case-finding in clinical practice. It also considers technological developments and their potential in identifying high-risk individuals.

2. Early detection of cardiovascular disease

Around 20-40% of heart attacks occur in people previously undiagnosed with CVD.²⁴ To assist all people to reduce their risk and avoid the onset of the cardiovascular disease, it is crucial to identify those at high risk and to provide them with appropriate advice and preventive treatment.

2.1 About screening

The WHO defines screening as “*the presumptive identification of unrecognised disease in an apparently healthy, asymptomatic population by means of tests.*”²⁵ In essence, screening is a rough sorting process, identifying people who probably have a disease from those who probably do not or providing a probability that a person is at risk or risk-free from a disease.²⁶ It should be noted that screening tests are never 100% accurate.

²⁰ Examples include: UK, Check your heart age <https://www.nhs.uk/conditions/nhs-health-check/check-your-heart-age-tool/>
Germany, Herzinfarkt-Risikotest <https://www.herzstiftung.de/risiko>

²¹ Council conclusions on heart health https://ec.europa.eu/commission/presscorner/detail/en/PRES_04_163

²² WHO European Technical Consultation on Screening, 26-27 February 2019 <http://www.euro.who.int/en/health-topics/noncommunicable-diseases/mental-health/publications/2019/who-european-technical-consultation-on-screening-copenhagen,-demark,-2627-february-2019>

²³ WHO European Conference on Screening, 11-12 February 2020 <http://www.euro.who.int/en/media-centre/events/events/2020/02/who-european-conference-on-screening>

²⁴ Call to Action: Urgent Challenges in Cardiovascular disease, *Circulation* 2019; 139:00-00, <https://doi.org/10.1161/CIR.0000000000000652>

²⁵ Screening. When is it appropriate and how to get it right? Policy Brief 35 by the European Observatory on Health Systems and Policies, WHO Regional Office for Europe; 2020

²⁶ Screening programmes: a short guide. Increase effectiveness, maximize benefits and minimise har. Copenhagen: WHO Regional Office for Europe; 2020. Licence CC BY-NC-SA 3.0 IGO

In line with the WHO definition, a screening programme must include all the core components in the screening process, from inviting the target population to accessing effective treatment for individuals diagnosed with the disease.²⁷ **Screening programmes** should, therefore, always be conducted as **a series of sequential steps that form a pathway**.²⁸ To be effective, a screening programme must be **evidence-based, organised and quality-assured** with substantial resources, including financial, human and technological resources across the pathway, and with engagement of multiple organisations both within and beyond the health system.²⁹

Often the aim of screening for CVD is to detect individuals who are at high risk of developing or dying from cardiovascular disease and to ensure that they are helped in reducing their risk through early primary prevention interventions (e.g. smoking cessation, healthy eating, weight management, exercise interventions) and use of medication,³⁰ when specific conditions have been detected.

As set out above, across the European Union, CVD remains the leading cause of death with some countries observing a slowdown in the rate of mortality reduction and some reporting an increase in premature CVD death. These adverse trends pose a great challenge in matching past progress and can be attributed to insufficient awareness of CVD, limited and geographically varied investment in prevention and treatment, rising prevalence in risk factors such as obesity and diabetes, and an ageing population. Evidence-based, high-quality screening programmes, using validated risk-assessment tools, can help identify individuals at risk and can help determine the most appropriate preventive measures for these people.

2.2 Strategies for screening

A screening programme is a public health strategy to reduce the burden of disease in society by detecting people at high risk or afflicted by a disease. Preventive interventions or treatment can then be applied to reduce mortality and morbidity. The Wilson and Jungner principles of 1968 as updated in 2008 (Annex I) remain the gold standard for determining whether screening is an appropriate course of action to improve public health.

A screening programme can be at a population-level, that is to target the whole population, or selective, that is to target groups in the population that are expected to be at high risk of developing a disease.³¹

Screening programmes, whether population-level or targeted to sub-groups of the population, need to be evidence-based and must reflect country or even regional and local specificities, including cultural sensitivities and diversity of the population, and resources. There is no “one size fits all solution”.

²⁷ Ibid

²⁸ Screening. When is it appropriate and how to get it right? Policy Brief 35 by the European Observatory on Health Systems and Policies, WHO Regional Office for Europe; 2020

²⁹ Ibid

³⁰ European Guidelines on cardiovascular disease prevention in clinical practice, European Heart Journal, Volume 37, Issue 29, 1 August 2016, <https://doi.org/10.1093/eurheartj/ehw106> (under review process)

³¹ Wilson, James Maxwell Glover, Jungner, Gunnar & World Health Organization. (1968). Principles and practice of screening for disease, <https://apps.who.int/iris/handle/10665/37650>

2.2.1 Screening for risk of cardiovascular disease

Adult health checks are a typical example of systematic screening used in several countries where a predefined population is approached in an organised and quality-assured way to detect those at risk of CVD. This type of screening is often well-accepted by the population because it consists of simple questions and measurements.³²

