

International Cardiovascular Disease Prevention case studies

October 2018

Report and case studies

This publication has been based on information and data provided by a number of third parties. While care was taken in the preparation of the information in this report and every effort has been made to ensure the information is accurate and up-to-date, SPH accepts no responsibility for gaps or limitations in the information.

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Executive Summary

Cardiovascular disease (CVD) affects around seven million people in the United Kingdom (UK) and is a significant cause of disability and death, affecting individuals, families and communities. CVD is responsible for one in four premature deaths in the UK and was responsible for 26% of all deaths (129,147) in England in 2015.¹ Healthcare costs in the UK associated with CVD are estimated to be about £8.96 billion and non-healthcare costs estimated at about £4.04 billion (Wilkins et al 2017).² There are a number of different physiological and behavioural risk factors for CVD, including smoking, high cholesterol, high blood pressure, poor diet, harmful drinking and physical inactivity. It is also linked to a range of environmental and social factors, including air pollution and financial inequalities.

Solutions for Public Health (SPH) was commissioned by the British Heart Foundation (BHF) and Public Health England (PHE) to identify and describe cardiovascular disease prevention programmes successfully implemented in countries outside the UK. SPH developed case studies for 10 of these programmes that illustrate approaches that may be applicable and effective within the UK. This report sets out how SPH undertook this project, the current context in England and the case studies that emerged from the information gathering process.

The purpose of this project is to:

- Identify, describe and critique a series of cardiovascular disease (CVD) prevention programmes that are, or have been, implemented outside the UK
- Make recommendations for implementation of effective CVD prevention programmes in England and the UK
- Provide background and context of current CVD prevention programmes in England, within which CVD prevention programmes from elsewhere may be implemented in this country.

The programmes identified that were developed into case studies were a mix of prevention approaches, some were single interventions and others were programmes with multiple initiatives. They were all multifaceted in that they targeted a range of modifiable CVD risk factors including those that would benefit from lifestyle change and/or optimisation of medical management. Some programmes also described in detail how people with undetected high risk of CVD were identified.

Four of the case studies focus on people with CVD or a high risk of CVD, with risk factors such as, atrial fibrillation, hypertension, hypercholesterolaemia and diabetes. Those with current CVD or a high risk of CVD are offered interventions to reduce their risk with the aim of averting further morbidity and impact on health services. A further four case studies are programmes with a combination of prevention approaches encompassing both prevention of developing, and amelioration of, CVD risk factors across populations. These programmes typically comprise multiple small initiatives under one programme umbrella.

Two cases studies are national initiatives with a core aim to improve the detection and effective management of people at risk of CVD. This is achieved through building research capacity, collaborating with stakeholders, education of public and professionals, developing guidelines and promoting evidence based activities in health services and the community.

Table1: Case studies

Table 1A Australia: Coaching patients On Achieving Cardiovascular Health (COACH)

The COACH Program® (Coaching patients On Achieving Cardiovascular Health) focuses on increasing the engagement of individuals in understanding and improving their own health by understanding how lifestyle impacts on CVD risk and identifying any treatment gaps in the management of conditions. The intervention consists of coaching sessions for patients by trained nurses by phone over a minimum of three sessions.

Outcomes

Change in patient characteristics during and after the trial			
	Before	After(6 months)	18 months
Percentage of patients achieving the total cholesterol target	27%	57%	52%
Percentage of patients undertaking physical activity	70%	94%	92%
Percentage not smoking	82%	94.5%	94.5%
Change in service outcomes at four year follow up			
Activity	Reduction (%)		
Any-cause hospital admissions	16%		
Any-cause hospital bed days	20%		
Cardiac bed days	15%		

Table 1B Finland: DEHKO and One Life

DEHKO was launched in Finland as part of the Finnish National Diabetes Programme (FIN D2D), from 2000 to 2010 and aimed to improve self care and prevent and reduce complications from type 2 diabetes. From 2011, the DEHKO programme expanded to include raising awareness and reducing risk of non communicable diseases with common risk factors including cardiovascular disease (CVD), dementia, chronic obstructive pulmonary disease (COPD) and type 2 diabetes. This included using a brief screening tool followed by an in depth health check up and education/motivational individual and group sessions for those at high risk of CVD. 'One Life' is supported by a collaboration of the Finnish Diabetes, Brain and Heart Associations and focuses on supporting people to make lifestyle changes to improve modifiable risk factors.

Outcomes

Population awareness of FIN-D2D	Men	Women
Awareness of national FIN-D2D within pilot area	25%	48%
Awareness of national FIN-2D2 outside of pilot area	20%	36%
For those with high risk of CVD at 12 months following intervention		
Increase in reported physical activity	4.1%	3.8%
Improved dietary pattern	39.3%	39.2%
Increase in physical activity and improved dietary pattern	9.6%	14.2%
No lifestyle change	47%	42.7%
Reduction in 10 year risk for CVD event for people who reported change in physical activity and dietary pattern	3.5%	1.5%
Change in 10 year risk for CVD event for people who reported no change in physical activity and dietary pattern	0.15%*	-0.43%^

*p<0.001 between groups compared with men who made changes to diet and physical activity levels and those who did not
 ^ p=0.027 between groups compared with women who made changes to diet and physical activity levels and those who did not.

Table 1C France: ESCAPE

ESCAPE was designed to show whether a multifaceted intervention, aimed at general practitioners (GPs), could significantly increase the proportion of hypertensive patients at high risk of cardiovascular disease (CVD) who achieved all their recommended therapeutic targets. This involved one day of GP training and support to ensure patients were managed according to guidelines and followed up. A trial with an intervention group and no intervention group measured the effect.

Outcomes

Comparisons at 2 years between intervention group and no intervention group	Odds ratio (95% confidence interval)	P value
Patients achieving all their therapeutic targets compared with no intervention	1.89(1.09 to 3.27)	p = 0.02
Patients achieving their blood pressure targets compared with no intervention	2.03(1.44 to 2.88)	p < 0.0001
	Difference in blood pressure	
Additional decrease in systolic blood pressure in intervention group compared with control	4.8mmHg	p < 0.0001
Additional decrease in diastolic blood pressures in intervention group compared with control	1.9mmHg	P<0.0001

Table 1D The Netherlands: Vascular risk management

This programme was designed to improve and add to standard nurse-led vascular risk factor management of patients with the addition of web based support focused on lifestyle change and adherence to medication following a CVD event.

Outcomes

Key outcomes at 12 months	Percentage difference between groups (95% confidence intervals)	P value
Patients who quit smoking at 12 months	7.7(0.4 to 14.9)	p=0.038
Patients reaching the low density lipoprotein goal	18.4%(5.9 to 30.9)	p=0.004
Relative change in Framingham risk score of the intervention group compared to the usual care group	-8%(-18 to 2)	ns

Table 1E Canada: The Cardiovascular Health Awareness Program (CHAP)

CHAP is a community based model of cardiovascular disease (CVD) prevention which has been used in a range of different communities. It encourages people to become more aware of their cardiovascular risk and to acquire self-management skills. Increased detection of people at high risk of developing CVD results in referral and the opportunity to manage the condition medically.

Outcomes

Longitudinal study of 13,596 people in 22 communities over 18 months	Baseline mean	18 months follow up
People attending ≥2 CHAP sessions improvement in blood pressure	142/78mmHg	123/69 mmHg
	Rate ratio(95% CI)	P value
Reduction in rate of acute myocardial infarctions	0.87(0.79 to 0.97)	p=0.008
Reduction in congestive heart failure	0.90(0.81 to 0.99)	p=0.029
No change in rate of stroke	0.99(0.88 to 1.12)	p=0.89
No change in all cause mortality	0.98(0.92 to 1.03)	p=0.38
No change in hospital death	0.86(0.73 to 1.01)	p=0.06

Table 1F Japan: Healthy Japan 21

Japan has embarked on a national health policy change to prevent lifestyle-related diseases, including cardiovascular disease (CVD) and diabetes. Following the detection of high CVD risk (via the annual health check up) people are invited to participate in individual or group sessions to motivate them to reduce their risk of metabolic syndrome and CVD.

Outcomes

	Intervention	No intervention	P value
Waist circumference (WC) - clinically relevant (>5%) reduction - proportion(%) of participants at 3 years	21.4%	16.1%	P<0.001
BMI - clinically relevant(>5%) reduction - proportion(%) participants at 3 years	17.6%	13.6%	P<0.001
Reversal of metabolic syndrome – number of participants	47%	41.5%	P<0.001
Reductions in systolic blood pressure (mmHg)	-1.15mmHg	-0.72mmHg	
Reductions in diastolic BP	-0.97mmHg	-0.64mmHg	
	Odds ratio(95% confidence interval)		
>5% reduction in WC intervention vs no intervention group	1.33(1.31 to 1.36)		p<0.001
>5% reduction in BMI intervention vs no intervention n group	1.36(1.33 to 1.38)		p<0.001
Reversal of metabolic syndrome	1.31(1.29 to 1.33)		p<0.001

Table 1G United States: Franklin County

This programme was an integrated, community-wide comprehensive cardiovascular risk reduction programme started in 1970 with a 40-year follow-up assessing the impact of risk factor improvements on reductions in morbidity and mortality. The initial focus was on hypertension detection and management but over the years broadened to encompass other CVD risk factors.

Outcomes

	Outcome
From 1994-2006 reduction in Franklin County's hospitalisation rate	Observed vs expected difference -17 discharges per 1,000 population
Reductions in total in and out of area hospital charges for Franklin County residents per year due to drop in hospitalisation rate	\$5,450,362 (£3,919,300) per annum
From 1974/75 to 1977/8 increase in proportion of people with treated and controlled hypertension	Absolute increase of 24.7%
From 1986 to 2009 increase in the proportion of people with treated and controlled cholesterol levels	Absolute increase of 28.5%
Smoking quit rates (ever smokers who report they have quit) with Franklin County quit rates significantly higher than those seen in Maine and the US	Improved from 48.5% in 1994-5 to 69.5% in 2006-10

Table 1H United States: New Ulm Heart beats back (HONU)

New Ulm is a small community of 17,000 people and local health organisations were keen to track the cardiovascular health of the population before and during the implementation of community wide interventions. There were individual, family and organisational and community level interventions implemented in order to influence behaviour and reduce modifiable cardiovascular disease (CVD) risk factors.

Outcomes

Measure	2008-9	2010-11	2012-13
Blood pressure at goal*	79.3%	82.3%	86.4%
On blood pressure medication*	41.8%	43.5%	44.0%
Low-density lipoprotein at goal*	68.9%	72.3%	71.1%
High-density lipoprotein at goal	63.8%	59.0%	58.0%
Cholesterol at goal*	59.2%	64.2%	64.1%
Triglycerides at goal*	66.3%	68.7%	70.2%
On lipid medication*	25.3%	27.7%	29.1%
Not obese	56.0%	55.5%	55.1%
Fasting glucose at goal [†]	46.9%	49.7%	48.2%
Smoking	11.3%	12.6%	13.6%
ASCVD 10-year risk score <7.5%	27.8%	28.9%	27.5%

Table 1I Canada: Hypertension Canada

Hypertension Canada was formed in 2010 from the merger of the Canadian Hypertension Society, the Canadian Hypertension Education Program and Blood Pressure Canada. The main goal of this national initiative is to ensure that Canada is effective in controlling hypertension within the population. The core aim of the programme is reducing misdiagnosis by ensuring that all healthcare professionals in Canada are appropriately trained to diagnose hypertension and follow recommended guidance to manage the condition. In addition there is a focus on building research and surveillance capacity and coordinating the networking of local and national stakeholders.

Outcomes

Measure	2007-09	2010-11	2012-13
Hypertension Prevalence (2020 target 13%)	19.6%	21.8%	22.6%
Awareness of condition (2020 target 95%)	83.4%	82.9%	84.3%
Diagnosed with hypertension with normal BP while not on antihypertensive drug treatment a (i.e. lifestyle control of hypertension) (2020 target 40%)	8.5%	11.1%	6.6%
Appropriate drug therapy (2020 target 87%)	79.9%	79.2%	79.6%
Blood pressure under control (2020 target 78%)	65.9%	64.1%	68.1%

Table 1J United States: Million Hearts

In 2012 the Million Hearts initiative was established by the US Department of Health and Human Services, the Centre for Disease Control and Prevention (CDC) and Centres for Medicare and Medicaid (CMS). This national initiative had a first phase, 5-year goal, of preventing 1 million cardiovascular events by 2017, and is now in its second phase, Million Hearts 2022. The core aim of the work is to align CVD prevention efforts across 50 states and 120 partners in the US by focussing on implementation of the ABCS approach to CVD management (Aspirin when appropriate, Blood pressure control, Cholesterol management, and Smoking cessation). Meaningful use of health tools and technology such as electronic records for identifying and monitoring patient groups and introducing policies to eliminate artificial trans-fat intake, reduce tobacco use and reduce sodium intake are other key elements of the initiative.

Outcomes

Measure	2005/06	2007/8	2009-10	2011-12	2013-14	2015-16
Aspirin use in people aged >40 (target 70%)	NR	NR	81.1%	NR	NR	NR
Blood pressure control population level (target 65%)	43.4	48.4	53.4	51.9	54.0	57.7*
Cholesterol control with statins – % statin use among adults for whom it is recommended (target 70%)	44.1	49.4	49.7	54.2	56.8*	59.9*
Smoking – prevalence (%) of current combustible tobacco use among adults (target 23%)	28.2	26.9	26.2	25.1	24.0	23.0*
Mean sodium intake among adults (mg/day) (target 2,900mg.day)	3,697	3,595	3,594	3,618	3,534	3,525*

NR – not reported *Projected figures

The case studies described in this report offer alternative models to CVD prevention than those currently implemented in England. All the cases studies showed some evidence of success in reducing CVD risk factors but some programmes were more applicable and likely to be sustainable in a UK setting than others. None of the programmes stood out as having a truly innovative approach. Indeed innovation was not an important factor in the success of the programmes, but rather developing a tried and tested approach that successfully engaged relevant stakeholders and that could be sustained in the long term and readily transferred and tailored to other communities was more important.

Two programmes, Hypertension Canada and Million Hearts are national initiatives and foster collaboration between health care providers and the implementation of evidence based practice. Hypertension Canada focuses on research and the development of guidelines, education of health care professionals to prioritise the accurate detection and management of people with CVD risk. Million Hearts is a wide ranging national initiative with a small core team who focus on promoting evidence based clinical quality improvement, detecting people at risk of CVD using electronic health records, changing harmful behaviours such as smoking, and high sodium and trans-fat intake. Organisations become partners in the Million Hearts initiative and can secure funding through a variety of routes to support change in practice. Both national programmes have not yet met their challenging targets but are slowly progressing towards them using multiple approaches.

The case studies that developed a tried and tested sustainable approach that successfully engaged relevant stakeholders that could be readily transferred to other communities whilst reducing CVD risk, are arguably the most likely to be usefully adapted for use in England and the wider UK. They were also the case studies that focused on long term sustainability from the outset, and we suggest that this should be central to implementation of any changes that follow from this work in the UK. The most successful three programmes identified here from the evidence available (HONU, CHAP and COACH) all have a very strong community focus although they are targeting different elements of prevention. They are using schools, workplaces, community centres, pharmacies, or peoples own homes to deliver the programme. HONU has the broadest approach drawing on all sectors of the community, whilst CHAP has a more focused approach running community clinics to detect CVD risk factors in the local population and COACH offers support in management of risk factors by phone to people in their own homes. Going to where the people are, empowering individuals and the wider community with information and an understanding of CVD risk, that they can monitor themselves, is clearly important in the success of the programmes.

All three programmes built in mechanisms for ensuring that they were sustainable in the long term with minimal continued investment which is a particularly important consideration, given the constraints of resources at the current time. Strong leadership and governance of the programmes was built into the mainstream running of each service or community programme to ensure it was fully integrated as part of the approach to prevention. This led to good community engagement and mobilisation with the use of volunteers to support the delivery of the programmes in the case of HONU and CHAP. COACH meanwhile used and trained a wider professional group to contact people at home to support them to be actively engaged in reducing their own risk factors by optimising medication and making lifestyle changes.

Introduction

Cardiovascular disease (CVD) affects around seven million people in the United Kingdom (UK) and is a significant cause of disability and death, affecting individuals, families and communities. CVD is responsible for one in four premature deaths in the UK and was responsible for 26% of all deaths (129,147) in England in 2015.³ Healthcare costs in the UK associated with CVD are estimated to be about £8.96 billion and non-healthcare costs estimated at about £4.04 billion at the time of the study by Wilkins et al (2017).⁴ There are a number of different physiological and behavioural risk factors for CVD, including smoking, high cholesterol, high blood pressure, poor diet, harmful drinking and physical inactivity. It is also linked to a range of environmental and social factors, including air pollution and financial inequalities.

Solutions for Public Health (SPH) was commissioned by the British Heart Foundation (BHF) and Public Health England (PHE) to identify and describe cardiovascular disease prevention programmes successfully implemented in countries outside the UK. SPH developed case studies for 10 of these programmes that illustrate approaches that may be applicable and effective within the UK. This report sets out how SPH undertook this project, the current context in England and the case studies that emerged from the information gathering process.

1 Aims and objectives

The purpose of this project is to:

- Identify, describe and critique a series of cardiovascular disease (CVD) prevention programmes that are, or have been, implemented outside the UK
- Make recommendations for the implementation of effective CVD prevention programmes in England and the UK
- Provide background and context of current CVD prevention programmes in England, within which CVD prevention programmes from elsewhere may be implemented in this country.

A broad range of prevention programmes are of interest, including initiatives focussed on behavioural and medical risk factors and high risk conditions.

2 Methods

This project was built on the outcomes of PHE's work to identify current and past CVD prevention programmes implemented in the UK and internationally. PHE identified these programmes through a structured review of published and unpublished literature and developed a spreadsheet of relevant programmes and their outcome studies.