Health checks can also be opportunistic (often referred to as case-finding). In opportunistic screening there is no predefined strategy. It is done when the opportunity arises such as in consultations with general practitioners. Thus, opportunistic screening is an integrated part of the daily contact with patients in primary care and should not be confused with systematic screening. The WHO, in its Package of Essential Noncommunicable Disease Interventions protocol for assessment and management of cardiovascular risk, proposes opportunistic screening, i.e., targeting those in primary care that could be at higher risk due to age or presence of a risk factor.³³ The recent WHO European initiative on screening did not cover opportunistic screening. The policy brief of the European Observatory on Health Systems and Policies published by WHO in 2020, suggests that opportunistic screening or case finding within clinical practice is invariably less appropriate than organised screening and it must meet the same criteria and be subject to the same scrutiny as organised screening. It may be appropriate among individuals known to be at risk, but if scaled up indiscriminately to individuals without such risk factors, it rarely provides any benefit for the population and potentially risks creating harm and widening existing inequalities even further because of the lack of quality assurance mechanisms.³⁴ Nonetheless, healthcare professionals in primary care are well placed to identify individuals at risk of cardiovascular disease (i.e. family history of premature CVD, familial hyperlipidaemia, major cardiovascular risk factors or comorbidities increasing cardiovascular risk) and they can play an important role in cardiovascular prevention and health promotion.³⁵ **Investments in primary care** can ensure that appropriate mechanisms are in place to pick up those at high risk and that quality-assured pathways are in place to provide the most effective preventive care.

Commissioned by the WHO Europe, a review of evidence from randomised control trials, conducted mainly in Western and Northern European countries, on effectiveness of population level, systematic screening for cardiovascular risk in the form of health checks, shows no significant difference in mortality and no effects on prescribed medications, hospitalisations, number of visits to physicians, disability pensions and on the average direct cost per participant.³⁶ Studies looking at adverse effects also showed no negative effect in psychological distress and mental health.³⁷ However, worrying evidence has derived from a study looking at whether the effects of a population-level health check and lifestyle intervention differed according to participation rate and from a randomised control trial in Denmark, looking at the effect of repeated general health checks on the 30-year incidence of ischaemic heart disease, stroke and all-cause mortality. The first study, in high participation areas, found a significantly

³² Information about measurements are included in section 3 'Performing screening' of this report.

³³ 'WHO PEN Protocol 1' in 'Implementation tools: package of essential noncommunicable (PEN) disease interventions for primary health care in low-resource settings'. Geneva: World Health Organization 2013.

³⁴ Screening. When is it appropriate and how to get it right? Policy Brief 35 by the European Observatory on Health Systems and Policies, WHO Regional Office for Europe; 2020

³⁵ European Heart Journal 2016 August, 1;37(29):2315-2381. 2016 European Guidelines on cardiovascular disease prevention in clinical practice, doi: 10.1093/eurheartj/ehw106

³⁶ Eriksen CU, Rotar O, Toft U, Jørgensen T. What is the effectiveness of systematic population level screening programmes for reducing the burden of cardiovascular disease? Copenhagen: WHO Regional Office for Europe; 2020 (WHO Health Evidence Network (HEN) Evidence Synthesis Report 71)

³⁷ Ibid

higher risk of lifestyle- and smoking-related cancer death among women in the intervention group than in the control group,³⁸ while the second one found no beneficial effects on the development of ischaemic heart disease and stroke but it observed increased incidence of stroke in the intervention group.³⁹ It is worth noting that some systematic reviews and meta-analysis of randomised control trials show modest improvements of risk factors (e.g. decline in smoking, blood pressure, blood lipids), but not overall reduction of mortality.^{40,41,42}

Though evidence indicates that lifestyle counselling to individuals will lower high levels of risk factors for CVD, but may not reduce total or CVD mortality, nor CVD incidents or other markers of morbidity in the general population^{43,44}, it does not rule out benefits of targeted screening strategies and counselling.⁴⁵

In most countries, physicians in general practice deliver more than 90% of health consultations and provide most public health medicine. **High-quality primary care** could play a unique role in identifying individuals at risk of CVD and assessing their eligibility for personalised intervention based on their risk profile.⁴⁶

Various studies have shown the effective role of nurses in primary care and primary prevention of CVD. It would therefore be beneficial for physicians and nurses to collaborate as a team to provide the most effective multidisciplinary preventive care.⁴⁷

At the same time, the introduction of **electronic health records** has led to an exponential growth in health data availability. Potentially, these data could help stratify populations into risk groups to help organise appropriate, quality-assured, and targeted screening pathways for selected high-risk groups.

Finally, sufficient evidence from solid, randomised controlled trials in Eastern European countries are lacking. Learnings from Western Europe are difficult to transfer to other geographical regions due to differences in general health care systems and disease burdens. CVD mortality and morbidity, as well as prevalence of important risk factors, such as obesity⁴⁸

³⁸ Bender AM, Jørgensen T, Pisinger C. Higher mortality in women living in high-participation areas of a population-based health check and lifestyle intervention study. *Int J Public Health*. 2019;64(1):107-14.