A steering group with representation from PHE, BHF and NHS England met monthly to oversee the project and were consulted at key decision points over the lifetime of the project.

Identifying CVD prevention programmes to develop as case studies

PHE included 116 current and historic programmes in their spreadsheet and SPH undertook a hand search which identified a further two CVD prevention programmes (a total of 118 programmes). Two initial inclusion/exclusion criteria were agreed with the steering group and

applied to the list of CVD prevention programmes to exclude those which were not of interest as potential case studies. These criteria were:

- Programmes which were implemented and had final follow-up completed prior to 2007 were excluded
- Programmes where there was no publications published in the English language were excluded.

The application of these inclusion/exclusion criteria resulted in a shortlist of 55 programmes from the 118 initially identified. The abstracts for these publications were retrieved and used to appraise each of the programmes to aid decision-making about the selection of case studies. The agreed factors for selection of the final programmes to be used as case studies were:

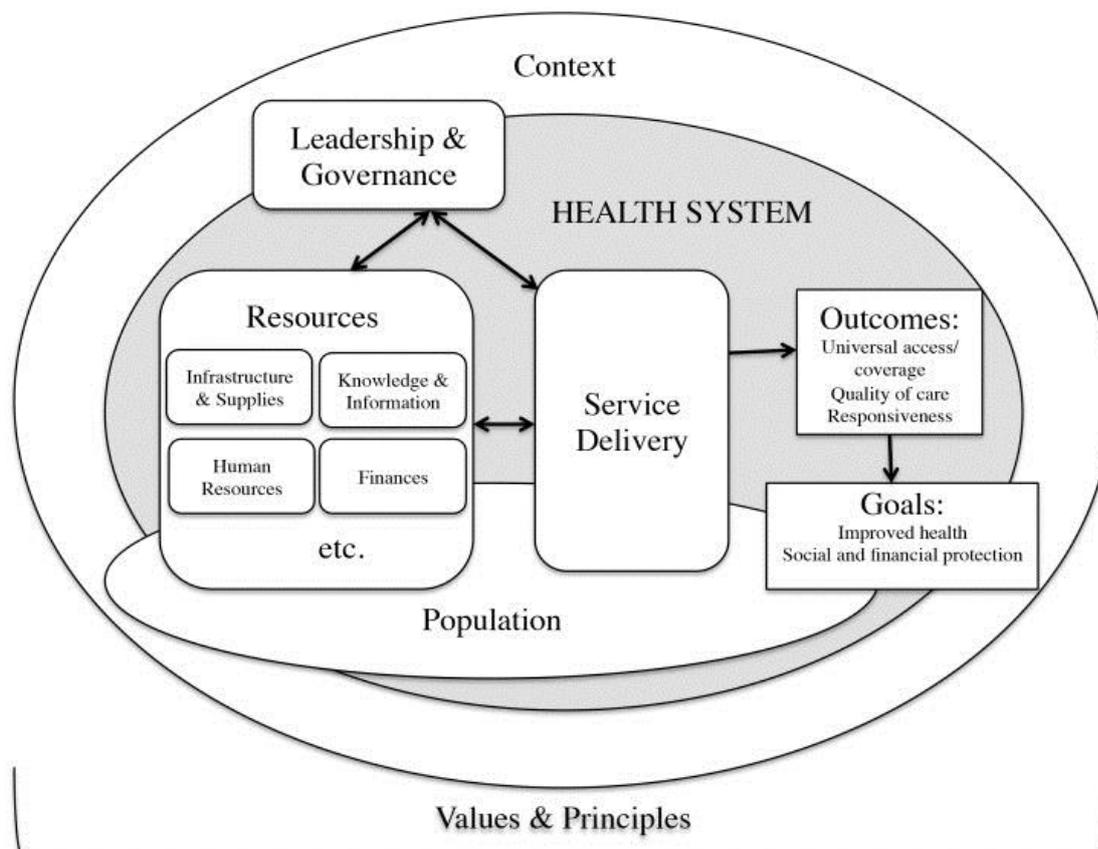
1. The availability of published evidence about the intervention and the outcomes
2. Level of evidence e.g. size of study population and inclusion of a comparator
3. CVD risk factors targeted
4. CVD conditions targeted
5. Type of intervention (e.g. awareness raising, health check, case finding)
6. Whether the intervention targeted a broad or narrow population group
7. Local or national programmes.

From this exercise 8 programmes were selected and agreed by the CVD International Review Steering Group which oversaw the project and comprised representatives from PHE, BHF and NHS England. The strength and volume of evidence (factors 1 and 2) a mix of, prevention focus (factors 3 and 4) and type of intervention (factor 5) were the most important of the 7 factors in the selection process. Two additional case studies of national programmes (Million Hearts and Hypertension Canada) were purposefully selected to be reviewed along with those that met the original criteria. This is due to the particular interest of PHE and BHF in the approach of community mobilisation and self management models used in supporting reduction of hypertension, early detection of atrial fibrillation and high cholesterol.

Framework for organising case study information

Detailed information was gathered for each case study to populate a framework to ensure a systematic approach. The framework used was the dynamic health systems framework (Van Olmen et al 2012)⁵ which combines a range of previously published health systems frameworks including the WHO system building blocks. This framework incorporates the wider system elements of population, context, values and principles in addition to core health system components of leadership and governance, health workforce, health information systems, access to medicine and equipment, finance and service delivery.

Figure 1: Dynamic health systems framework from Van Olmen et al (2012)⁵



Source: Van Olmen et al (2012)⁵

Where possible, information was extracted from unpublished and published documents readily available on the internet or through the British Library services. In addition SPH undertook interviews with key staff for the programmes where available. This helped to fill any significant gaps and obtain additional contextual information. The table in Appendix 1 shows the different elements of the framework and the type of content required for each case study.

Once the information had been gathered it was organised in a consistent case study format with two pages summarising the key points about the implementation, benefits and limitations of each initiative. This was followed by more in depth information extracted from peer reviewed publications.

3 Background and context of cardiovascular disease prevention in England

Rates of cardiovascular disease in the UK have been declining year on year since the 1960s, (Scarborough et al 2011⁶). This decline took place across large parts of the world including Western Europe, the United States of America (US) and Australia. The US reported a 20% drop in mortality from coronary heart disease between 1968 and 1978 (Jones and Greene 2013⁷). At the time it was unclear why this decline had taken place but subsequent modelling pointed to better understanding of the risk factors for CVD, as well as early prevention programmes and improved treatment. Capewell et al (1999), using Scottish data for 1975-1994, estimated that risk factor reductions through prevention contributed 51% to the decline in mortality rate and improved coronary care by a further 40%⁸.

By the year 2000 the rate of decline in CVD mortality had started to slow in the US from a decline annually of -3.1% between 1970 and 1979 to -2.7% from 1990 to 1997⁹. Modelling by Ford and Capewell et al (2007)¹⁰ of US data suggested that improvements in blood pressure, cholesterol and smoking were being offset by adverse trends in obesity and diabetes. A similar plateau in the decline was also reported in Europe and Australia. The consensus was that despite the predicted health gains that could be achieved, there was fatigue from prolonged campaigns aimed at risk factor reduction, and sustaining prevention initiatives required consistent political will¹¹. The CVD risk reduction message is no longer novel and is ever harder to follow, given the rise of the current obesogenic culture.

Latterly there has been a global resurgence in a full range of CVD prevention programmes. These include community based interventions supporting people to reduce CVD risk through lifestyle changes, targeting of high risk individuals and offering one to one support to improve health and wellbeing. This is alongside initiatives to promote effective medical management of risk factors such as hypertension, diabetes and high cholesterol levels to reduce the likelihood of progression to a CVD event such as stroke, or a life limiting chronic disabling disease such as heart failure.

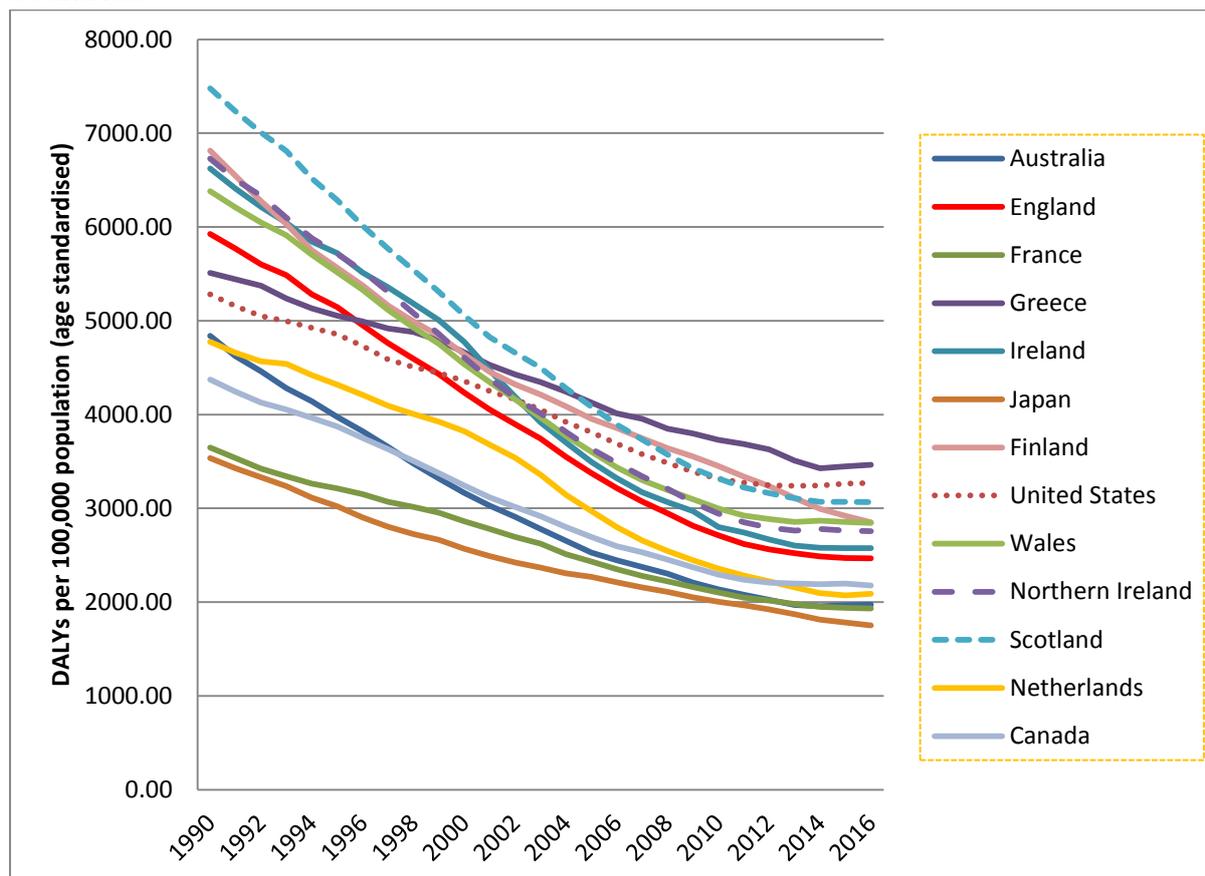
According to the data extracted from the Global Burden of Disease Study (Institute of Health Metrics, Washington <http://www.healthdata.org/gbd>), despite the declines in rates of CVD over the past 50 years, cardiovascular disease still accounted for 30.15% deaths (282.41 per 100,000 population 95% CI; 275.71-289.29) in the UK in 2016, similar to the rate of cancers (29.22%) at a rate of 273.67(95% Confidence Interval [CI]; 268.21 - 279.52) per 100,000 population. The next most frequent causes of death were neurological conditions which accounted for less than 12% of the total.

Figure 2 uses the Global Burden of Disease (GBD) study data collated by the Institute of Health Metrics (IHM) based in Washington (<http://www.healthdata.org/gbd>). The project captures premature death and disability data for more than 300 diseases and injuries in 195 countries, by age and sex, from 1990 to the present. Figure 2 shows the trend in Disability Adjusted Life Years due to cardiovascular disease for the four UK countries and a small range of other countries from around the world. Disability Adjusted Life Years (DALYs) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

Greece has had the shallowest decline in CVD burden since 1990, and is similar to the United States. Out of the 13 countries in Figure 2, these two countries had the 7th and 8th

highest DALYs per 100,000 population in 1990, but in 2016 had the 1st and 2nd highest level of CVD burden. In 1990, Scotland had a much greater CVD burden than all of the other countries, but this steeply declined to half this rate by 2016. France and Japan started with the lowest CVD burden in 1990. Their rates have steadily declined and they are still the countries with the lowest CVD burden in 2016. England had the 6th highest burden of CVD in 1990 and in 2016 was 8th out of this group of countries, improving at a greater rate with a steeper decline than Greece and the US.

Figure 2: Cardiovascular disease burden change between 1990 and 2016 in selected countries

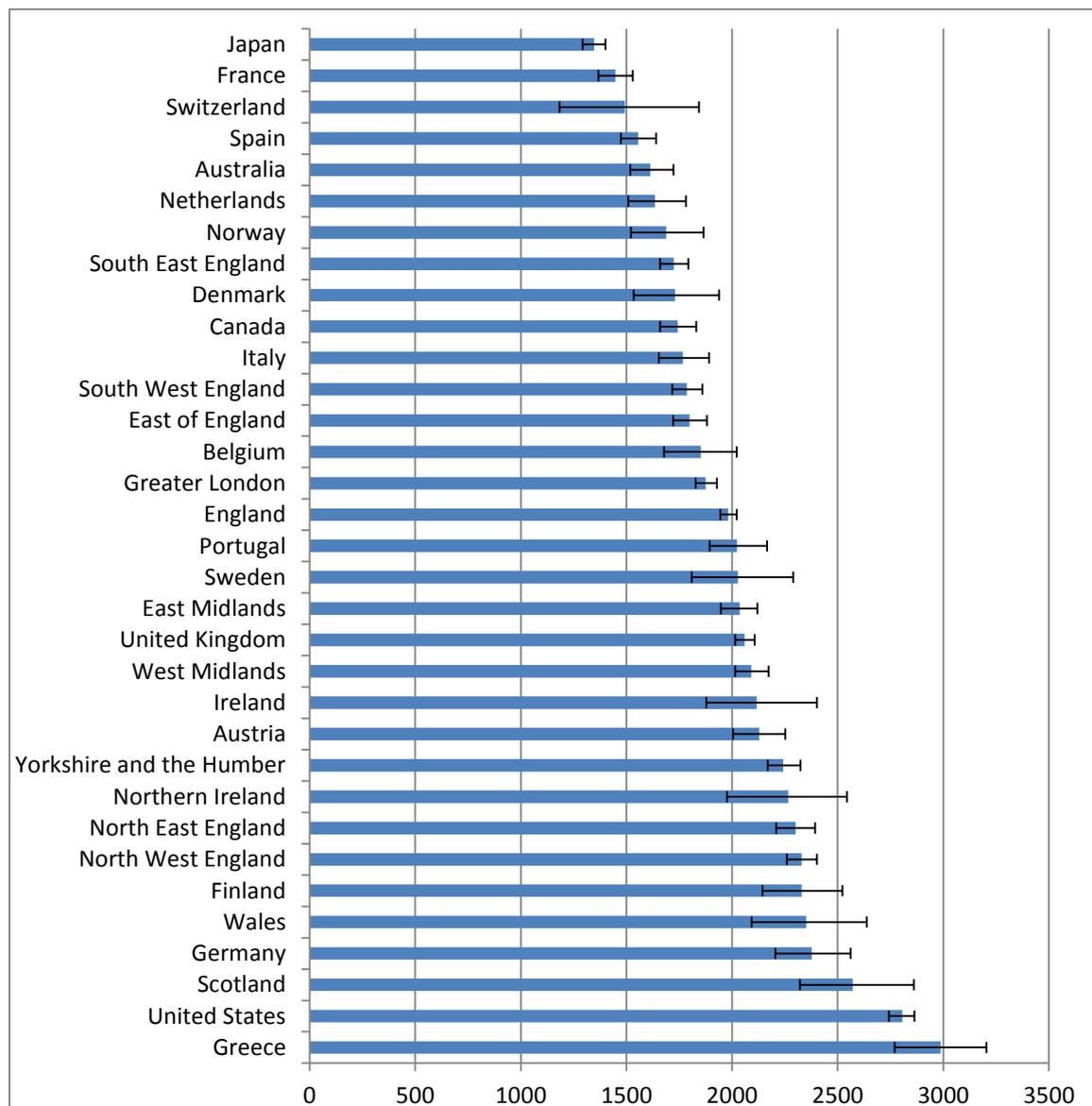


Source: Global Burden of Disease Study 2016 (GBD 2016) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2016. (<http://www.healthdata.org/gbd>)

Newton et al (2015) analysed the 2013 data from the GBD study, comparing potential years of life lost from all causes across the 15 EU countries, the four UK countries, the nine English regions, plus Australia, Canada, Norway and the USA. SPH has extracted similar data from the GBD study for cardiovascular disease for the same countries and regions plus Japan. The data is based on the latest information supplied by each country up to 2016. Figure 3 shows the latest data available (2016) of age standardised years of life lost (YLL) per 100,000 population from CVD. Years of life lost (YLL) or years of potential life lost (YPLL) or potential years of life lost (PYLL), is an estimate of the average years a person would have lived if he or she had not died prematurely. It is, therefore, a measure of premature mortality. Currently CVD in Japan accounts for the fewest years of life lost per 100,000 population (1347, 95% Uncertainty Interval [UI]; 1292 - 1400) and Greece the most (2987, 95% UI; 2770 - 3204). Of the 10 areas with the highest rate of YLL due to CVD, six

are from the UK and include the English regions of Yorkshire and the Humber, Northern Ireland, North East and North West England, Wales and Scotland.

Figure 3: Global Burden of Disease Study - age standardised rates of years of life lost (YLL) from CVD per 100,000 population in 2016 for the nine English regions, 4 UK countries, 15 EU countries and Australia, Canada, Norway, the USA, and Japan for both sexes.