³⁹ Skaaby T, Jørgensen T, Linneberg A. Effects of invitation to participate in health surveys on the incidence of cardiovascular disease: a randomized general population study. *Int J Epidemiol*. 2017;46(2):603-11

⁴⁰ Ebrahim S, Taylor F, Ward K, Beswick A, Burke M, Davey Smith G. Multiple risk factor interventions for primary prevention of coronary heart disease. *Cochrane Database of Systematic Reviews* 2011, Issue 1. Art. No.: CD001561. DOI: 10.1002/14651858.CD001561.pub3.

⁴¹ Si S, Moss JR, Sullivan TR, Newton SS, Stocks NP. Effectiveness of general practice-based health checks: a systematic review and meta-analysis. *Br J Gen Pract*. 2014 Jan;64(618):e47-53. doi: 10.3399/bjgp14X676456. PMID: 24567582; PMCID: PMC3876170.

⁴² Dyakova M, Shantikumar S, Colquitt JL, Drew CM, Sime M, MacIver J, Wright N, Clarke A, Rees K. Systematic versus opportunistic risk assessment for the primary prevention of cardiovascular disease. *Cochrane Database of Systematic Reviews* 2016, Issue 1. Art. No.: CD010411. DOI: 10.1002/14651858.CD010411.pub2.

⁴³ Robson J. et al. (2017). NHS Health Check comorbidity and management: an observational matched study in primary care, *British Journal of General Practice* 2017; 67 (655): e86-e93. DOI: <https://doi.org/10.3399/bjgp16X688837>

⁴⁴ Krogsbøll LT, Jørgensen KJ, Gøtzsche PC (2019). General health checks in adults for reducing morbidity and mortality from disease. *Cochrane Database of Systematic reviews*, 1:CD009009.

⁴⁵ Robson J. et al. (2017).

⁴⁶ *European Heart Journal* 2016 August, 1;37(29):2315-2381. 2016 European Guidelines on cardiovascular disease prevention in clinical practice, doi: 10.1093/eurheartj/ehw106

⁴⁷ Ibid

⁴⁸ Berghöfer, A., Pischon, T., Reinhold, T., Apovian, C. M., Sharma, A. M., & Willich, S. N. (2008). Obesity prevalence from a European perspective: a systematic review. *BMC public health*, 8, 200. <https://doi.org/10.1186/1471-2458-8-200>

and unhealthy diet,⁴⁹ are higher in Central, Eastern, and Southern Europe than in Western and Northern Europe. Studies are therefore needed to identify appropriate and effective strategies for prevention and screening cardiovascular risk in those countries with higher prevalence of important risk factors, as well as higher CVD mortality and morbidity. An interesting example from the region is the Slovenian National programme for primary prevention of cardiovascular disease.⁵⁰ National research on prevalence of lifestyle and biological risk factors, morbidity and mortality provided evidence for the design of a national strategic approach to deliver prevention activities at population level and at individual level from 2002 onwards. At population level, a series of important health promotion initiatives were implemented under a common framework entitled “Living Healthy”. These included, for example, a national action plan to reduce salt intake in the Slovenian diet (2010-2020), a national nutritional policy programme, a national health-enhancing physical activity programme (2007-2012) and enforcement of strict alcohol and anti-tobacco legislation. At individual level, the systematic and universally available national programme for primary prevention of cardiovascular disease aims to detect individuals who are at risk of developing cardiovascular disease, individuals with unhealthy lifestyles and risk factors for these diseases. The programme aims to deliver appropriate interventions, including counselling and support to change lifestyle, as part of a pathway with quality assurance procedures. The combined approach of Slovenia has resulted in significant changes in cardiovascular epidemiology with number of deaths from all types of cardiovascular disease dropping significantly.⁵¹

Based on available evidence, it can be concluded that screening programmes, in the form of systematic population-level, adult health checks, may be effective in reducing risk factors for CVD, but are not effective in reducing total CVD mortality. However, the effectiveness of systematic screening for CVD risk in European countries, with high prevalence of risk factors and CVD morbidity and mortality (notably Eastern Europe), needs to be researched. In general, health care systems should be able to ‘pick up’ individuals at risk of CVD and offer tailored interventions to mitigate their individual risk profiles.

2.2.2 Screening for risk of specific cardiovascular conditions

In Europe, an increasingly ageing population combined with the occurrence of co-morbidities, will result in an increase in the prevalence of conditions such as **atrial fibrillation (AF)** and **abdominal aortic aneurism (AAA)**.

WHO Europe’s initiative on screening also reviewed evidence on effectiveness of national, population-level, and systematic screening programmes for AF and AAA. Although there are short term and modelling studies suggesting AF screening is cost effective, long term prospective studies with evidence for or against population-level AF screening programmes is very sparse.⁵² It is therefore wise to wait for results of studies on the effectiveness of screening for AF. Pulse taking and electrocardiogram (ECG) rhythm strip in primary care might be a

⁴⁹ Country profiles on nutrition, physical activity and obesity in the 53 WHO European Region Member States. Methodology and summary, WHO Regional Office for Europe; 2013

⁵⁰ National institute of Public Health, Ljubljana <https://www.nijz.si/en/national-programme-primary-prevention-cardiovascular-diseases>

⁵¹ European Association of Preventive Cardiology (EAPC) Country of the month – Slovenia, June 2015, report prepared by Prof Zlatko Fras, [https://www.escardio.org/Sub-specialty-communities/European-Association-of-Preventive-Cardiology-\(EAPC\)/Advocacy/Prevention-in-your-country/country-of-the-month-slovenia](https://www.escardio.org/Sub-specialty-communities/European-Association-of-Preventive-Cardiology-(EAPC)/Advocacy/Prevention-in-your-country/country-of-the-month-slovenia)

⁵² WHO Technical Consultation on Screening Report 2019

simple and beneficial intervention in elderly populations (≥ 65 years) as the risk of AF (often asymptomatic) and stroke increase with age.⁵³

Digital technologies are rapidly developing for atrial fibrillation detection. Big Data analytics and artificial intelligence may be useful to identify target groups of high-risk individuals. However, the field is relatively new, lacking clinically validated tools and sufficient studies on effectiveness. An overview of existing studies demonstrates promising results. Nonetheless, there is a need for more multi-centre, randomised controlled trials on their effectiveness for AF screening.⁵⁴

There is strong evidence that screening for AAA in men over the age of 65 years can reduce mortality. AAA screening programmes have been implemented in Sweden and the UK and three randomised control trials have shown their effectiveness and cost-effectiveness.⁵⁵ Yet, there are concerns over the future effectiveness of systematic screening for AAA in Western countries⁵⁶ due to significant reduction of smoking rates, a key risk factor that is estimated to cause 75% of all AAA cases, and improved treatment, such as endovascular repair of aneurysms that have lower operative mortality than open repair and fewer deaths related to abdominal aortic aneurysm in the longer term.⁵⁷ Exceptions to the falling trend of mortality are evident in countries not reporting decreased smoking rates.⁵⁸

Familial hypercholesterolaemia (FH) is an inherited condition that is passed down through families and is caused by genetic mutations that make the liver unable to remove excess ‘bad’ cholesterol, known as LDL. This means the LDL level remains high. **Having FH means being at higher risk of getting heart and circulatory disease at an early age if it is left untreated.** This risk may be significantly diminished through early detection and treatment. Yet, FH is under-detected and under-treated. With an overall prevalence of 1:300, FH is among the commonest genetic disorders in general practice, similarly present across different regions of the world, and is more frequent among those with atherosclerotic cardiovascular disease.⁵⁹ FH detection can be achieved with cascade screening. **Cascade screening** refers to screening family members of identified FH cases, typically by genetic testing though cholesterol levels can be used. Identification of cases by search of medical records requires medical evaluation of patients identified to determine if FH is present, it does not trigger cascade screening in families of those identified. For example, in the UK, the National Institute for Health and Care Excellence (NICE) guidelines from 2008 onwards recommend cascade testing for FH. The updated guidelines of 2019 promote proactive case-finding by searching systematically

⁵³ Hindricks G, Potpara TS, et al. 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association of Cardio-Thoracic Surgery (EACTS). *Eur Heart J* 2020. doi/10.1093/eurheartj/ehaa612

⁵⁴ Scherrenberg M., Vangenechten G., Janssen A., Dendale P., What is the value of digital tools for cardiovascular patients?, European Heart Network (2020)

⁵⁵ WHO Technical Consultation on Screening Report 2019

⁵⁶ For example, in July 2019, the Health Council of the Netherlands advised against population-based screening for AAA and instead recommended to investigate screening in high risk groups, like family members of persons with an AAA, and on people at higher risk for cardiovascular disorders and additional risk factors. <https://www.healthcouncil.nl/documents/advisory-reports/2019/07/09/population-based-screening-for-abdominal-aortic-aneurysm-aaa>

⁵⁷ Thompson SG, Ashton HA, Gao L, Scott RA, Multicentre Aneurysm Screening Study G. Screening men for abdominal aortic aneurysm: 10 years mortality and cost effectiveness results from the randomised Multicentre Aneurysm Screening Study. *BMJ*. 2009;338:b2307

⁵⁸ Svensjö, S. et al. (2014) Update on Screening for Abdominal Aortic Aneurysm: A Topical Review, *European Journal of Vascular and Endovascular Surgery*, Volume 48, Issue 6, 659 – 667, <https://doi.org/10.1016/j.ejvs.2014.08.029>