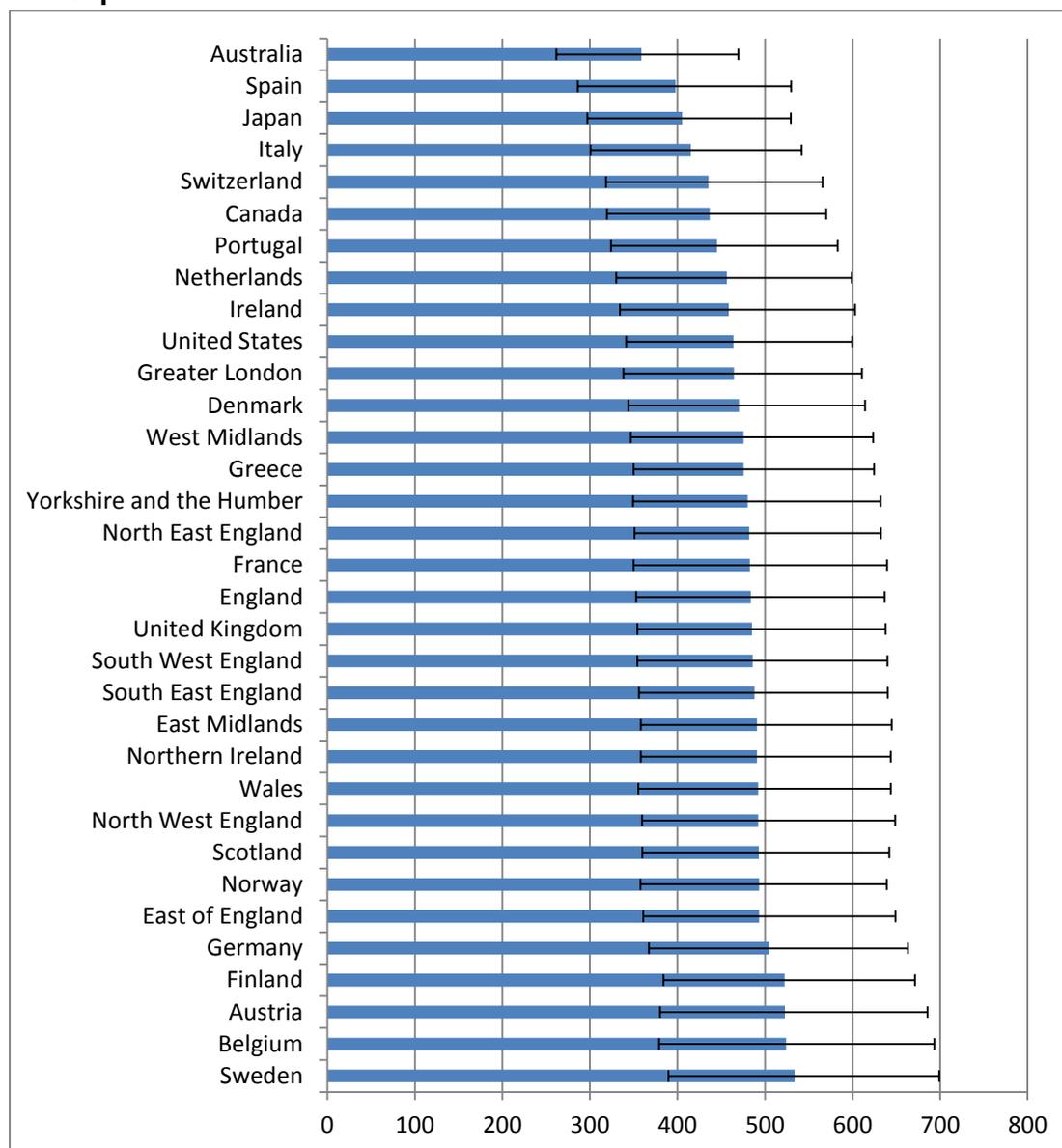


Source: Global Burden of Disease Study 2016 (GBD 2016) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2016.

In the UK, the South East region has the lowest YLL per 100,000 population from CVD at 1724 (95% UI; 1659 - 1793) whilst Scotland has the highest YLL per 100,000 population from CVD at 2522 (95% UI; 2320 - 2860).

Figure 4 shows the years of life lost to disability (YLD) from CVD by each country and English region. This measure is determined by the number of years disabled, weighted by level of disability caused by a disability or disease.

Figure 4: Global Burden of Disease Study - age standardised rates of years of life lost to disability (YLD) per 100,000 population due to CVD in 2016 for the nine English regions, 4 UK countries, 15 EU countries, and Australia, Canada, Norway, the USA, and Japan for both sexes.



Source: Global Burden of Disease Study 2016 (GBD 2016) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2016.

Within the UK, the YLD from CVD in 2016 were lowest in Greater London at 464 per 100,000 population (95% UI; 338 - 610) and highest in the East of England at 494 per 100,000 population (95% UI; 361 - 649). Of the countries included in Figure 4, years of life lost to disability from CVD were lowest in 2016 in Australia at 359 (95% UI; 261 - 499) per 100,000 population compared to Sweden at 534 (95% UI; 390 - 699) per 100,000 (Figure 4).

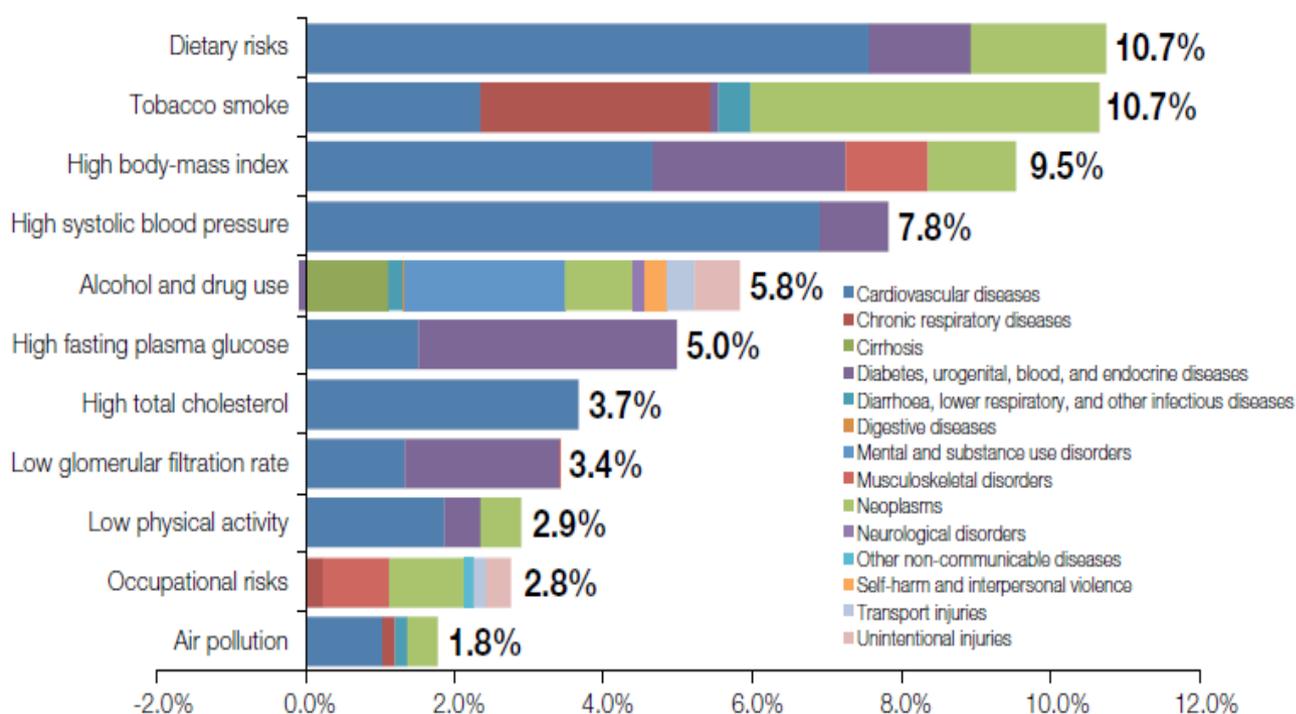
It should be noted that the Global Burden of Disease study data is constantly being updated and countries will frequently move up and down the rankings from year to year. It is important to link back these snapshots in time to the overall trends shown in Figure 2. This shows that in order to achieve rates nearer to those of Japan, France and Australia

acceleration in CVD prevention is needed to shift the England trend line to a steeper downward trajectory away from its current plateau.

4 Strategies for CVD prevention in England

In September 2017 PHE published their action plan for cardiovascular disease prevention for 2017 and 2018¹², and the NHS Prevention board have prioritised this topic and proposed actions in their update to the NHS five year forward view (Next steps on the five year forward view, 2017¹³). These plans go beyond the activities undertaken by NHS England and PHE and incorporate actions by government, local authorities, employers and third sector organisations alone and in partnership. Not only do CVD prevention initiatives cut across organisational boundaries, but they cannot be considered in isolation from other non-communicable diseases which are impacted by the same risk factors. The multiple risk factors for CVD are also risk factors for other non-communicable diseases such as cancer, COPD, diabetes, and dementia. Figure 5 shows the different risk factors and their attribution to the disease burden of non-communicable diseases in England in 2013.

Figure 5: Percentage of disease burden in England (2013) that is attributable to each risk factor, by disease group (Disability Adjusted Life Years)



Source: Public Health England (2016)¹

The overall national approach to CVD prevention is to focus on the risk factors in Figure 5 with initiatives that make it easier for healthy people to remain healthy and for those at high risk or already diagnosed with CVD to change their behaviour and receive optimal medical management to meet risk factor targets. The particular combination of population-wide strategies and strategies targeted at high risk individuals depends on achievable effectiveness, as well as cost-effectiveness and availability of resources. This results in a

plethora of different types of initiatives across the country that range from making the built environment a place to encourage physical activity to ensuring patients are on the recommended dose of statins so their target lipid levels are more likely to be achieved.

There are a range of community and primary care settings where prevention, detection and management of CVD can occur including pharmacies, the NHS Health Check programme, routine GP and nurse appointments and local health promotion initiatives. Detection of a high risk of CVD can also be determined automatically by interrogating GP medical records to identify people with a combination of recent medical test results that indicate high risk of CVD. In these cases people might be invited directly to participate in a risk reduction programme such as the NHS Diabetes Prevention Programme without having first been in contact with a health professional.

Figure 6 and Figure 7 below illustrate the Right Care CVD risk prevention pathway and the difference that effective CVD prevention across all risk factors could make.

As primary care is currently under significant pressure, CVD prevention will benefit from a focus on increasing capacity and capability, using established resources innovatively and identifying potential new routes for detection and management of those with increased risk of CVD. There is considerable scope to improve prevention of CVD within primary care and community settings as outlined in Figures 6 and 7. In 2017 PHE and NHS England quantified some of the benefits that would accrue from optimal detection and treatment of CVD risk factors (The Size of the Prize, 2017¹⁴). There are an estimated 13.5 million adults with hypertension in England of which 5.5 million are undiagnosed and a further 1.5 million with known hypertension are not reaching the Quality Outcomes Framework (QOF) target blood pressure of 150/90Hgmm. If only half of all people diagnosed with hypertension were optimally treated over a three year period this would result in 4,855 fewer heart attacks (saving £36 million) and 7,250 strokes (saving £100 million). There are just under a million people with diagnosed Atrial Fibrillation (AF) in England on GP registers and a further 400,000 people estimated to be undiagnosed. Around 170,000 people are estimated to have AF at high risk of causing a stroke but who are not receiving optimum anticoagulation treatment. If only half those people who are at high risk of AF were optimally treated over three years there would be an estimated 7,110 fewer strokes (saving around £125 million).

Figure 6: Summary of Risk Factors and How These are Detected and Managed in Primary Care

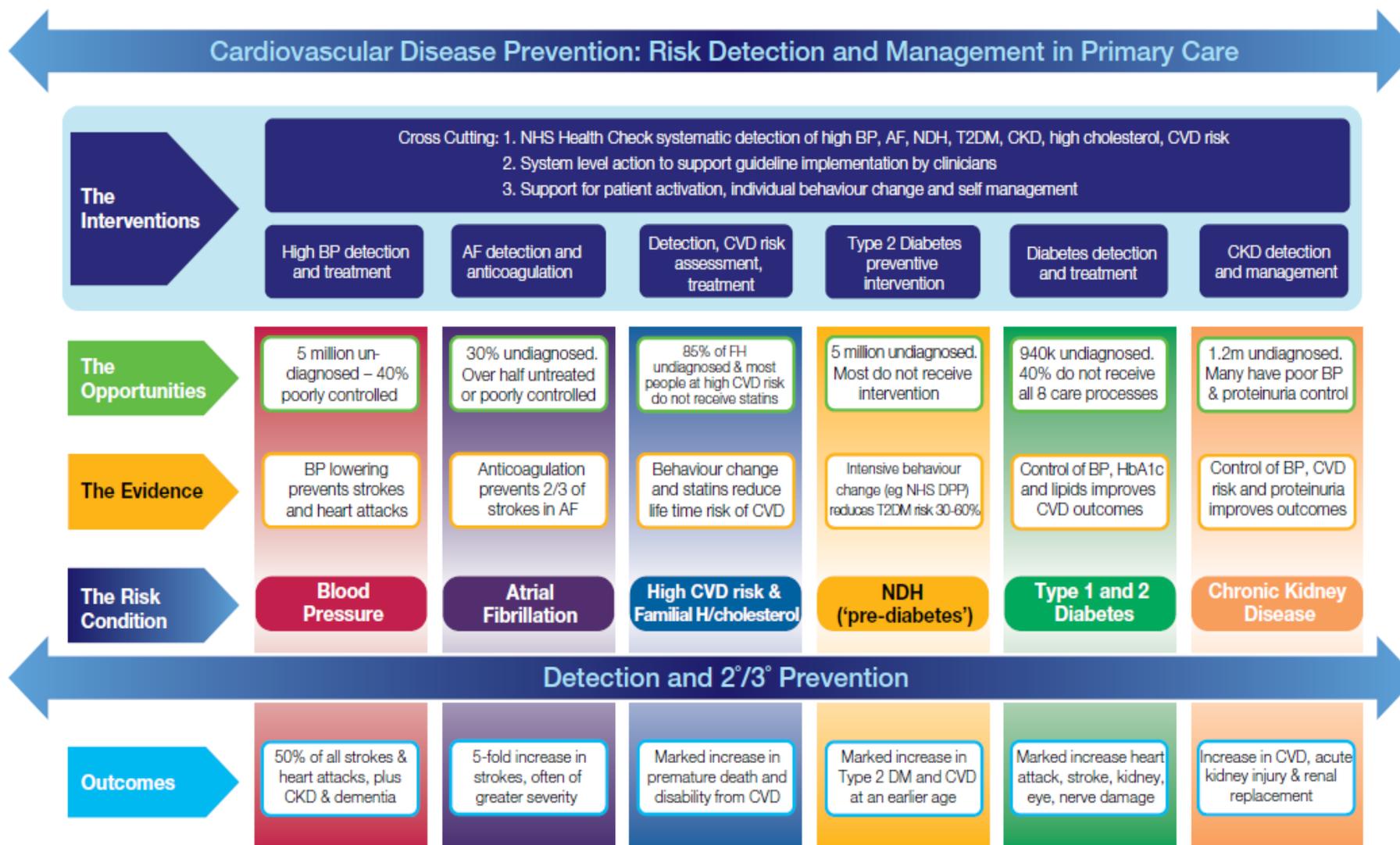
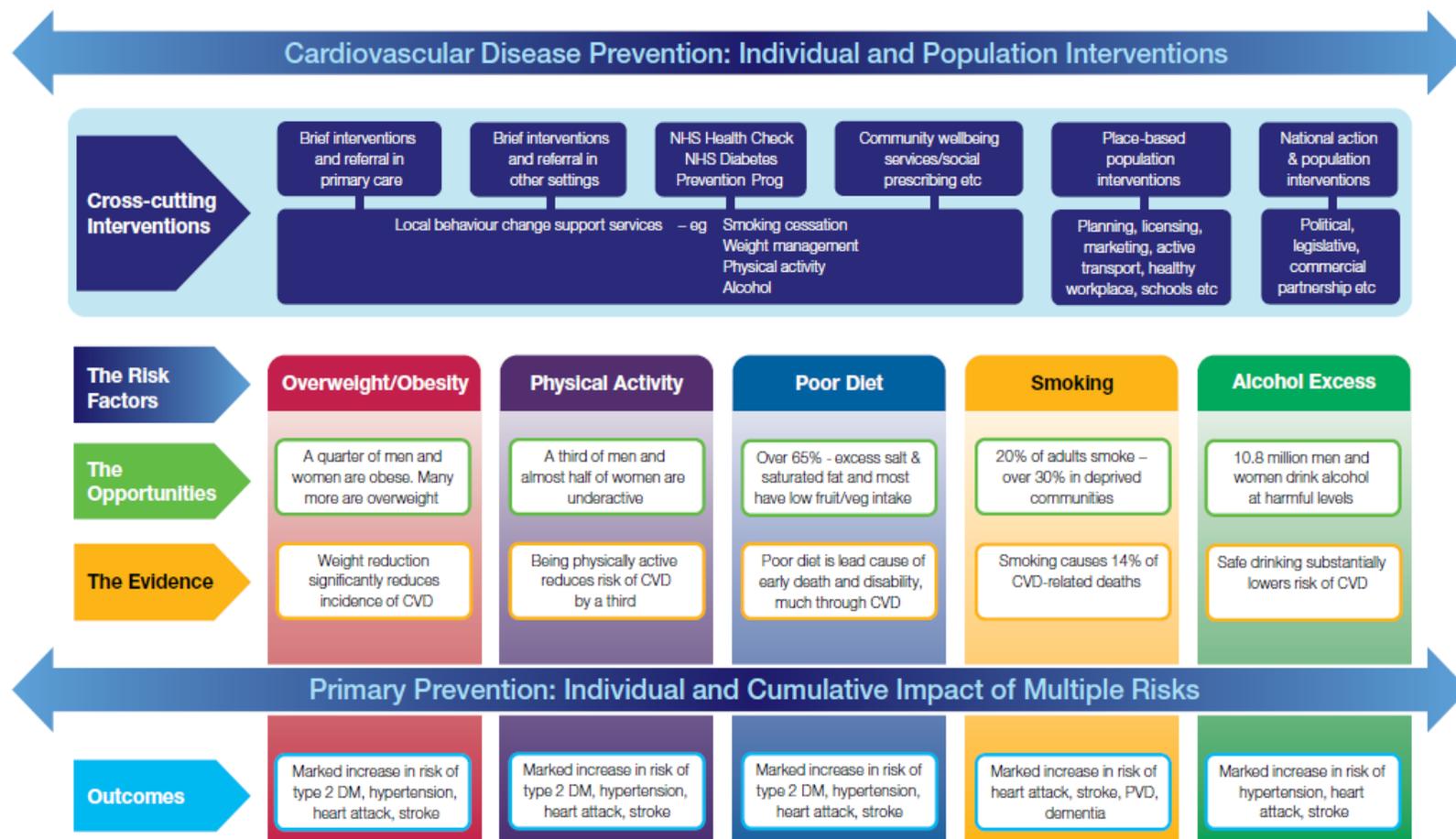