⁵⁹ Hu P, Dharmayat KI, Stevens CAT, Sharabiani MTA, Jones RS, Watts GF, Genest J, Ray KK, Vallejo-Vaz AJ. Prevalence of Familial Hypercholesterolemia Among the General Population and Patients With Atherosclerotic Cardiovascular Disease: A Systematic Review and Meta-Analysis. *Circulation*. 2020 Jun 2;141(22):1742-1759. doi: 10.1161/CIRCULATIONAHA.119.044795. Epub 2020 May 29. PMID: 32468833

primary care records to identify an eligible target population for cascade testing.⁶⁰ Economic modelling shows FH cascade screening to be cost effective.⁶¹ Despite NICE guidelines, there has been limited implementation across the UK but overall, policy and clinical guidelines have evolved in support of the required focus and there has been tremendous progress in FH genetic testing.⁶² Progress in genetic testing has led to the ability to use cascade screening to identify affected family members of people with FH. While initially costs were very high, testing is now much more affordable, though it is not available everywhere.

It can be concluded that new insights and more research are needed to identify optimal strategies for AF and AAA screening. AAA screening in high-risk groups, such as men over the age of 65 years, people at higher risk for cardiovascular disorders and additional risk factors, including family history of AAA, is appropriate. Where very high levels of blood cholesterol are found in individuals and in family members of those with proven FH, cascade screening should take place.

2.2.3 Screening for risk of cardiovascular disease in targeted settings and for selected population groups

In deprived communities⁶³ and among certain population groups, the number of high-risk individuals is known to be significantly higher than in the general population. It is therefore necessary to explore targeted outreach in selected settings and with selected population groups who are likely to benefit from tailored interventions.

An example of a targeted screening programme from Ireland is provided in Annex III of this paper as a source of inspiration.

3. Performing Screening

Screening for risk of CVD, whether in the form of checks in clinical settings where a doctor or allied health professional undertakes assessment of their patients' risk, or in targeted settings and with selected populations, requires the use of a **validated risk-score** tool which integrates multiple risk factors. Several risk-score tools are available and validated. Some of these are listed in Annex II, though the list is not exhaustive.

Five basic elements are sufficient for assessing CVD risk: sex, age, tobacco use, blood cholesterol and blood pressure. These are included in all validated risk-score tools. In addition, the assessment may include taking the pulse which would allow identifying asymptomatic atrial fibrillation (see also above in section 2.2.2). Other elements are full lipid profiles (LDL, HDL cholesterol and triglycerides), family history of premature CVD, diabetes, body mass index, renal failure, waist circumference and lifestyle factors other than smoking (e.g. exercise/physical activity, intake of fruit and vegetables), as well as social deprivation. The measurement of all elements is straight forward, non-invasive, and relatively cheap.

⁶⁰ NICE (2019) Familial hypercholesterolaemia: identification and management, <https://www.nice.org.uk/guidance/CG71>

⁶¹ Kerr M. et al, Cost effectiveness of cascade testing for familial hypercholesterolaemia, based on data from familial hypercholesterolaemia services in the UK, *European Heart Journal*, Volume 38, Issue 23, 14 June 2017, Pages 1832–1839, <https://doi.org/10.1093/eurheartj/ehx111>

⁶² Public Health England (2018), Familial Hypercholesterolaemia, Implementing a systems approach to detection and management, <https://www.gov.uk/government/publications/familial-hypercholesterolaemia-implementation-guide>

⁶³ Capewell S. (2010), Cardiovascular Disease Inequalities, Causes and Consequences

The WHO PEN Protocol 1 proposes assessment of high blood pressure (hypertension), diabetes mellitus and smoking as entry points, targeting the following categories of people in primary health care: age >40 years; smokers; waist circumference (≥ 90 cm in women ≥ 100 cm in men); known hypertension; known diabetes mellitus; history of premature CVD in first degree relatives; history of diabetes mellitus or kidney disease in first degree relatives.⁶⁴ The later WHO HEARTS module on risk-based CVD management, which uses the updated WHO risk prediction charts, also proposes to use hypertension, diabetes mellitus and smoking as entry points for cardiovascular risk assessment.⁶⁵

It is preferable that life-time risk is assessed since age is a predominant risk factor. Life-time risk assessment avoids underestimation in younger individuals. However, it should be noted that even well-validated risk-score tools assessing life-time risk may underestimate risk in some ethnic groups, for whom not enough data are available, and overestimate risk in higher socio-economic groups.

It is essential that those performing screening for CVD risk are trained and know how to interpret risk and how to communicate it properly to the individual.