Figure 7: Summary of Cardiovascular Disease Prevention Individual and Population Interventions

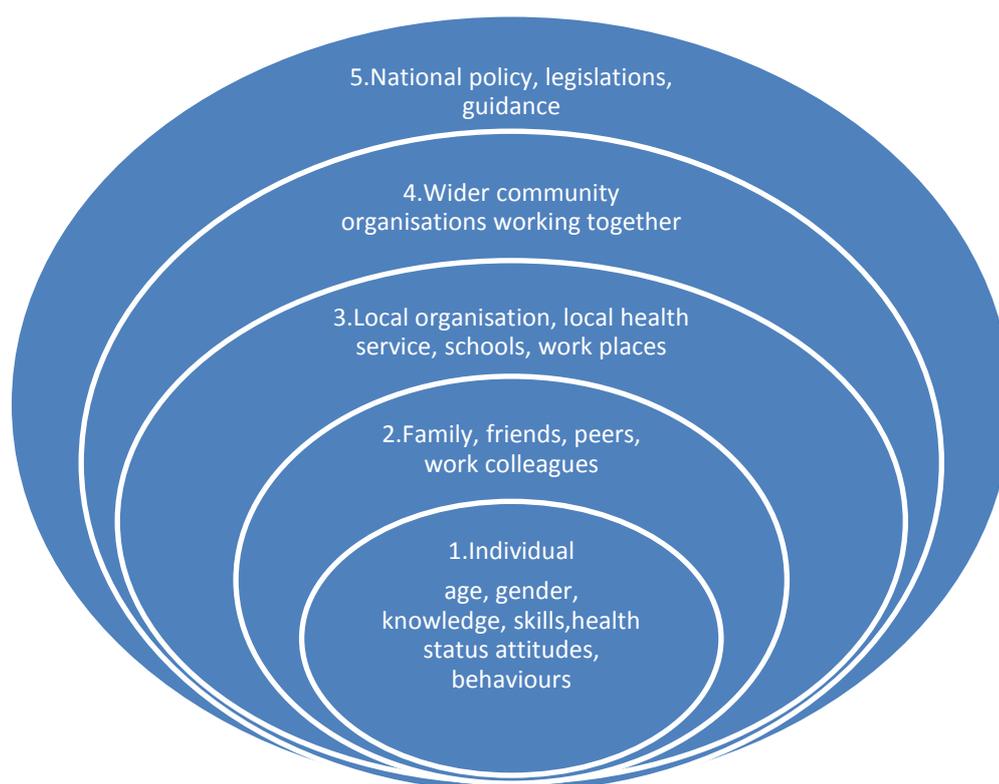


The socio ecological model as a focus for prevention programmes

The Social Ecological Model has been used in multiple areas of public health to improve our understanding of the interplay between different elements of society and how these will impact on health promotion initiatives. By using this model to organise examples of the different types of initiatives that will impact on CVD currently undertaken in England (Appendix 2) it is possible to better understand their context and approach. It is also a helpful way to frame each of the case studies set out in Section 5.

Originally developed to model human development in the 1920s¹⁵ the ecological model has been modified to apply to a range of different societal systems including politics, economics, communications and public health. Drawing from natural ecosystems, defined as the network of interactions among organisms and between organisms and their environment, social ecology is a framework or set of theoretical principles for understanding the dynamic interrelations among various personal and environmental factors. Applied to health promotion the Social Ecological Model (SEM) is a framework for understanding the multifaceted and interactive effects of personal and environmental factors that determine behaviors.¹⁶

Figure 8: Social Ecological Model



Source: Adapted from the Centers for Disease Control and Prevention (CDC), The Social Ecological Model: A Framework for Prevention, <http://www.cdc.gov/violenceprevention/overview/social-ecologicalmodel.html>

There are five nested levels of the SEM which illustrate the interplay between individual, interpersonal, local organisations, community and national influences. An approach that

incorporates combinations of interventions at several levels is more likely to achieve and sustain success over time than a single intervention.

Changing individual level behaviors and creating new social norms is achieved through removing bottlenecks and barriers to the new behaviors.

In terms of cardiovascular disease prevention Figure 9 below illustrates the multitude of factors at each level that are important in influencing lifestyle behavior, detection and management of CVD. Examples of policy, strategy or guidance in England that aim to address those factors at each of these levels are given in Appendix 2. This list is not exhaustive but gives a feel for the current principle activities taking place.

Figure 9 Examples of key influences on CVD risk factor reduction at each level of the socio ecological model.



The Social Ecological Model is a helpful way to understand the approach of each of the international programmes that were chosen to develop into a case study.

5 Case studies

Following the application of the methodology described in section 2.1, 10 CVD prevention programmes from across the world were chosen to be developed into case studies. The programmes were a mix of prevention approaches, some were single interventions and others were programmes with multiple initiatives. They were all multifaceted in that they targeted a range of modifiable CVD risk factors including those that would benefit from lifestyle change and/or optimisation of medical management. Some programmes also described in detail how people with undetected high risk of CVD were identified.

Five of the case studies focus on people with high risk conditions. Those with current CVD or a high risk of CVD are offered interventions to reduce their risk with the aim of averting further morbidity and impact on health services. The remaining five case studies are programmes with a combination of prevention approaches encompassing both prevention of CVD and reducing CVD risk factors. These programmes typically comprise multiple small initiatives under one programme umbrella.

Australia: Coaching patients On Achieving Cardiovascular Health (COACH)

The COACH Program® (Coaching patients On Achieving Cardiovascular Health) was developed in 1995 in Melbourne and is currently available in all Australian states. It focuses on increasing the engagement of individuals in understanding and improving their own health by increasing capacity and capability in local health services (Socio Ecological Model levels 1 and 3).

The programme looks for ways to reduce future cardiovascular disease (CVD) risk in those people already diagnosed with CVD or at high risk of an event. The focus is on lifestyle change and identifying 'treatment gaps' where medication has not been optimised. Health professionals, trained in the COACH system, mentor the patient on changes in lifestyle and support them in working with their usual doctor to ensure treatment is optimised for their particular circumstances, based on national guidance in order to reach target levels for their modifiable risk factors.

COACH is a structured telephone and mail-out health programme for people with chronic disease.

There are five stages to each phone coaching session:

- **Finding out what the patient knows:** ask patients questions to find out what they know about their risk factors and treatment for their risk factors
- **Education:** tell patients what they should know
- **Patient empowerment:** empower patients to ask their own doctor(s) to measure their risk factors; provide them with their test results; prescribe appropriate medication and alter doses/ drugs if appropriate
- **Action plan:** set an action plan to be achieved by the next coaching session
- **Monitoring:** check what action has taken place since the previous coaching session and use the information as the basis for the next session.

The COACH Program runs for approximately six months with telephone-based coaching sessions every four to six weeks. At the end of each session a letter detailing the topics discussed is sent to the patient and the doctor(s). Patients receive a written information pack

at the start of the programme. Coaches are all health professionals including nurses, dieticians, pharmacists, physiotherapists and occupational therapists. Patients need four or five coaching sessions to make progress and a full time coach can take on somewhere between 200 to 250 patients a year. COACH has been operating with BUPA in the UK for five years and has been adapted for UK guidelines.

A multicentre randomised controlled trial (n=792)¹⁷ has demonstrated greater improvements at six-months follow-up for patients receiving COACH in addition to usual care compared to usual care alone:

- COACH patients had significantly better total cholesterol, LDL cholesterol, BMI, saturated fat intake, proportion of patients taking lipid-lowering drugs, a higher proportion of people taking up walking since discharge and lower anxiety levels
- There was no significant difference at six months in HDL cholesterol, triglyceride levels, blood pressure, fasting glucose, smoking or depression score.

Longer-term follow-up of RCT¹⁸ participants has shown that improvements in risk factor status and adherence to medications following COACH are sustained for 18 months. For example:

- The percentage of patients achieving the total cholesterol target was 27% before COACH, 57% immediately after COACH and 52% 18 months later
- The percentage of patients undertaking physical activity was 70% before COACH, 94% immediately after COACH and 92% 18 months later.

A four-year follow up of RCT participants has shown that four coaching sessions over six months is associated with significant reduction in:

- Any-cause hospital admissions (by 16%)
- Any-cause hospital bed days (by 20%)
- Cardiac bed days (by 15%).

When assessing the published literature for the case studies COACH had more evidence based publications outlining the benefits to patients and the health economy than any of the other programmes. Detail of the evidence from some of these publications is outlined in the COACH case study (Appendix 3).

Finland: DEHKO and One Life

DEHKO, was launched in Finland as part of the Finnish National Diabetes Programme, established as a ten year programme running from 2000 to 2010 and aimed to improve self-care, prevent and reduce complications from type 2 diabetes. From 2011, the DEHKO programme expanded to include raising awareness and reducing risk of non-communicable diseases with common risk factors including cardiovascular disease (CVD), dementia, chronic obstructive pulmonary disease (COPD) and type 2 diabetes. This programme 'One Life' is supported by a collaboration of the Finnish Diabetes, Brain and Heart Associations and focuses on supporting people to make lifestyle changes to improve modifiable risk factors.

The principle elements of DEHKO are:

- Prevention of type 2 diabetes through:
 - A whole population strategy
 - A high risk population strategy
 - A strategy of early detection and management
- Improving quality of care of people with type 2 diabetes with a focus on reducing the risk of cardiovascular disease
- Supporting self-care of people with type 2 diabetes.

In addition One Life focusses on:

- Raising awareness of cardio-vascular health amongst the general population
- Improving the health outcomes of patients with cardiovascular disease through education and improved access to care.

One element of DEHKO was the FIN D2D project conducted in 2003–2008 supporting the implementation of the prevention of T2D in five hospital districts (about 400 health care centres/occupational health care clinics) in Finland with existing resources. This project was evaluated and showed:

- In the FIN-D2D area 25% of men and 48% of women were aware of the programme compared to a control area, where the proportions were 20% and 36% respectively
- Over a 12 month period of the high risk population intervention, those men and women who reported changing their physical activity and diet had a decrease in estimated 10-year risk for CVD events by 3.5% in men and 1.5% in women compared to an increase of 0.15% in men ($p < 0.001$, between groups) and decrease of 0.43% ($p = 0.027$, between groups) in women who did not make the changes
- There was no change in estimated mortality in individuals at high-risk of T2D.

Of people who attended the health check-ups and individual/group sessions, men reported:

- An increase in physical activity and improved dietary pattern (9.6%)
- An increase in physical activity (4.1%)
- An increase in improved dietary pattern (39.3%)
- No lifestyle changes (47.0%).

Women reported:

- An increase in physical activity and improved dietary pattern (14.2%)
- An increase in physical activity (3.8%)
- An increase in improved dietary pattern (39.2%)
- No lifestyle changes (42.7%).

The high risk population strategy in the FIN D2D study may be useful and applicable to primary health care settings' strategies relating to T2D and CVD. However, commitment to lifestyle changes in primary health care was rather low, which is why increased motivation and self-management of people at risk should be emphasised.

Detail of the evidence from some of these publications is outlined in the DEHKO case study (Appendix 4).

France: ESCAPE

ESCAPE, conducted in France from 2006-2008, was a pragmatic cluster randomised controlled CVD prevention trial¹⁹. It was designed to show whether a multifaceted intervention, aimed at general practitioners (GPs), could significantly increase the proportion of hypertensive patients at high risk of cardiovascular disease (CVD) who achieved all their recommended therapeutic targets. In terms of the socio ecological model this programme focussed on developing the local health capability and capacity to optimise management of people with a high risk of CVD (SEM level 3).

GPs in the intervention group received one day of medical education on therapeutic targets and strategies featured in the French guidelines on treatment of hypertension and type 2 diabetes, and were given a validated electronic blood pressure measurement device to improve the accuracy of blood pressure measurements and a leaflet that summarised targets and therapeutic strategies. GP participants were all members of the French National College of Teachers in General Practice.

To be included, patients had to be aged between 45 and 75 years, be treated for hypertension for at least six months, not have any known clinical signs or history of CVD, and have at least two cardiovascular risk factors from a list of eight including age, family history, smoking, type 2 diabetes, LDL or HDL cholesterol levels, known left ventricular hypertrophy and urinary excretion of albumin.

Key primary outcomes from the trial are:

- After two years, the proportion of patients achieving all their therapeutic targets increased significantly in both groups, but significantly more in the intervention group with between group OR (odds-ratio) of 1.89, (95% CI); 1.09 - 3.27, $p = 0.02$)
- Significantly more patients achieved their blood pressure targets in the intervention group than in the usual care group: OR 2.03 (95% CI; 1.44 - 2.88, $p < 0.0001$)
- Systolic and diastolic blood pressures decreased significantly more in the intervention group than in the usual care group, by 4.8 mmHg and 1.9 mmHg, respectively ($p < 0.0001$ for both SBP and DBP).

The authors suggest that the absolute difference in the reduction of SBP of about 5mmHg in the intervention group was clinically relevant because this difference could be expected to reduce stroke mortality by 20%, and mortality related to cardiac ischaemic events or long-term overall cardiovascular mortality by 15%.

For more detail about the evidence published from this trial see the France ESCAPE case study in Appendix 5.

The Netherlands: Vascular risk management

This programme assessed the effectiveness of adding internet-based, nurse-led vascular risk factor management to usual care for patients with clinically manifest vascular disease. In terms of the socio ecological model this programme focussed on development of the local health capability and capacity to engage people in reducing their CVD risk by changes in lifestyle and optimal management of their condition (SEM levels 1 and 3). This programme was part of a research trial with eligible patients, recruited²⁰ between 2008-2010, who had a

recent clinical manifestation of a vascular disease and a number of risk factors that were not at the recommended levels.

Key elements of delivery for patients in the intervention group included:

- A personalised website detailing the patient's risk factors that required additional treatment
- A separate internet page for each risk factor with a history of risk factor measurements, drug use, treatment goal, advice from the nurse, correspondence between nurse and patient and news items for that particular risk factor
- Patients were asked to log in fortnightly to submit new measurements (blood pressure, weight, smoking status, cholesterol) and to read and send messages
- Patients were encouraged to measure their own blood pressure at home or ask their GP to measure their blood pressure. The nurse posted patients laboratory forms for blood tests to measure plasma lipids and glucose
- Prescriptions for changes in drug regimen were posted to patients.

The key outcome of the programme after 12 months was that:

- When adjusted for differences in the baseline score, the relative change in Framingham risk score of the intervention group compared to the usual care group was not statistically significant at -8% (95% CI; -18% to - 2%)
- The difference between groups in patients reaching the low density lipoprotein goal was 18.4% (95% CI; 5.9% - 30.9%, p=0.004)
- The difference between groups in change in patients who quit smoking at 12 months was 7.7% (95% CI; 0.4 - 14.9, p=0.038).

The cost effectiveness analysis measured societal costs, quality-adjusted life-years (QALYs) and incremental cost effectiveness²¹. It concluded that the intervention in addition to usual care does not result in QALY gain at one year, but has a small effect on vascular risk factors and is associated with lower costs.

Treating patients at the point where they are likely to be concerned about mortality and may be self-motivated to take action was considered to be effective and lower cost. It was seen as productive for patient and nurse to work together collaboratively to reduce risk factors and for patients to take responsibility for their health and be part of the solution. It is also an opportunity to involve carers in cardiovascular risk management, rather than just surgery or medication straight after the event.

The ability of patients to see their results online as soon as they were available was a controversial step. One view was that patients may access results without health professional support which could be distressing. In some areas there is a delay of a day or a week between request to access results by the patient and the result being available to view by them to give health professionals time to check their significance.

After the programme was finished (1 year) the functionality of the website for patients to retrieve their own records was incorporated in to the local health electronic record system. During the trial people could enter their own numbers, lab results from the GP, or blood pressure taken at home, but they cannot do that in the current system.

Other features of the programme including an extended outpatient appointment to review risk factors and ongoing communication to review progress in changes to modifiable risk factors have been incorporated into the usual care of patients. Nurses can set up this system of enhanced support if they think it might be effective for patients coming through the CVD outpatients department after an event.

For more detail about the evidence published about this programme see the case study in Appendix 6.

Canada: The Cardiovascular Health Awareness Program (CHAP)

The Cardiovascular Health Awareness Program (CHAP) was developed in Ontario, Canada. CHAP aims to improve the process of care related to the cardiovascular health of older adults.