Technological developments and the digital revolution could transform prevention at an individual level. Nowadays, most people use smartphones and various wearable devices for activity tracking and heart rate monitoring. A comprehensive review of studies and clinical trials from 2000 to December 2019 concludes that the field of ambulatory monitoring is evolving rapidly with new tools becoming available for assessing CVD risk, as well as for long-term monitoring. Smartwatches, handheld devices and bio-patches show promising results for long-term monitoring and detection of hypertension and atrial fibrillation. However, more research is needed to validate these tools and methodologies to confirm the effectiveness and cost-effectiveness of these interventions.⁶⁶

While these technologies may seem promising, there are also a number of risks associated with using such technology to screen for diseases. Firstly, as mentioned earlier, studies on screening for atrial fibrillation have not yet shown benefits at a population level. Secondly, these technologies depend on sensors and those have not yet been scientifically validated as appropriate screening tools. Finally, there are major implications for data protection and careful consideration is needed to avoid potential misuse of data or issues of intellectual property related to these data.⁶⁷

4. Interventions

No screening for CVD should take place unless a prevention system is in place, which allows mitigating individuals' risk through lifestyle counselling by professionally trained personnel and medication where appropriate.

⁶⁴ 'WHO PEN Protocol 1' in 'Implementation tools: package of essential noncommunicable (PEN) disease interventions for primary health care in low-resource settings'. Geneva: World Health Organization 2013.

⁶⁵ World Health Organization. Hearts: technical package for cardiovascular disease management in primary health care. 2016.

⁶⁶ Scherrenberg M., Vangenechten G., Janssen A., Dendale P., What is the value of digital tools for cardiovascular patients?, European Heart Network (2020)

⁶⁷ Screening. When is it appropriate and how to get it right? Policy Brief 35 by the European Observatory on Health Systems and Policies, WHO Regional Office for Europe; 2020

Counselling must include smoking cessation, advice on nutrition and exercise, as well as weight control. Evidence of effectiveness of general health counselling may not be conclusive, but a number of studies from different countries/regions provide models for optimal health counselling interventions. Comprehensive smoking cessation programmes have been proven to be effective⁶⁸ as have medical therapies to lower blood pressure⁶⁹ or serum cholesterol.⁷⁰ Such interventions can only be realised if eligible high-risk individuals are identified.

Professional guidelines⁷¹ provide advice on and set thresholds for use of medication. In addition, the WHO Global Hearts Initiative and its HEARTS technical package provide practical, step-by-step modules to support policy makers and programme managers in Health Ministries to strengthen CVD management in primary care.⁷²

⁶⁸ Review: smoking cessation reduces the risk of death and non-fatal myocardial infarction in coronary heart disease, Critchey et al, JAMA 2003;290:86–97, <http://ebm.bmj.com/content/9/1/28.extract>, Intensive Smoking Cessation Intervention Reduces Mortality in High-Risk Smokers With Cardiovascular Disease, Syed M et al, 2007, <http://chestjournal.chestpubs.org/content/131/2/446.full.pdf+html>, World Bank, Tobacco Control at a Glance, Washington, 2003.

⁶⁹ Law MR, Morris JK, Wald NJ. Use of blood pressure lowering drugs in the prevention of cardiovascular disease: meta-analysis of 147 randomised trials in the context of expectations from prospective epidemiological studies. BMJ 2009;338:b1665

⁷⁰ Cholesterol Treatment Trialists' (CTT) Collaboration. Efficacy and safety of more intensive lowering of LDL cholesterol: a meta-analysis of data from 170 000 participants in 26 randomised trials. Lancet 2010; 376:1670-81

⁷¹ European Heart Journal 2016 August, 1;37(29):2315-2381. 2016 European Guidelines on cardiovascular disease prevention in clinical practice, doi: 10.1093/eurheartj/ehw106

⁷² Global Hearts Initiative, working together to promote cardiovascular health (2016), https://www.who.int/cardiovascular_diseases/global-hearts/en/

5. Conclusions

European and international frameworks and commitments by governments provide a powerful momentum for actions to reduce the burden of cardiovascular disease in our societies.

A significant percentage of cardiovascular disease morbidity and mortality can be prevented through a combination of primary prevention measures, targeting the entire population and complementary programmes for early detection of individuals at high risk of developing CVD or living with a specific cardiovascular condition.

Systematic population level screening programmes, in the form of adult health checks, could be effective in reducing risk factors for CVD in the short term, but are proven not to be effective in the long term in reducing total CVD mortality in Western-Northern European countries. Yet sufficient evidence is lacking from countries with high prevalence of important risk factors, as well as CVD morbidity and mortality, notably Eastern European countries, and therefore more research is needed in those contexts.

Identifying individuals at high risk of cardiovascular disease should be a standard part of medical consultations in general practice and supported by health care systems.

The potential of stratifying the population into risk groups using available data from electronic health records should be further explored.

Screening for abdominal aortic aneurism is effective, yet future programmes must continue to target high risk individuals (e.g., family members of persons with AAA, and patients with CVD) and must consider the reduction of smoking rates and improved prevention and treatment options.

More research is needed to identify optimal strategies for screening specific cardiovascular conditions, such as atrial fibrillation.

Cascade screening should take place for family members of those with proven familial hypercholesterolaemia and where very high levels of blood cholesterol are found in individuals.