CHAP started as a research study piloting a community based model of cardiovascular disease (CVD) prevention in two communities. CHAP encourages older people to become more aware of their cardiovascular risk and to acquire self-management skills. The programme covers the individual, local organisation and community levels of the socio ecological model (SEM levels 1, 3, 4).

Key elements of CHAP are:

- Free cardiovascular risk assessment and education sessions held in community pharmacies
- Family physicians invite their patients over 65 to attend and sessions are also advertised in the local community
- Sessions run by volunteer peer health educators
- Community Health Nurses train the volunteers, provide quality control and are on call to assess people with elevated blood pressure
- During the sessions volunteers assist patients to take and record their blood pressure using an automated device and complete a CVD risk profile (based on blood pressure, previous hypertension diagnosis and lifestyle risk factors)
- Patients are told about the importance of reducing lifestyle CVD risk factors and sign posted to community agencies and resources for support
- Family physicians receive feedback on patients attending sessions.

Key outcomes:

- A longitudinal study of 13,596 people who attended ≥ 2 CHAP sessions in 22 communities reported average blood pressure for patients with initially high blood pressure improved from 142/78mmHg to 123/69mmHg over the 18-months follow-up²²
- Exposure to CHAP was associated with a 9% relative reduction in a composite measure of hospital admissions for acute myocardial infarction, stroke and congestive heart failure. This was equated to 3.02 fewer annual hospital admissions per 1,000 people aged ≥ 65 ²³
- There were statistically significant reductions favouring the intervention for acute myocardial infarction (rate ratio 0.87, 95% CI; 0.79 - 0.97, $p=0.008$) and congestive heart failure (rate ratio 0.90, 95% CI; 0.81 - 0.99, $p=0.029$)²³

- There was no significant difference for stroke (rate ratio 0.99 95%CI 0.88 to 1.12, p=0.89)²³
- When calculated as number of unique people admitted to hospital there was a significant difference favouring CHAP in newly prescribed antihypertensive drug treatment (rate ratio 1.10, 95% CI; 1.02 - 1.20, p=0.02)²³
- There was no significant difference in all-cause mortality (rate ratio 0.98, 95% CI; 0.92 - 1.03, p=0.38) or in-hospital death from CVD (rate ratio 0.86, 95% CI; 0.73 - 1.01, p=0.06)²³
- There was no significant difference in all-cause mortality or in-hospital death from CVD²³.

CHAP is a community-driven and community-owned initiative. It is designed to be a scalable service that minimises centralised support over time to achieve a long-term sustainable service. Since it began, the CHAP model has also been applied in a range of different types of communities where it is tailored to maximise participation from the target group. For example:

- South Asian community in Ontario, Canada
- Rural community in Alberta, Canada
- Social housing developments in Ontario, Canada
- Rural community in the Philippines.

For more detail about the CHAP programme see the case study in Appendix 7.

Japan: Healthy Japan 21

As part of the Healthy Japan 21 strategy, Japan has embarked on a national health policy change to prevent lifestyle-related diseases, including cardiovascular disease (CVD) and diabetes. National legislation requires employers and local governments to offer annual 'health check-ups' focussed on CVD, cancer and life style risk factors. There are financial incentives for employers, so uptake is typically high. The full Healthy Japan 21 strategy has developed initiatives at all five levels of the socio ecological model. One initiative outlined in this case study focusses on an intervention for those at high risk of developing either CVD or metabolic syndrome.

The basic health check-up includes: a blood pressure test, waist circumference, height and weight, blood tests (lipids, triglycerides, HDL and LDL cholesterol, blood sugar (HbA1c, fasting blood sugar), hepatic function, red blood cell count, haemoglobin level, and haematocrit), electrocardiogram and urine tests for chronic kidney disease. A questionnaire about lifestyle is focused on diet, tobacco smoking, physical activity, work life balance and family history of disease. Results of tests are graded A to D and sent to individuals and their employer (if the test was provided by the employer). For those at risk of CVD or metabolic syndrome the following intervention is offered which comprises:

- Sessions of 20 minutes or more for each individual or 80 minutes or more to a group, by a physician, public health nurse or registered dietician
- In the sessions a facilitator provides motivational support, explains the necessity of lifestyle improvement, the relationship between lifestyle and the health check-up data and the person's lifestyle

- An explanation is given about the advantages of lifestyle improvement and the disadvantages of failing to improve lifestyle
- The facilitator suggests changes needed to improve the lifestyle (e.g. diet and exercise) and sets goals for actions and signposts people to community resources for support
- The facilitator shows how to measure body weight and abdominal circumference
- A follow-up interview is performed if the facilitator and participant feel it would be helpful
- An evaluation of progress via interview, telephone or other method is carried out six months after the first session.

Evaluation²⁴ of this intervention reported:

- Clinically relevant reductions, i.e. >5% at year 3, were achieved in a significantly higher percentage of participants of the lifestyle intervention compared to non-participants (Waist circumference (WC), 21.4% vs 16.1% and BMI, 17.6% vs 13.6%; $p < 0.001$, each)
- Participants who received lifestyle intervention had significantly more improvements in metabolic syndrome, as compared with non-participants who did not receive a lifestyle intervention (reversal of metabolic syndrome: 47.0% vs. 41.5%, $p < 0.001$)
- After adjusting for confounders, lifestyle intervention was associated with an adjusted odds ratio (OR) of 1.33 (95% CI; 1.31 - 1.36, $p < 0.001$) for 5% reduction in WC; 1.36 (95% CI; 1.33 - 1.38, $p < 0.001$) for 5% reduction in BMI; and 1.31 (95% CI; 1.29 - 1.33, $p < 0.001$) for reversal of metabolic syndrome)
- The mean WC changes were -1.34 and -0.44 cm in participants and non-participants, respectively, with a difference of -0.89 cm (95% CI; -0.92 to -0.86)
- The mean BMI changes were -0.29 and -0.08 kg/m² in participants and non-participants, respectively, with a difference of -0.22 kg/m² (95% CI; -0.22 to -0.21)
- Participants, compared to non-participants, had significant reductions in systolic blood pressure (SBP, -1.15 vs -0.72 mm Hg), diastolic blood pressure (DBP, -0.97 vs -0.64 mm Hg).

The use of annual health check-ups for the whole population means that individuals, employers and health professionals can track the progress in reducing CVD risk factors and where improvements can be made.

For more detail about the evidence published about this programme see the case study in Appendix 8.

United States: Franklin County

Franklin County is a low income rural community in Maine, USA. An integrated, community-wide comprehensive cardiovascular risk reduction programme was started in 1970 with a 40-year follow-up assessing the impact of risk factor improvements on reductions in morbidity and mortality.

The programme aimed to focus public, individual and health professional attention on the importance of long-term risk factor detection and control with initiatives at levels 1 to 4 of the socio ecological model. Key features of the programme through the decades include:

- In the 1970's the programme emphasised the detection and control of hypertension. Volunteer nurses and trained community volunteers ran screening, education and follow-up clinics in community centres
- Volunteer citizen and professional task forces initiated, promoted and staffed diverse projects promoting healthy eating
- The programme promoted various initiatives to increase physical activity and improve access to facilities
- In the 1980's the programme emphasised the detection and control of hyperlipidaemia using the same community-outreach model used for hypertension
- Between 1988 and 2011 a number of initiatives promoted smoking cessation. These were run by teachers, volunteer health professionals and high school students
- From 2000 nurses were located in medical practices to facilitate the care of complex patients
- The programme developed relationships with local media, with regular programme updates and features on health topics.

Health promotion projects later combined into a hospital-supported Healthy Community Coalition which served as the policy, co-ordinating and goal-setting body for the area's health education, promotion and prevention activities. Volunteer citizens and professionals formed regional task forces.

The main outcomes from the programme include:

- In Franklin County (part of the US state of Maine) mortality rates (age and income adjusted) decreased below Maine rates during 1970 to 2010, with the greatest differences coinciding with the peak programme activities²⁵
- From 1994-2006 Franklin County's observed hospitalisation rate was significantly lower than predicted by household income (observed vs expected difference -17 discharges per 1,000 population)²⁵
- The lower than expected hospitalisation rates were associated with \$5,450,362 (£3,919,300) reductions in total in and out of area hospital charges for Franklin County residents per year²⁵
- The proportion of people with treated and controlled hypertension improved from 1974/75 to 1977/8 (an absolute increase of 24.7%)²⁵
- The proportion of people with treated and controlled cholesterol levels improved from 1986 to 2009 (an absolute increase of 28.5%). People with more programme visits had better control²⁵
- Smoking quit rates (ever smokers who report they have quit) improved from 48.5% in 1994-5 to 69.5% in 2006-10, with Franklin County quit rates significantly higher than those seen in Maine and the US.²⁵

The programme responded to changing demographics and financial support by taking the service to the people. For example, senior citizens initially had access to free grant-supported buses to attend community blood pressure clinics. When this transport became less available, the programme took the service to seniors' group meetings. When attendance at these meetings diminished, the programme used a donor-sponsored mobile van that took services to a wide variety of locations including shopping centres. This mobile service offered risk factor assessment, referral and coaching.

For more detail about the evidence published about this programme see the case study in Appendix 9.

United States: New Ulm Heart Beats Back

New Ulm is a small community of 17,000 people. Local health organisations were keen to track the cardiovascular health of the population before and during the implementation of community wide interventions. The Health of New Ulm (HONU) project implemented individual, family and organisational and community level interventions (levels 1 to 4 of the socio ecological model) in order to influence behaviour and reduce modifiable cardiovascular disease (CVD) risk factors.

HONU gathered cardiovascular risk data either from electronic records or from community based CVD risk assessments held three times a year in New Ulm

- People at risk of CVD or with pre-diabetes were assigned a health coach to support lifestyle change
- Families were invited to come together once a month and do physical activity and cook together and take part in taste testing
- HONU worked with employers to support them to offer health and wellness activities in the workplace
- A systematic method was used to assess how nutritionally healthy all food outlets were and supported a shift to more healthy options including smaller portion sizes
- HONU implemented community health challenges around diet and activity
- The project worked with local government on integrating a health approach when planning changes to the built environment
- Safe walking and cycling routes to school and other school based activities were promoted to parents and children.

Part way through the 10 year programme funding period, plans for ongoing sustainability were put in place to ensure continuation of the multifaceted approach.

Outcomes of a study assessing population-level CVD risk factors over a six year time frame before and during project implementation are outlined in Table 1.

Table 1: Change in CVD risk factors with the HONU project (Sidebottom et al 2016)²⁶

	2008-9	2010-11	2012-13
Blood pressure at goal*	79.3%	82.3%	86.4%
On blood pressure medication*	41.8%	43.5%	44.0%
Low-density lipoprotein at goal*	68.9%	72.3%	71.1%
High-density lipoprotein at goal	63.8%	59.0%	58.0%
Cholesterol at goal*	59.2%	64.2%	64.1%
Triglycerides at goal*	66.3%	68.7%	70.2%
On lipid medication*	25.3%	27.7%	29.1%
Not obese	56.0%	55.5%	55.1%
Fasting glucose at goal [†]	46.9%	49.7%	48.2%
On aspirin medication*	29.3%	33.5%	36.0%
Smoking	11.3%	12.6%	13.6%
Mean (±SD) ASCVD 10-year risk score*	12.1±0.2	11.6±0.2	11.5±0.2
ASCVD 10-year risk score <7.5%	27.8%	28.9%	27.5%

*Change between 2008/9 and 2012/13 p<0.001

[†] Change between 2008/9 and 2012/13 p=0.023

ASCVD – atherosclerotic cardiovascular disease 10 year risk score

The study by Sidebottom et al (2016)²⁶ shows improvements (p<0.001) in meeting blood pressure cholesterol and triglycerides recommended levels. There were also improvements in the proportion of people on recommended levels of blood pressure and lipid medications and mean reduction in CVD risk score. Other outcomes include an increase in CVD risk awareness and increased participation of members of the community in a range of initiatives focused on increasing physical activity, improving diet and reducing tobacco smoking.

The programme began with funded researchers dedicated to working with particular sectors of the community such as schools, health services, employers and food outlets. This funding was available for 10 years and the community is now in the process of taking on the full scope of the prevention programme. This is a long term approach which needs to be sustained and supported by all sectors of the community in order for a reduction in CVD risk factors to continue.

The New Ulm community is relatively small and it is not clear whether if implemented in a larger more varied population similar reductions in CVD risk would be achieved. This may however be an approach useful to more rural towns.

For more detail about the evidence published about this programme see the case study in Appendix 10.

Canada: Hypertension Canada

Hypertension Canada was formed in 2010 from the merger of the Canadian Hypertension Society, the Canadian Hypertension Education Program and Blood Pressure Canada. Previously, all three organisations had worked independently to improve hypertension diagnosis and management and had been involved in the development of the national hypertension strategy (Pan Canadian Hypertension Framework, 2011).

The main goal for Hypertension Canada is to ensure that Canada is effective in controlling hypertension within the population. The core objective of the initiative is reducing misdiagnosis by ensuring that all healthcare professionals in Canada are appropriately trained to diagnose hypertension and follow recommended guidance to manage the condition.

In order to achieve this there are three main areas of activity that fall into levels 3, 4 and 5 of the socio ecological model:

- Research - Building capacity and undertaking hypertension surveillance by monitoring the progress of hypertension treatment and prevention initiatives in Canada and establishing a Chair in the Canadian Institute of Health Research (CIHR).
- Education - Improvement of diagnosis and management through dissemination of annual evidence based guidelines and the establishment of a national public and professional education programme.
- Advocacy - Collaboration with stakeholders and governments to create supportive environments through improved awareness, prevention, and treatment that encourages the development of community interventions and programmes.

The October 2015 update to the 2011 Pan Canadian Hypertension Strategy detailed the progress made so far in achieving the various 2020 targets (Table 2). Effective management of those already diagnosed with hypertension has been more successful than the uptake of lifestyle interventions.

Table 2: Progress towards 2020 targets set out in the 2011 Pan-Canadian hypertension strategy

	2007-2009	2010-2011	2012-2013	2020 Target
Hypertension Prevalence	19.6%	21.8%	22.6%	13%
Awareness of condition	83.4%	82.9%	84.3%	95%
Diagnosed with hypertension with normal BP while not on antihypertensive drug treatment a (i.e. lifestyle control of hypertension)	8.5%	11.1%	6.6%	40%
Appropriate drug therapy	79.9%	79.2%	79.6%	87%
Blood pressure under control	65.9%	64.1%	68.1%	78%

There are recommendations to national and regional government to improve performance against these targets. This includes calling for a national physical activity strategy, a national healthy food policy and better implementation of the 2010 Sodium Reduction Strategy and for established and effective community programmes (such as CHAP) to be scaled up and sustained as well as new programmes to be developed for deprived and hard to reach groups.

For more detail about the evidence published about this programme see the case study in Appendix 11.

United States: Million Hearts

In 2012 the Million Hearts initiative was established by the US Department of Health and Human Services, the Centre for Disease Control and Prevention (CDC) and Centres for Medicare and Medicaid (CMS). This national initiative had a first phase, five year goal, of preventing 1 million cardiovascular events by 2017, and is now in its second phase, Million Hearts 2022.

Million Hearts works to align CVD prevention efforts across 50 states and 120 partners in the US by focussing on a small set of evidence-based priorities selected for their impact on heart disease, stroke and related conditions.

Promoting clinical quality improvement such as the implementation of the ABCS approach to CVD management (Aspirin when appropriate, Blood pressure control, Cholesterol management, and Smoking cessation) and meaningful use of health tools and technology such as electronic records for identifying and monitoring patient groups are key activities. Community approaches include introducing policies to eliminate artificial trans-fat intake, reduce tobacco use and reduce sodium intake. The approaches of the partners involved with Million Hearts cover levels 2,3 and 5 of the socio economic model.

Million Hearts 2022 continues these activities but with a new emphasis on achieving 70% participation in cardiac rehabilitation by 2022. Key to achieving these aims are:

- Health care teams prioritise detection, treatment and control and review data regularly to keep on track
- Using technology that includes decision support, patient portals, registries, and algorithms to find gaps in care
- Processes around treatment protocols, proactive outreach and finding patients with undiagnosed high BP, cholesterol or tobacco use
- Patient and Family Supports – training in home BP monitoring, problem solving in medication adherence, counselling on nutrition, physical activity, tobacco use, referral to community-based physical activity programs and cardiac rehabilitation.
- Health care professionals and health care organisations promote activities that reduce the likelihood of CVD such as increased physical activity, healthy eating and smoking cessation.

The core team, funded through CDC, works to distribute funding and support networks of partners, and information gathering. Partners join the network because they have a common aim to reduce the risk of CVD.

Organisations can apply for funding from Million Hearts for short term projects to implement an initiative that the organisation will sustain after this time. This funding tends to be for innovative projects such as helping health centres use their clinical data to identify potentially hypertensive patients, or work to improve numbers of people monitoring their own blood pressure. Funding can also be secured by taking part in the Medicare electronic health record incentive programme that encourages meaningful use of health records to identify people at risk of CVD and taking part in the ABCS challenge which rewards health care providers who achieve the overall 70% target.

Table 3: Progress towards Million Hearts ABCS and sodium intake targets

Measure	2005/06	2007/8	2009/10	2011/12	2013/14	2015/16
Aspirin use in people aged >40 (target 70%)	NR	NR	81.1%	NR	NR	NR
Blood pressure control Population level (target 65%)	43.4	48.4	53.4	51.9	54.0	57.7*
Cholesterol control with statins – % statin use among adults for whom its recommended (target 70%)	44.1	49.4	49.7	54.2	56.8*	59.9*
Smoking – prevalence (%) of current combustible tobacco use among adults (target 23%)	28.2	26.9	26.2	25.1	24.0	23.0*
Mean sodium intake among adults (mg/day) (target 2,900mg.day)	3,697	3,595	3,594	3,618	3,534	3,525

*projected figures, NR=not reported

Features of practices and health systems that achieved high levels of ABCS and hypertension control include:

- Using multiple strategies to achieve high BP control rates aligned with the World Health Organization’s Innovative Care for Chronic Conditions recommendations, and strategies recommended by the Centers for Disease Control and Prevention funded State Public Health Actions grantees and Million Hearts
- Having electronic health records with features such as electronic prescribing, patient registries, and clinical decision support tools
- Implementing hypertension treatment protocols. This helps standardize and coordinate care and facilitates a team approach to BP management
- Some practices were offered financial and other incentives to clinicians and patients to encourage greater attention to BP control by health insurers
- Engaging patients in BP home monitoring to assess progress, inform decision making, and encourage adherence to treatment regimens.