Evidence-based, targeted outreach and screening in selected settings and to specific population groups known to be at high risk are more likely to be effective than population level screening programmes. This includes screening of family members in certain cases (cascade screening).

In all cases, programmes for screening cardiovascular risk should be well organised and conducted as a series of sequential steps (including lifestyle interventions) that form a pathway and be sufficiently supported with financial, human, and technological resources.

The European Heart Network (EHN) recommends that the EU establish a joint action/network of Member States, supported by experts, to identify the most effective policies, measures, and programmes for reaching out to and managing individuals at high risk of developing cardiovascular disease and detect those with specific, highly treatable cardiovascular conditions.

Annex I: Principles for risk assessment programmes

Commissioned by the World Health Organisation, the first overview of guidelines on the principles and practices of screening for disease was published in 1968 by Wilson and Jungner and it has since become a public health classic.⁷³

Wilson and Jungner's principles of screening

1. The condition should be an important health problem.
2. There should be an accepted treatment for patients with recognised disease.
3. Facilities for diagnosis and treatment should be available.
4. There should be a recognisable latent or early symptomatic phase.
5. There should be a suitable test or examination.
6. The test should be acceptable to the population.
7. The natural history of the condition, including development from latent to declared disease, should be adequately understood.
8. There should be an agreed policy on whom to treat as patients.
9. The cost of case-finding (including a diagnosis and treatment of patients diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole.
10. Case-finding should be a continuous process and not a “once and for all” project.

40 years later, following technological advances in medicine, an updated overview of criteria for screening was published in 2008 by WHO.⁷⁴

Synthesis of screening criteria proposed over the past 40 years:

1. The screening programme should respond to a recognised need.
2. The objectives of screening should be defined at the outset.
3. There should be a defined target population.
4. There should be scientific evidence of screening programme effectiveness.
5. The programme should integrate education, testing, clinical services and programme management.
6. There should be quality assurance, with mechanisms to minimize potential risks of screening.
7. The programme should ensure informed choice, confidentiality and respect for autonomy.
8. The programme should promote equity and access to screening for the entire target population.
9. Programme evaluation should be planned from the outset.
10. The overall benefits of screening should outweigh the harm.

⁷³ Wilson, James Maxwell Glover, Jungner, Gunnar & World Health Organization. (1968). Principles and practice of screening for disease, <https://apps.who.int/iris/handle/10665/37650>

⁷⁴ Andermann A, Blancquaert I, Beauchamp C, Déry V, Revisiting Wilson and Jungner in the genomic age: a review of screening criteria over the past 40 years, World Health Organisation, 2008 <https://www.who.int/bulletin/volumes/86/4/07-050112/en/>

Annex II: Validated risk-assessment tools

This Annex lists some widely recognised, validated risk-assessment tools, as well as some national tools. Apart from the national tools listed below, a number of countries have calibrated SCORE to their national situations. The list is by no means exhaustive.

Internationally recognised validated risk-assessment tools⁷⁵

- **SCORE:** The SCORE (Systematic Coronary Risk Evaluation) project intended to provide better predictive accuracy for European people. The SCORE system estimates the 10-year risk of a first fatal atherosclerotic event including heart attack, stroke, or aortic aneurysm. Risk factors used in the SCORE system include age, sex, total cholesterol, total cholesterol to HDL-C ratio, systolic blood pressure, and cigarette smoking.
- **Framingham:** The Framingham Heart Study is a 10-year risk score for prediction of CHD events in asymptomatic patients. Risk factors used in Framingham scoring include age, sex, total cholesterol, high-density lipoprotein cholesterol (HDL-C), blood pressure, and cigarette smoking.
- **Reynolds:** The Reynolds risk score estimates the 10-year risk of cardiovascular events, a composite of MI, ischemic stroke, coronary revascularization, and cardiovascular death. Risk factors are age, systolic blood pressure, haemoglobin Alc if diabetic, smoking, total and HDL-C, C-reactive protein measured by a high sensitivity assay (hsCRP), and parental history of MI before age 60 years.
- **ASSIGN:** The ASSIGN score estimates the 10-year risk of CVD, including cardiovascular death or any hospital discharge diagnosis of CHD, cerebrovascular disease, or coronary artery intervention. Traditional risk factors, plus social deprivation and family history.

National validated risk-assessment tools

- **QRISK2/3⁷⁶:** A CVD risk score which is designed to identify people at high risk of developing CVD, who need to be recalled and assessed in more detail to reduce their risk of developing CVD. It estimates the risk of a person developing CVD over the next 10 years. Risk factors include age, sex, postcode, ethnic origin, history, smoking, cholesterol HDL ratio, systolic blood pressure, BMI, type 2 diabetes, rheumatoid arthritis, atrial fibrillation, and chronic renal disease. QRISK3 includes the following additional clinical variables: chronic kidney disease, a measure of systolic blood pressure variability, migraine, corticosteroids, SLE, atypical antipsychotics, severe mental illness, and erectile dysfunction.
- **Progetto CUORE⁷⁷:** An Italian project that proposes a CVD risk score predicting 10-year risk of fatal and non-fatal CVD events on the basis of age, sex, systolic blood

⁷⁵ Screening for Cardiovascular Risk in Asymptomatic Patients, Jeffrey S. Berger, Journal of the American College of Cardiology, 2010.