For more detail about the evidence published about this programme see the case study in Appendix 12.

Key features of a successful CVD programme

The key features of what makes a successful CVD prevention programme has been known for some time. The paper from the 33rd Bethesda conference of preventative cardiology held in 2001 published a checklist of strategies²⁷ which the authors suggested may result in a successful CVD prevention programme (Table 4). This is split into strategies aimed at optimising treatment and one to one support for lifestyle change for those at high risk of a first or subsequent CVD event or diagnosis (strategies 1 to 10) and those which are aimed at awareness raising of CVD risk, and encouraging community level changes (11 to 21). From the information gathered from peer reviewed publications, interviews and the marketing of the programmes on the internet a brief assessment was made about which strategies each of the programmes employed. The information gathered was not exhaustive so in some cases we may not know if particular strategies were used by some programmes.

Of the five programmes that focused on people with high risk conditions, COACH is employing the greatest number of strategies (9/11) that might increase the likelihood of a successful programme whilst ESCAPE were employing the fewest (2/11). DEHKO (7/11) and the vascular risk programme (6/11) and Hypertension Canada (5/11) employed some but not all of the strategies considered important for success.

Of the five community programmes, CHAP employs all 11 strategies whilst HONU and Franklin both employ 10/11 of the strategies which might confer success. Million Hearts utilise 7/11 and the particular case study initiative from Healthy Japan 21 employed 4/11 of the strategies.

Table 4: Strategies that may contribute to successful implementation of community CVD prevention programs (Ades et al 2002)

CVD prevention programme strategies for patient groups at high risk of a first or subsequent CVD event or diagnosis		COACH	ESCAPE	DEHKO	Vascular risk	Hypertension Canada
1	Have an enduring, consistent vision and mission	✓		✓		✓
	Be flexible in goals and objectives	✓		✓		
2	Integrate three health models: medical, public health, and health promotion	✓		✓	✓	✓
3	Strive to make enduring changes in systems, policies, and environment: to have a lasting impact					✓
4	Continually improve quality: Design - Implement - Measure -Redesign	✓		✓		
5	Go where the people are	✓			✓	
6	Focus on continuous tracking, follow-up, and improvement of modifiable risk factors among individuals and populations at risk for preventable adverse outcomes	✓	✓		✓	✓
7	Adhere to national guidelines; synchronize with national movements and topics	✓	✓	✓	✓	✓
8	Facilitate supportive, strong 3-person teams: patient, physician, professional nurse or other counsellor	✓			✓	
9	Produce best results by deploying teams of physicians and non-physicians using multiple intervention modalities to deliver individualized advice on multiple occasions	✓		✓	✓	
10	Promote integration of the community programme with primary medical care and community resources			✓		

		CHAP	Healthy Japan 21	Franklin County	HONU	Million Hearts
CVD prevention programme strategies for whole populations aimed at awareness raising and community based change						
11	Promote community ownership and openness to change	✓		✓	✓	
12	Mobilize, collaborate, network, and integrate with key stakeholders and community resources	✓	✓	✓	✓	✓
13	Employ multiple interventions through multiple channels: school, workplace, health care, community	✓	✓	✓	✓	✓
14	Develop and participate with coalitions: local, regional, state, and/or national	✓		✓	✓	✓
15	Identify and nurture local health professional and community champions	✓	✓	✓	✓	✓
16	Nurture local media advocacy	✓		✓	✓	
17	Know your community, and modify general principles to deal with local realities, including cultural and resource issues. One size does not fit all	✓	✓	✓	✓	✓
18	Seek reliable, long-term funding, immune from legislative and economic vagaries	✓		✓	✓	
19	Try to make financial and behavioural vectors point in the same direction	✓			✓	✓
20	Enable and reward health-promoting behaviour's by individuals and organizations	✓	✓	✓	✓	✓
21	Promote concept that community hospital has service-area responsibility for health promotion and disease prevention and management, in addition to acute treatment	✓		✓	✓	

6 Discussion

The 10 programmes used as case studies in this report all found some success in their application of a broad community based prevention approach and/or interventions to detect and manage people diagnosed with CVD or at a high risk of CVD developing. Interestingly, among all the case studies and indeed the wider list of programmes initially identified, none stood out as having a truly innovative approach. Indeed innovation was not an important factor in the success of the programmes, but rather developing a tried and tested approach that successfully engaged relevant stakeholders, that could be sustained in the long term and readily transferred and tailored to other communities, appears to be more important.

Ades et al (2002) considered that the thoughtful systematic application of interventions and sustaining programme momentum, particularly in the face of economic decline, remained a major challenge. Whilst all the case studies used some strategies included in the checklist in Table 4, not all of the programmes have become sustainable and made the transfer to other communities. However, three programmes, CHAP, COACH and HONU, employed the most strategies and also focussed on sustainability. COACH and CHAP also focused on applicability to other populations.

All the programmes employ some elements that Ades et al (2002) propose contribute to a successful CVD prevention programme. For CVD prevention to be successful it helps if 1) people are aware of the need and possibilities in relation to CVD reduction, 2) those at particular risk are detected and their risk factors are identified, and 3) strategies for reducing those risks are effective. Useful learning points from the case studies are discussed below in relation to these three headings.

Whole population approach to raising awareness and changing lifestyle

A whole population approach to raising awareness is important as a first step to reducing CVD and to reaching the maximum number of people. Several case studies were built around a whole population approach and this was most clearly described in the literature by the HONU project although there were descriptions of community centred population approaches with the Health Japan 21, Franklin County and DEHKO case studies.

The HONU project looked at a small community and applied a multifaceted approach to impact lifestyle and the development of healthy behaviours. HONU employed all 11 community strategies (numbers 11 to 21) from Table 4. An overarching steering group comprising representatives from local government, large employers, chamber of commerce, local health services, public health, schools, supermarkets and restaurants developed a strategy to improve the health of their community. From this steering group 11 action teams are formed who plan and implement initiatives specific to the need of their community across all sectors. Each person on the steering group has their role written into their job description by their employer so when anyone moves to a different job there will be a replacement on the steering group. The steering group is also responsible for raising funding for initiatives either by applying for national or regional funding for specific projects or raising it within the community. Volunteers from the community were key to implementing the initiatives. The initiatives involved activities in all sectors of the community for example; families invited to the school domestic science rooms for cookery classes and taste testing; a range of school based challenges for children; the offer of workplace lifestyle change courses lasting 6 to 8

weeks; workplace health assessments and heart screenings; a range of community based events; food outlet challenges to improve healthy options offered to people and working with national planning experts to make safety recommendations in the streets and built environment.

This model could be an option in UK rural areas or towns where the town or district council was keen to make a difference and where all key stakeholders could be represented. The leadership group for each community could report into the town or district council and from there to the local Health and Wellbeing Boards via public health teams. Well organised communications and strong leadership from all sectors of the community were seen as key elements to the success of the programme.

HONU was successful because there was very strong community engagement and mobilisation and the community felt empowered to make changes that worked for them. This empowerment in part was put in train by the initial research funding and a clear focus on sustainability and incorporating the work into the mainstream business of the community.

Local authorities in England have a key role to develop strategy and facilitate health improvement in the community and individually may be more or less successful in employing some or all of the community strategies in Table 4 (numbers 11 to 21).

A focus on school and workplace support for people to undertake activities to help reduce CVD risk factors would be helpful. There is some guidance for the NHS as an employer (NICE, 2015) about creating healthy NHS workplaces but there could be more focus on implementing the guidance for the benefit of employees. Some workplaces have developed their own initiatives, giving out step counters to encourage more physical activity and offering bike to work schemes. Overall, there is a lot of potential to develop workplace schemes further to encourage health education sessions, physical activity, healthy eating options and healthier ways to undertake desk based work such as standing desks and treadmill workstations. For schools there are some marketing and teaching resources available for teachers and some support from Sport England and the Youth Sport Trust to help people achieve in sport however there may be other ways physical activity can be built into the school day and a stronger focus on healthy eating and preparing healthy food across the year groups.

It will be interesting to see the outcomes of the 'Building Healthy Partnerships', initiative in eight sites in England, where funding is provided to enable Sustainability and Transformation Partnerships (STPs) to engage with people in the community and the Voluntary, Community and Social Enterprise (VCSE) sector to determine wellbeing and self-care priorities locally. The self-care programme has a dual focus combining relationship building with agreeing and implementing joint action and runs from April 2017 to June 2018.²⁸

Detection of people with high risk of CVD

Detection of people with either a high risk of CVD or risk factors that could be improved by lifestyle change (e.g. hypertension) in England is primarily in an NHS setting through presentation with symptoms, GP case finding, the NHS health check and results from tests taken during a hospital visit. A pilot by BHF to test wider models of delivering blood pressure testing within the community is in the process of being implemented. This includes community assets such as pharmacies, barber shops, football clubs, libraries, community

centres and via partnering with other initiatives such as Fire & Rescue Service Safe & Well programmes. Two national case studies Million Hearts and Hypertension Canada were focused on the detection of people with a risk of CVD through the health system by education and training of health professionals, development of credible evidence based guidance, facilitating the collaboration of partner organisations and in the case of Million Hearts, financial incentives. Detection of CVD risk has improved in areas where there have been financial incentives to make meaningful use of electronic health records. Some elements of these initiatives are utilised in England such as using algorithms to identify people at risk of CVD and the development of evidence based guidelines.

Many of the case studies, CHAP in Canada, HONU and Franklin County in the US, DEHKO, in Finland, Healthy Japan 21, Hypertension Canada and Million Hearts aimed to identify people in communities with a high risk of CVD and those with risk factors that could be improved by lifestyle change. The promotion and implementation of an annual health check by employers in Japan with financial incentives for high uptake, leads to a programme that tracks most of the population every year. This top down approach can lead to employers using the information to make work related decisions about employees depending on their health check result and engagement with interventions offered.

Some elements of the Japan model may be less generalisable to a UK context, such as the sharing of test results and subsequent actions with employers. A model more obviously applicable to the UK is the one developed in Canada (CHAP). It is a community-driven and community-owned initiative designed to be a scalable service that minimises centralised support over time to achieve a long-term sustainable service. The basic premise is that if people can be encouraged to come to community settings where volunteers can help them take their blood pressure and ask them about their lifestyles to assess CVD risk in a systematic way, then it is an opportunity to raise awareness about what their results mean and how they can reduce their CVD risk. In this way all adults in the community can get to know their numbers whilst detection of those at high risk of CVD and referral will improve.

This initiative ran clinics out of pharmacies who had signed up to participating in the programme. Volunteers were recruited and trained by a nurse coordinator and clinic sessions were held in pharmacies in rotation. In addition to education about CVD risk factors, people have a CVD risk assessment using a questionnaire and they are assisted by volunteers to take their own blood pressure using an automated monitor. Those meeting the criteria for high risk of CVD and requiring treatment are referred to their GP. Those who need to change lifestyle in order to reduce CVD risk factors are given information about what community resources are available. The target population for the programme were those aged ≥ 65 and volunteers were aged matched to this group. All those aged ≥ 65 were invited to go to a session personally by the GP practice, a strategy known to elicit a higher participation rate which is also used in the UK to invite people to take up the offer of NHS screening (e.g. cervical, breast and bowel screening). However any adult could attend the sessions which were advertised in the community. The CHAP model has been applied to different communities with different requirements with the core principles being:

- Go to the people in the community
- Risk factor detection in the community is non-medicalised (i.e. do-it-yourself with help from trained volunteers) but there are clear protocols and routes into a health care setting when necessary

- Education, detection and signposting to community resources happen within the risk factor detection sessions
- Use of peer volunteers where possible.

This case study illustrates how it can be beneficial to use wider professional groups and lay people to deliver interventions whilst also linking the programme into primary care. This model could be used within England, commissioned by the existing Local Authority and Clinical Commissioning organisations or Accountable Care Systems (ACS) that are coming on line. The service would be run by a small team such as a nurse co-ordinator and administrative support who would run the programme by:

- Recruiting pharmacies
- Recruiting and training volunteers
- Engaging the support of GP practices
- Helping run clinics
- Ensuring referrals of people with high risk of CVD were made to the relevant GP.

This is certainly feasible in England and the generic model has been employed successfully in communities in Canada, the Philippines, in Asian communities and rural communities.

Prevention for people at high risk of a first or subsequent CVD event or diagnosis.

For people who have been identified with a high risk of a first or subsequent CVD event the most common intervention described by the case studies was the delivery of and training of clinical staff in one to one or group counselling and motivational interviewing. DEHKO and Healthy Japan 21 both focussed on delivering lifestyle counselling and motivational sessions to educate and encourage people to make lifestyle changes either as individuals or in group settings. The Vascular Risk Management programme supported patients who had had a CVD event with a one hour session with the vascular nurse to identify where their CVD risk could be reduced. Patients were encouraged to make changes to their lifestyle, self monitor and record results and changes in CVD risk factors over a period of time. A website was developed as a resource for patients and they were able to contact the nurse and ask for advice by email. ESCAPE focused on one day of GP training and how that translated in a change of patient management in terms of systematically talking to patients about exercise, diet and adherence to drug treatment and tracking changes in patient CVD risk factors. Two national case studies Million Hearts and Hypertension Canada both emphasised training of health professionals and adherence to guidelines. Million Hearts aimed to improve clinical quality by choosing a limited number of evidence based interventions known to make a difference (ABCS). They then worked with partner organisations to ensure the agreement of standards, and the addition of data items to national data sets for surveillance and research purposes. To ensure progression towards the standards financial incentives to meet targets, short term funding of projects and fostering collaboration between partners has been important.

The COACH approach has been used extensively in Australia and has the most evidence of all the case studies with two decades of reporting on clinical and cost effectiveness. It has been used for a range of chronic conditions but also for people at risk of developing chronic conditions who already require medication such as people with hypertension. Once a condition has been diagnosed, the aim of COACH is to ensure that a nurse works with the

patient to educate and identify the areas of CVD risk that can be reduced. These could be losing weight, increasing physical activity or empowering the patient to query their medication with the GP if it does not follow national guidance.

A combination of the COACH programme where trained nurses support patients with phone coaching and training for GPs similar to the ESCAPE case study might be a helpful combination of initiatives to implement together. The continuing professional development (CPD) would help refresh GPs understanding of the current UK guidance and available prevention tools and COACH would introduce patients to self care, lifestyle change resources, monitoring and understanding their medication. In this way the communication between patient and GP may be more useful and support the initiative around Making Every Contact Count in England. This would enhance the effectiveness of primary care in facilitating patients to adhere to their medication and put in place strategies to make lifestyle changes to reduce future CVD risk.

This approach could be commissioned by CCGs or the Accountable Care Systems that are currently emerging in England, with CPD being offered in ways that are as accessible as possible.

7 Conclusion

The case studies described in this report offer alternative models to CVD prevention than those currently implemented in England. All the case studies showed some success in reducing CVD risk factors but some programmes were more applicable and likely to be sustainable in a UK setting than others. The most successful three programmes identified here from the evidence available (HONU, CHAP and COACH) all have a very strong community focus although they are targeting different elements of prevention. They are using schools, workplaces, community centres, pharmacies, or peoples own homes to deliver the programme. HONU has the broadest approach drawing on all sectors of the community, whilst CHAP has a more focused approach running community clinics to detect CVD risk factors in the local population and COACH offers support in management of risk factors by phone to people in their own homes. Going to where the people are, empowering individuals and the wider community with information and an understanding of CVD risk, that they can monitor themselves, is clearly important in the success of the programmes.

All three programmes built in mechanisms for ensuring that they were sustainable in the long term with minimal continued investment which is a particularly important consideration, given the constraints of resources at the current time. Those case studies that were able to achieve this, while at the same time succeeding in reducing CVD risk, are arguably the most likely to be usefully adapted for use in England and the wider UK. They were also the case studies that focused on long term sustainability from the outset, and we suggest that this should be central to implementation of any changes that follow from this work in the UK.

One point that comes out strongly from many of the case studies is the large amount of overlap between prevention of CVD and other long term non-communicable diseases, and the fact that improvements in CVD prevention have the potential to impact on other diseases that are currently major causes of morbidity and mortality in the UK, such as diabetes, dementia and cancer.

8 Appendices

Appendix 1: Framework for information gathered for CVD prevention case studies from interviews and programme documentation

	Elements of model by Van Olmen et al (2012)	Questions
1	Goals and outcomes	What are the goals and outcomes of the intervention? (e.g. Raised awareness, Reduced mortality or morbidity, reduction of variation in risk factors such as blood pressure, clinical effectiveness - are the changes in outcomes recorded and if so what are they, maximise return to shareholders)
2	Values and principles	What are the driving values and principles of the organisation putting the programme in place? (e.g. equity, sustainability, choice, autonomy, security and protection; efficiency and effectiveness; maximization or optimization)
3	Service delivery	What is/was the time frame for the programme? (e.g. Fixed or ongoing, length of fixed programme, any follow up)
		What is the type of intervention and mechanism? (e.g. Health promotion local, mass media, health checks/screening (direct invitation to individuals, opportunistic testing), pharmaceutical treatments, case finding)
4	The population	Is the intervention targeting a broad or narrow population? (Local or national level, size of target population, geography, characteristics of population/population sub group – all adults or those with specific high risk factors specific conditions , behavioural and/or medical risk factors)
5	The context	How does the approach of the programme fit with the overall CVD risk in the population?
		Is this programme part of a wider suite of programmes (focussed on individual, relationship, community, society)?
6	Leadership and governance	Who is signing off the project? (e.g. National CVD lead, Insurance company, Public health lead, Hospital Medical Director)
		How is governance of implementation and running of the programme achieved (e.g. steering group, to what level?)
		Have any safety issues been flagged?

		Is there any formal quality assurance to ensure agreed standards are met?
7	Finances	How was the intervention funded (e.g. private investment, local health commissioners, National commissioners, Charitable)
8	Human resources	Who delivers the function? (e.g. primary care physicians, nurses, consultants, local public health teams, pharmacies, national programme staff)
9	Infrastructure and supplies	Are there significant back office functions? (e.g. to organise lists of people to contact, mail out invitations to people to participate, is there any specific equipment needed? (e.g. Blood pressure monitors, ECG machines)
		Where and how is the intervention delivered (setting)? (e.g. Clinic room in GP surgery or hospital outpatients or ward, Community pharmacy, Village hall, phone, community centres, shopping centres, events e.g. football matches)
10	Knowledge and information	Did the workforce and or volunteers need training and what for
		How are outcomes collated and performance monitored (e.g. locally, standard national template collated at programme level, not at all)
		Is there any monitoring about what happens to patients next?
		Was cost effectiveness measured and if so how?
		Was an evaluation published and or is it ongoing?

Appendix 2: Socio ecological model and the influencers on health status with examples of policy, strategy, guidance and media campaigns used in England to promote CVD prevention

Influencers on health status	Policy/guidance/toolkit/media campaign	Hyperlink
Individual		
Awareness or accurate understanding of risk factors	PHE marketing campaigns, featuring 28 campaigns, 18 of which are linked to CVD prevention	https://campaignresources.phe.gov.uk/resources/campaigns
	<i>Social Marketing Strategy, 2017 to 2020</i> . Sept 2017, PHE	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/646715/public_health_england_marketing_strategy_2017_to_2020.pdf
Accessible format of information for individuals	<i>Making health and social care information accessible</i> . Update July 2015, NHS England	https://www.england.nhs.uk/wp-content/uploads/2015/07/access-info-upd-july-15.pdf
Individual attributes, e.g. gender, ethnicity, age, mental and physical capability and impact on approach to lifestyle change	<i>This Girl Can</i> . Sport England	http://www.thisgirlcan.co.uk/
Access to information about how to change behaviour	<i>Change4life</i> . PHE	https://www.nhs.uk/change4life
	<i>One You!</i> PHE	https://www.nhs.uk/oneyou
Understanding your own risk	<i>Heart Age Test – How Healthy is Your Heart?</i> NHS Choices	https://www.nhs.uk/conditions/nhs-health-check/check-your-heart-age-tool/
	<i>One You!</i> PHE	https://www.nhs.uk/oneyou

Family, peers and work colleagues		
Accurate information at the start of family life about healthy lifestyles	<i>Your Babies Health and Development Reviews</i> . Details of routine checks and reviews for babies. NHS Choices	https://www.nhs.uk/conditions/pregnancy-and-baby/baby-reviews/
	<i>Social Marketing Strategy, 2017 to 2020</i> . Sept 2017, PHE	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/646715/public_health_england_marketing_strategy_2017_to_2020.pdf
Work place colleagues views about taking up work place challenges	<i>Workplace Challenge</i> . National programme to engage workplaces in sport and physical activity, Chartered Society of Physiotherapists Network & British Heart Foundation	https://www.bhf.org.uk/health-at-work/inspire-workplace-health/physical-activity/workplace-challenge
Local organisations		
Local health services capacity and capability to optimise CVD detection and management	<i>Cardiovascular disease: risk assessment and reduction including lipid modification</i> . Updated Sept 2016, NICE Guidance	https://www.nice.org.uk/guidance/cg181
	<i>NHS Diabetes Prevention Programme</i> . NHS England, PHE, Diabetes England	https://www.england.nhs.uk/diabetes/diabetes-prevention/
	NHS Health Check	https://www.nhs.uk/conditions/nhs-health-check/
	<i>NHS Diabetic Eye Screening: Programme Overview</i> . Updated Feb 2017, PHE, Guidance	https://www.gov.uk/guidance/diabetic-eye-screening-programme-overview
	<i>Summary of Changes to QOF 2017/18 – England</i> . Quality Outcomes Framework for detection and	http://www.nhsemployers.org/-/media/Employers/Documents/Primary-care-contracts/QOF/2017-18/201718-Quality-and-outcomes-framework-summary-of-changes.pdf

	management of CVD within primary care	
	<i>GRASP-AF</i> . Quality improvement tool to help GPs interrogate their clinical data and assist in management and care of patients with AF and at risk of stroke. Primis, University of Nottingham	https://www.nottingham.ac.uk/primis/tools-audits/tools-audits/grasp-af.aspx
	<i>High Blood Pressure: Plan and deliver effective services and treatment</i> . Updated Mar 2015. PHE, Guidance	https://www.gov.uk/guidance/high-blood-pressure-plan-and-deliver-effective-services-and-treatment
	<i>Preventing ill health: Commissioning for Quality and Innovation (CQUIN) supplementary guidance</i> . August 2017, NHS England, Guidance. Addressing risky behaviours with a focus on alcohol consumption and smoking	https://www.england.nhs.uk/publication/preventing-ill-health-cquin-supplementary-guidance/
	Social prescribing by GPs	http://www.nhsalliance.org/wp-content/uploads/2015/10/Making-Time-in-General-Practice-FULL-REPORT-01-10-15.pdf
Employers engagement and promotion of healthy workforce	One You!	https://campaignresources.phe.gov.uk/resources/campaigns/44-one-you/resources
	<i>Creating healthy NHS workplaces: A toolkit to support the implementation of the NICE workplace guidance</i> , Sept 2015, NHS Employers, Toolkit	http://www.nhsemployers.org/-/media/Employers/Documents/Retain-and-improve/Health-and-wellbeing/Creating-healthy-workplaces-toolkit.pdf

Schools engagement in healthy activities, education and challenges.	<i>School Zone</i> . Marketing and teaching resources for teachers, school nurses and parents, PHE.	https://campaignresources.phe.gov.uk/resources/campaigns/40-school-zone
	<i>School Games</i> . Supports young people to compete and achieve in sport at school. Sport England & Youth Sport Trust	https://www.yourschoolgames.com/
Community		
Local authority health promotion plans	<i>Local health and care planning: Menu of preventative interventions</i> . Updated Feb 2018, PHE, Guidance	https://www.gov.uk/government/publications/local-health-and-care-planning-menu-of-preventative-interventions
Clinical Commissioning Groups	<i>Cardiovascular disease data and analysis: guide for health professionals</i> Guidance aimed at commissioners and service planners. Updated Feb 2018, PHE, Guidance	https://www.gov.uk/guidance/cardiovascular-disease-data-and-analysis-a-guide-for-health-professionals
	<i>CVD Prevention Pathway</i> . Shows improvement potential specific to each community. Updated Nov 2016, RightCare, NHS England	https://www.england.nhs.uk/rightcare/products/pathways/cvd-pathway/
Food outlets and limited offering of healthy options including cafes, restaurants, retail businesses, community facilities such as leisure centres	<i>Healthier catering guidance for different types of businesses – tips on providing and promoting healthier food and drink for children and families</i> . Mar 2017, PHE, Guidance	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/604934/Healthier catering guidance for different types of businesses.pdf
	<i>Strategies for Encouraging Healthier 'Out of Home' Food</i>	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/604912/Encouraging healthier out of home food provision toolkit for lo

	<i>Provision: A toolkit for local councils working with small food businesses.</i> Mar 2017, PHE, Toolkit	cal_councils.pdf
Limited green spaces or lack of perceived safety in available green spaces,	<i>Local Action on Inequalities: Improving access to green spaces.</i> Sept 2014, PHE	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/355792/Briefing8_Green_spaces_health_inequalities.pdf
Built environment not conducive to walking, cycling, or other physical activity	<i>Spatial Planning for Health: an evidence resource for planning and designing healthier places.</i> July 2017, PHE	https://www.gov.uk/government/publications/spatial-planning-for-health-evidence-review
Community facilities available for health and wellbeing activities	<i>A guide to community-centred approaches for health and wellbeing.</i> Feb 2015, PHE	https://www.gov.uk/government/publications/health-and-wellbeing-a-guide-to-community-centred-approaches
Community challenges	<i>One You.</i> Resources to support implementation of community challenges, case studies for 'using the brand' around England	https://campaignresources.phe.gov.uk/resources/campaigns/44-one-you/using_the_brand2
Moving to more active travel	<i>Working Together to Promote Active Travel: A briefing for local authorities.</i> May 2016, PHE	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/523460/Working_Together_to_Promote_Active_Travel_A_briefing_for_local_authorities.pdf?utm_source=The%20King%27s%20Fund%20news!
National		
Food industry approach to health to reformulation of foodstuffs	<i>Sugar Reduction: Achieving the 20%.</i> A technical report outlining progress to date, industry guidelines, 2015 sugar baseline levels in 9 food categories and next steps. Mar 2017, PHE	https://www.gov.uk/government/publications/sugar-reduction-achieving-the-20
	<i>Salt reduction: targets 2017.</i> Mar	https://www.gov.uk/government/publications/salt-reduction-targets-for-2017

	2017, PHE	
	<i>Calorie reduction: the scope and ambition for action.</i> Evidence on children's calorie consumption and details of the calorie reduction programme, principally for the food industry and public health bodies. Mar 2018, PHE	https://www.gov.uk/government/publications/calorie-reduction-the-scope-and-ambition-for-action
Political will to legislate about food, built environment, alcohol, and tobacco smoking	<i>Improving lives: the future of work health and disability.</i> Nov 2017, DWP & DoH	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/663400/print-ready-improving-lives-the-future-of-work-health-and-disability.pdf
	<i>Tobacco control laws: Analysis of legislation and litigation from around the world.</i> Includes England summary, updated Sept 2017	https://www.tobaccocontrollaws.org/legislation/country/england/summary
	<i>Nutrition legislation Information Sheet.</i> Oct 2015, DoH	https://www.reading.ac.uk/foodlaw/pdf/uk-15019-Nutrition-Legislation-Info.pdf
Evidence based approach to policy and guidance around CVD risk factors	<i>Childhood obesity: a plan for action.</i> Jan 2017, PHE, Guidance	https://www.gov.uk/government/publications/childhood-obesity-a-plan-for-action
	<i>Government Dietary Recommendations for energy and nutrients for males and females aged 1 – 18 years and 19+ years.</i> Aug 2016, PHE	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/618167/government_dietary_recommendations.pdf
	<i>Towards a smoke free generation: A tobacco control plan for England.</i> Objectives to be achieved by 2022.	https://www.gov.uk/government/publications/towards-a-smoke-free-generation-tobacco-control-plan-for-england

	July 2017, DHSC	
	<i>Alcohol: applying All Our Health.</i> Details interventions, outcomes, indicators & guidance. Updated Feb 2018	https://www.gov.uk/government/publications/alcohol-applying-all-our-health/alcohol-applying-all-our-health
	<i>The public health burden of alcohol: evidence review. Impact of alcohol on public health and the effectiveness of alcohol control policies.</i> Dec 2016, PHE	https://www.gov.uk/government/publications/the-public-health-burden-of-alcohol-evidence-review
	<i>Action Plan for cardiovascular disease prevention, 2017 to 2018.</i> Sept 2017, PHE	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/648190/cardiovascular_disease_prevention_action_plan_2017_to_2018.pdf
	<i>Everybody Active, Every Day: Implementation and Evidence Guide.</i> Sept 2014, PHE	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/353385/Everybody Active Every Day Implementation Evidence Guide CONSULTATION VERSION.pdf
	<i>Sporting Future – a New Strategy for an Active Nation.</i> Dec 2015, cross-government	https://www.gov.uk/government/publications/sporting-future-a-new-strategy-for-an-active-nation
	<i>High blood pressure: action plan.</i> How to identify, treat and prevent high blood pressure. Jan 2018, PHE, Guidance	https://www.gov.uk/government/publications/high-blood-pressure-action-plan
National public health marketing strategy	<i>Social Marketing Strategy, 2017 to 2020.</i> Collaborating with different partners to add impact and reach of initiatives taking into account current	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/646715/public_health_england_marketing_strategy_2017_to_2020.pdf

	changes in technology and digital media. Sept 2017, PHE	
National air pollution strategy by Department of Environment Food and rural affairs	<i>Clean air strategy May 2018</i> National strategy, targets and actions to reduce air pollution and people exposed to emissions between 2020 and 2030.	https://consult.defra.gov.uk/environmental-quality/clean-air-strategy-consultation/user_uploads/clean-air-strategy-2018-consultation.pdf
Construction industry approach to healthy environments	<i>Healthy New Towns network.</i> Network to develop best practice, case studies & guidance to help ensure all new housing developments embed certain principles, promoting health and wellbeing and securing high quality health and care services	https://www.england.nhs.uk/ourwork/innovation/healthy-new-towns/

COACHING PATIENTS ON ACHIEVING CARDIOVASCULAR HEALTH: THE COACH PROGRAM®

A CASE STUDY

PROGRAMME AT A GLANCE

The COACH Program® (Coaching patients On Achieving Cardiovascular Health) was developed in 1995 in Melbourne and is currently available in all Australian states. This prevention programme aims to reduce the impact of chronic disease on the individual and health system.

The programme looks for ways to reduce future cardiovascular disease (CVD) risk in those people already diagnosed with CVD or at high risk of an event. The focus is on lifestyle change and identifying 'treatment gaps' where medication has not been optimised. Health professionals, trained in the COACH system, mentor the patient on changes in lifestyle and support them in working with their usual doctor to ensure treatment is optimised for their particular circumstances, based on national guidance in order to reach target levels for their modifiable risk factors.

COACH is a structured telephone and mail-out health programme for people with chronic disease.

There are five stages to each phone coaching session:

- **Finding out what the patient knows:** ask patients questions to find out what they know about their risk factors and treatment for their risk factors
- **Education:** tell patients what they should know
- **Patient empowerment:** empower patients to ask their own doctor(s) to measure their risk factors; provide them with their test results; prescribe appropriate medication and alter doses/ drugs if appropriate
- **Action plan:** set an action plan to be achieved by the next coaching session
- **Monitoring:** check what action has taken place since the previous coaching session and use the information as the basis for the next session

The COACH Program runs for approximately six months with telephone-based coaching sessions every four to six weeks. At the end of each session a letter detailing the topics discussed is sent to the patient and the doctor(s).

Patients receive a written information pack at the start of the programme.



KEY TAKEAWAYS

- ▶ Started as a research project before expansion to public and private healthcare systems throughout Australia and other parts of the world
- ▶ Empowers and supports individuals to better manage their chronic disease and the associated lifestyle and biomedical risk factors
- ▶ Delivered by health professionals trained in the COACH system
- ▶ Programme standardised across training, access to Program software and generation of performance data

TARGET POPULATION

The programme targets people with chronic disease and is available in the public and private health care systems throughout Australia.

BENEFITS AND OUTCOMES

A multicentre randomised controlled trial (n=792) has demonstrated greater improvements at six-months follow-up for patients receiving COACH in addition to usual care, compared to usual care alone:

- COACH patients had significantly better total cholesterol, LDL cholesterol, BMI, saturated fat intake, proportion of patients taking lipid-lowering drugs, a higher proportion of people taking up walking since discharge and lower anxiety levels
- There was no significant difference at six months in HDL cholesterol, triglyceride levels, blood pressure, fasting glucose, smoking or depression score

Longer-term follow-up of RCT participants has shown that improvements in risk factor status and adherence to medications following COACH are sustained for 18 months. For example:

- The percentage of patients achieving the total cholesterol target was 27% before COACH, 57% immediately after COACH and 52% 18 months later
- The percentage of patients undertaking physical activity was 70% before COACH, 94% immediately after COACH and 92% 18 months later

A four-year follow up of RCT participants has shown that four coaching sessions over six months is associated with significant reduction in:

- Any-cause hospital admissions (by 16%)
- Any-cause hospital bed days (by 20%)
- Cardiac bed days (by 15%)

In an analysis of private patients receiving COACH in addition to usual care compared to usual care alone, there were:

- Significantly fewer deaths in the COACH group (absolute reduction in all-cause mortality of 5%)
- No differences in number of admissions, total days hospital stay and average bed days

An analysis comparing private patients receiving COACH in addition to usual care compared to usual care alone, found the average net cost impact over 6.35 years follow-up was a saving to the insurance company of \$12,115 (£6,822) per person.

PROGRAMME EXPERIENCES

- Patients need four or five coaching sessions to make progress
- Coaches are all health professionals including nurses, dieticians, pharmacists, physiotherapists and occupational therapists
- Full time coaches can take on 200-250 new patients per year
- COACH has been operating with BUPA in the UK for five years and has been adapted for UK guidelines

THE DETAIL

Context

The COACH Program® aims to empower and support individuals to better manage the symptoms related to their chronic disease and the associated lifestyle and biomedical risk factors and to reduce the impact of chronic disease on the individual and health system. The COACH Program is currently available in all Australian states.

Goals, Values and Principles

The COACH Program looks at where there are modifiable CVD risk factors that can be improved either by changes in lifestyle or optimising treatment and health coaches work with patients to reduce those CVD risk factors so they can achieve national recommended target levels while they work in partnership with their usual doctor. The COACH Program is 'risk factor outcome focused'.

The Queensland COACH Program describes the core components and distinguishing features of the COACH Program as:

- Coaches always initiate contact with the patients for coaching sessions – the programme does not depend on the patient contacting the coach
- Coaches identify where there are modifiable CVD risk factors which would improve with lifestyle changes
- Coaches identify the 'treatment gaps' in each patient's management – the gaps between the national guideline-recommended care and the care patient's actually receive
- Coaches educate, advise and encourage patients to close the 'treatment gaps' and achieve guideline-recommended risk factor targets whilst working with their usual doctor(s)
- Coaches encourage patients to work with their usual doctors to achieve the most practical medication regimens possible, in order to facilitate lifelong adherence to recommended medication

Targets are set for reducing modifiable lifestyle CVD risk factors and closing any 'treatment gaps'.