⁷⁶Hippisley-Cox J, Coupland C. QRISK2. Annual Update Information 2016;2016:5 and Hippisley-Cox J, Coupland C, Brindle P. Development and validation of QRISK3 risk prediction algorithms to estimate future risk of cardiovascular disease: prospective cohort study. BMJ 2017;357:j2099 10.1136/bmj.j2099

⁷⁷ CUORE project: implementation of the 10-year risk score, Palmieri et al, 2011, European Journal of Cardiovascular Prevention & Rehabilitation August 2011 vol. 18 no. 4 642-649.

pressure, antihypertensive treatment, total and high-density lipoprotein (HDL)-cholesterol, smoking, and diabetes.

- **FINDRISK**⁷⁸: A risk score set up by the Finnish Diabetes Association, using the 5 validated risk factors plus test for diabetes.
- **Procam**⁷⁹: Prospective Cardiovascular Münster Heart Study, using age, systolic blood pressure, LDL & HDL cholesterol, triglycerides, fasting blood glucose, antihypertensive drugs, diabetes and MI in family history.

⁷⁸ Finnish Diabetes Association, http://www.diabetes.fi/en/finnish_diabetes_association/

⁷⁹ International Task Force for Prevention of Coronary Heart Disease, http://www.chd-taskforce.de/pdf/sk_procam_07e.pdf.

Annex III: Irish Heart Foundation’s Farmers Have Hearts Programme

An example of a targeted outreach risk assessment programme ⁸⁰

Context:

Irish research showed that Irish farmers are 7 times more likely to die from heart disease compared to other occupational groups (*Smyth et al., 2013*).

For many farmers, making time to go to the doctor is one of those things that is too often pushed down the list because of so many other pulls on their time. That is why the Irish Heart Foundation supported by the Irish Health Service Executive (HSE) developed the “Farmers Have Hearts” programme, which aims to address the issue of CVD among rural men in Ireland.

About the programme:

Originally founded in Co. Roscommon in 2005 by a Multidisciplinary Health Service Executive (HSE) team, the programme has been led by the Irish Heart Foundation’s (IHF) Health Check team (or Health Promotion team) since 2009.

‘Farmers Have Hearts’ health checks have reached 54 Farmers’ Mart so far and nearly 6000 farmers have been supported by the programme.

What is involved in a health check?

At local Farmers’ Mart, professional nurses ~~will~~ measure:

- Blood pressure
- Cholesterol
- Glucose
- Pulse Checks
- Body mass index
- Waist circumference
- Carbon monoxide (only relevant to smokers)

Nurses provide lifestyle advice around all the risks for CVD including physical activity, smoking, alcohol and stress and through the use of brief interventions and motivational interviewing, they support Farmers to make positive changes for their health.

Key benefits for farmers:

- Free by fully trained nurses
- Identify risk factors for heart disease and stroke
- Personal one-to-one session to discuss any heart-health concerns with nurses skilled in the use of brief interventions and motivational interviewing, promoting positive behaviour change
- Personalised advice on how one can take action to manage risk factors with their doctor and prevent a more serious health event, such as heart attack or stroke
- Convenience – it just takes 30 minutes while farmers attend their local Farmers’ Mart.

⁸⁰ <https://irishheart.ie/your-health/our-health-programmes/healthy-communities/farmers-have-hearts/>

Effectiveness:

In 2018, Teagasc - The Agriculture and Food Development Authority (Ireland) commissioned the 'Farmers Have Hearts' Study⁸¹ to investigate whether a tailored intervention is effective in prompting Irish farmers to adopt sustainable behaviour change to improve their health. Specifically, the 4-year study will investigate whether the programme results in effective follow-up use of GP services, sustainable cardiovascular health behaviour change, and reduced CVD risk.

While the final data from the Teagasc study have not yet been published, previous research studies⁸² of the Irish Heart Foundation 'Farmers Have Hearts' have already shown that as a result of the health checks with IHF's nurses:

- 48% of farmers are making lifestyle changes
- 89% changes to diet
- 92% being more physically active
- 41% said they would not have had a health check otherwise
- 64% noted their intention to go to their doctor more regularly.

⁸¹ The 'Farmers Have Hearts' Study <https://doi.org/10.1186/ISRCTN26792329>

⁸² Irish Heart Foundation, Evaluation Report on 'Farmers Have Hearts' health checks, 2013-2014, http://irishheart.ie/wp-content/uploads/2017/01/FHH_report_Summary_final_13th_May.pdf

For more information visit the European Heart Network at <http://www.ehnheart.org/>

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