Population

The programme targets people with chronic disease. If a patient has more than one chronic disease, they are coached on the risk factors for all their conditions. There is no age limit in the current COACH Program.

Patients in the public health system are generally recruited in hospitals, but other referral routes are possible. For example, in the Queensland COACH Program referrals are accepted from all sources including public hospitals, general practitioners, medical specialists, other health professionals, cardiac rehabilitation services, 'Quitline' (smoking cessation) and self-referral. In the private health system, coaches use claims information to identify prospective patients and 'cold call' patients who have recently been hospitalised for chronic diseases. 99% of patients in public health systems and approximately 80% of people in private health systems choose to participate in the COACH Program.

Conditions included in the COACH Program include heart failure, coronary heart disease, hypertension, stroke, type 2 diabetes, pre-diabetes and COPD. The range of conditions covered can vary between Australian states.

Service Delivery

The COACH Program started in 1995 as a research project. In 2005 the COACH Program was rolled out as standard care in the Victoria public health system. In 2006 a limited company was formed to expand delivery and private health funds began using COACH from 2007. By 2009, the COACH Program was operating in the public health system in all Australian states and the majority of private health funds and had expanded overseas to Europe.

COACH is a structured telephone and mail-out health programme for people with chronic disease. A health professional trained in the COACH Program coaches patients to achieve and maintain the target levels for their modifiable risk factors and to take the recommended medications, according to evidence-based guidelines. There are five stages to each phone coaching session and the cyclical process illustrated in the figure below is repeated until the target level is achieved.

In the current Queensland programme:

- Patients receive an information pack with their first letter about their chronic condition
- A nurse contacts the patient at an agreed time and delivers information and education to help patients better manage their chronic disease. This includes discussion of biomedical and lifestyle risk factors and setting targets based on guidelines for specific diseases
- The programme runs for approximately 6 months with a call every 4-6 weeks
- At the end of each telephone session, a letter detailing the topics discussed is sent to the patient, the GP and/or their treating specialist
- Patients may contact their coach for advice and support between sessions

Figure 1: The five stages to each phone coaching session. The cyclical process is repeated until the target level is achieved



Source: Vale M. Leading the world in coaching for prevention of chronic disease. Available from https://www.health.qld.gov.au/_data/assets/pdf_file/0028/155197/coach-factsheet.pdf (Accessed February 2018)

Outcomes

The COACH Program was originally a research project and was initially evaluated in one single centre and one multicentre RCT with associated studies following patients for two and four years. Further published studies have looked at outcomes for COACH compared to usual care for private patients, outcomes for public health system patients compared to private patients and outcomes from the COACH Program in Queensland.

[A single centre RCT evaluation of the COACH Program \(Vale et al 2002\)](#)

The study included patients with coronary heart disease who had been hospitalised for revascularisation procedures who received the COACH Program plus usual care (n=121) compared to usual care only (n=124). Usual care included encouragement to attend a cardiac rehabilitation programme. Patients were excluded if they were >75 years or unsuitable for intensive coaching e.g. immobilized by their condition. 75% of participants were male. Only patients who provided follow-up data were included in the analysis (COACH n=107; usual care n=112). Patients were coached to achieve and maintain a target level of <4.5mmol/L.

- COACH patients had significantly lower total cholesterol levels at 6 months follow-up compared to usual care patients (5.00mmol/L vs 5.54mmol/L, p=0.0001)
- 31% of the COACH group achieved the total cholesterol target compared to 10% of the usual care group (p<0.01)
- COACH patients had significantly lower mean LDL cholesterol than usual care at 6-months follow-up (3.11mmol/L vs. 3.57mmol/L, p=0.0004)
- There was no difference in HDL cholesterol (1.12 vs. 1.16, p=0.4)
- The number of patients taking lipid-lowering drugs was similar in the 2 groups (63% vs 60%). There was also no significant difference in the dose prescribed
- A similar proportion of patients attended cardiac rehabilitation as part of usual care (53% vs 50%)

[A multicentre RCT evaluation of the COACH Program \(Vale et al 2003\)](#)

This study included patients admitted to six hospitals for coronary artery bypass graft, percutaneous coronary intervention, acute myocardial infarction or unstable angina (and discharged on medical therapy) or coronary angiography with later planned elective revascularisation. Patients were randomised to the COACH Program plus usual care (n=398) or usual care only (n=394). 77% of the patients were men with a mean age of 58.5 years. 113 patients dropped out (67 COACH and 46 usual care). The analysis was intention-to-treat.

At 6-months follow-up COACH patients compared to usual care only patients had:

- Significantly lower total cholesterol (4.48mmol/L vs 4.72mmol/L, p<0.001)
- Significantly more patients taking lipid-lowering drugs (94% vs 87%, p=0.002)
- Significantly lower LDL cholesterol (mean reduction 0.55mmol/L vs 0.21mmol/L, p<0.0001)
- Significantly greater reduction in BMI (mean reduction 0.5 vs 0.1, p<0.001)
- Significantly greater reduction in saturated fat intake (mean reduction 8.0g vs 4.9g, p=0.002)
- Significantly greater increase in people taking up walking since discharge (69% vs 44%, p<0.0001)
- Significantly greater reduction in anxiety level (p=0.03)
- There was no significant improvement in HDL cholesterol, triglyceride levels, blood pressure, fasting glucose, smoking behaviour or depression score
- A similar proportion of patients attended cardiac rehabilitation as part of usual care (53% vs 57%)

[A 2-year follow-up of COACH patients \(Jelinek et al 2009\)](#)

656 patients with coronary heart disease who completed the six month COACH Program in three hospitals were followed-up by telephone every six months for two years. Patients were 80% male, with a median age of 61 years.

Improvements in risk factor status and adherence to medications achieved after the COACH Program were sustained for more than 18 months after completion of the programme.

In table 1, all baseline to 6 months comparisons (before and after COACH) were statistically significant ($p < 0.05$) and all baseline to 24 month comparisons (except BMI) were statistically significant ($p < 0.05$).

Table 1: Baseline to 6 months comparisons (before and after COACH).

	Baseline	6 months	12 months	18 months	24 months
Percent achieved total cholesterol < 4.0 mmol/L	26.9%	56.9%	51.9%	51.2%	52.1%
Percent achieving target waist circumference	26.1%	42.5%	39.6%	40.5%	39.7%
Percent not smoking	82.3%	94.5%	94.6%	94.5%	94.7%
Percent taking renin-angiotensin antagonists	63.7%	74.7%	76.1%	76.1%	77.6%
Percent taking statins	88.0%	97.3%	96.3%	95.9%	94.4%
Percent undertaking physical activity	70.2%	94.0%	91.0%	92.3%	92.2%
Percent achieving fasting blood glucose < 6.1 mmol/L	65.3%	80.7%	75.4%	75.2%	73.0%
Percent achieving blood pressure $< 140/90$ mmHg	75.2%	87.5%	81.2%	78.1%	80.0%
BMI < 25 kg/m ²	21.2%	28.1%	26.2%	24.0%	23.6%

- There was no significant difference in the proportion of patients taking anti-platelet agents (95% at baseline and 24 months)
- The percentage of patients taking beta-blockers reduced over time (from 73% to 65%)

[A 4-year follow-up of COACH patients \(Vale et al 2004\)](#)

A 4-year follow-up of the 792 patients in the multicentre COACH RCT found that four phone coaching sessions over 6 months (i.e. two hours of coaching time):

- Reduced any-cause hospital admissions by 16% compared to usual care ($p < 0.01$)
- Reduced any-cause bed-days by 20% compared to usual care ($p < 0.001$)
- Reduced cardiac bed-days by 15% compared to usual care ($p < 0.01$)
- The reduction of 12% in cardiac hospitalisations compared to usual care was not statistically significant

[Case-control study on COACH outcomes from the perspective of a private health insurer \(Byrnes et al \(in press\)\)](#)

This analysis included patients aged < 85 with evidence from insurance claims of a CVD diagnosis. Outcomes based on six years of insurance hospital claims were compared for matched patients receiving COACH plus usual care and patients receiving usual care only. Patients in the control group were not aware that there was an intervention group. 512 patients were included in each group and were matched for age, sex, relationship status and prior hospital admission history (minimum 12 months history). The average age of participants was 75 years and approximately 70% of each group were male.

Key findings at a mean of 6.35 years follow-up:

- There were significantly fewer deaths in the COACH group (21.9%) than the usual care group (16.8%) (absolute reduction in all-cause mortality of 5.08% (95%CI -9.91 to -0.25, $p = 0.04$))
- There was a significant reduction in mortality for males receiving COACH compared to usual care (hazard ratio 0.70 (95%CI 0.53 to 0.93, $p = 0.014$)). The difference for females was not significant

- There was a significant reduction in mortality for COACH patients receiving ≥ 4 coaching sessions compare to usual care (hazard ratio 0.58 95%CI 0.42 to 0.81, $p=0.001$). The difference for COACH patients who received ≤ 3 coaching sessions was not significant
- Outcomes for number of admissions per participant per month, total days of hospital stay and average days of stay per hospital admission per participant favoured COACH patients but there was no statistically significant difference compared to usual care

A comparison of results for public health system and private patients (Jelinek et al 2014)

Australian patients in private hospitals are usually of higher socio-economic status than those treated in public hospital systems. This study compared outcomes for 2,266 patients treated in in public hospitals in two states with outcomes for 3,278 patients from four private health funds throughout Australia. The socioeconomic status of the two groups was confirmed by postcode analysis.

Greater improvements in the risk factors occurred in the public health group than in the private health group. These improvements were statistically significant for fasting blood glucose, body weight, smoking, physical activity, total and LDL cholesterol and diastolic blood pressure.

Table 2: Improvements in CVD risk factors public vs private health funding

	Public		Private	
	Before COACH	After COACH	Before COACH	After COACH
Total cholesterol (mmol/L)	4.4	3.7	4.2	3.6
Triglycerides (mmol/L)	1.5	1.3	1.3	1.1
LDL-cholesterol (mmol/L)	2.5	1.8	2.3	1.8
HLD-cholesterol (mmol/L)	1.0	1.1	1.2	1.2
Systolic blood pressure (mmHg)	121	120	125	124
Diastolic blood pressure (mmHg)	70	70	74	70
Fasting blood glucose (mmol/L)	5.5	5.3	5.3	5.3
HbA1c% (diabetics only)	7.5	7.0	6.9	6.8
Current smokers	19.5%	9.7%	2.4%	2.1%
Waist circumference (cm)	96.0	93	96.5	94
Weight (kg)	84	82	82	80
Alcohol consumption at target	78.3%	88.7%	75.7%	83.9%
Physical activity at target	45.4%	85.3%	54.6%	81.1%

Outcomes for the Queensland COACH Program (Ski et al 2015)

Outcomes for patients who completed COACH in Queensland were reported for coronary heart disease (CHD) ($n=1,962$) and type 2 diabetes patients ($n=707$). Patients were coached by registered nurses and 83% of the 3,235 patients who enrolled in COACH completed the programme, receiving a mean of 5.5 sessions (standard deviation 1.2). The mean age of CHD patients was 64 (69% male) and the mean age of diabetes patients was 60 (53% male).

There were statistically significant improvements in mean (standard deviation) values following COACH for all risk factors ($p\leq 0.001$) for both CHD and type 2 diabetes patients (Table 3).

Table 3: Improvements in mean CHD and type 2 diabetes risk factors

	CHD patients		Diabetes patients	
	Before COACH	After COACH	Before COACH	After COACH

Total cholesterol (mmol/L)	4.29 (1.27)	3.73 (0.96)	4.51 (1.26)	4.04 (1.02)
Triglycerides (mmol/L)	1.80 (1.84)	1.47 (0.97)	2.23 (1.84)	1.90 (1.24)
LDL-cholesterol (mmol/L)	2.44 (1.07)	1.83 (0.77)	2.46 (1.00)	2.04 (0.84)
HLD-cholesterol (mmol/L)	1.08 (0.35)	1.13 (0.34)	1.06 (0.30)	1.09 (0.30)
Systolic blood pressure (mmHg)	124.5 (16.3)	123.0 (13.3)	129.3 (15.7)	127.3 (12.8)
Diastolic blood pressure (mmHg)	71.4 (11.0)	70.2 (9.2)	74.8 (9.9)	73.4 (9.5)
Fasting blood glucose (mmol/L)	5.55 (0.90)	5.41 (0.92)	---	---
HbA1c% (diabetics only)	7.83 (1.80)	7.41 (1.43)	8.15 (2.06)	7.45 (1.54)
Current smokers	296	222	139	105
BMI (kg/m ²)	28.8 (6.0)	28.5 (5.8)	35.1 (9.5)	34.7 (9.1)
Weight (kg)	85.1 (20.2)	84.1 (19.5)	101.7 (28.5)	100.7 (28.1)
Alcohol (standard drinks per day)	1.4 (1.7)	1.1 (1.3)	1.3 (2.0)	0.9 (1.5)
Physical activity (minutes/week)	142.0 (170.3)	229.1 (238)	127.1 (197)	181.6 (177.1)

The proportion of patients taking medications significantly increased after the COACH programme for both CHD and diabetes patients ($p < 0.001$).

Table 4: Proportion of people taking medications before and after the COACH programme for CHD and type 2 diabetes.

	CHD patients		Diabetes patients	
	Before COACH	After COACH	Before COACH	After COACH
Statin	92%	93%	66%	78%
Beta-blocker	72%	72%	27%	28%
Antiplatelet agent	92%	93%	52%	59%
ACE inhibitor/ angiotensin receptor antagonist	77%	78%	63%	68%

Leadership and Governance

COACH started as a research programme. A limited company was formed in 2006 and by 2009 COACH was being delivered in the public health system in all Australian states and the majority of private health funds.

The COACH Program provides training and evaluation data for coaches, who are employed by healthcare organisations.

In the Queensland COACH Program, coaches perform a minimum of 60 coaching sessions per month to maintain competency. The Queensland Health Contact Centre conducts monthly quality assurance of phone coach sessions and patient letters. Session letters are reviewed by a trainer to ensure the documented advice follows the guideline recommendations and that formatting, structure and messaging are consistent across

trainers. A trainer reviews session call recordings with the coach during monthly quality review sessions and rates sessions against a best practice matrix.

Finances

The programme is delivered in-house by participating healthcare organisations.

A private insurer analysed the cost impact for matched patients who underwent COACH plus usual care (n=512) compared to usual care alone (n=512).

- The average COACH Program cost per participant was \$592 (£333)
- The average net cost impact to the insurance company of the COACH Program compared to usual care over a 6.35 year follow-up period was a saving of \$12,115 per person (£6,822)
- There was a significant difference in health care costs between COACH patients who received ≥ 4 coaching sessions (\$42,307; £23,826) and usual care patients (\$61,725; £34,754); a difference of \$19,418 (£10,931) per person ($p=0.006$). This difference was not significant for patients with ≤ 3 coaching sessions
- There was a significant difference in health care costs between male COACH patients (\$47,680; £26,842) and male usual care patients (\$66,627; £37,509); a difference of \$18,947 (£10,667) per person ($p=0.029$). This difference was not significant for female patients

(March 2016 costs, Australian dollars. Sterling costs calculated using March 2018 exchange rate)

The use of the COACH Program in the public health system is funded by the state government health departments.

The randomised controlled trials assessing the impact of COACH were funded by project/research grants.

Human Resources

The programme is delivered by qualified health professionals trained in the COACH system. Full time coaches can take on 200-250 new patients per year.

In the initial single centre study assessing the impact of the COACH Program, the first coaching session was the longest in duration with a median time of 20 minutes (range 5 to 45). Subsequent coaching calls were a median of 10-11 minutes long (range 3 to 66).

In the multicentre study assessing the impact of the COACH Program the median duration of the first coaching session was 30 minutes (range 6 to 200). The duration of subsequent calls was 20 minutes (range 5 to 50).

Infrastructure and Supplies

The COACH Program is delivered by telephone. Participants are primarily recruited in hospitals or through review of private claims data.

Knowledge and Information

Training

Nurses receive training in the application of the programme. The COACH Program provides training, software and support for qualified health professionals (employed by healthcare organisations).

In Queensland, coaches have 2 weeks face-to-face training in the principles and practice of the COACH Program and then undergo a 12-week preceptorship of intensive monitoring by experienced coaches where coaches are checked against set criteria. Training and delivery of the programme is standardised. Coaches are given continuing education when guidelines change and based on areas for improvement identified through quality assurance and programme evaluation.

Experienced coaches can undergo the 'Train-the-Trainer Coach Course' to become a trainer of novice coaches and conduct quality assurance activities.

Data

The COACH Program Software Application provides all key performance indicator data on the effectiveness of the programme. It includes patient baseline characteristics, patient uptake, discontinuation rates, achievement of guideline-recommended biomedical and lifestyle risk factor targets and adherence to guideline-recommended medications at entry to and exit from the programme. Relevant medical guidelines are incorporated in to the software application and are updated as guidelines change.

Organisations delivering the COACH Program receive six-monthly evaluation reports which include comparison with the national mean. Results are provided for individual coaches and organisations. The evaluation reports are used to review operations and improve the outcomes within each organisation through a continuous quality improvement process.

The COACH Program software also produces written summaries of each coaching session which are sent to patients and their doctor(s) and act as a record of progress. These are structured with headings which address each risk factor with the actual result, recommended treatment, target and whether the patient is meeting the target. Risk factor charts allow patients to track their progress towards achieving their risk factor targets.

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DEHKO – Development Programme for the Prevention and Care of Diabetes

A CASE STUDY

PROGRAMME AT A GLANCE

DEHKO, was launched in Finland as part of the Finnish National Diabetes Programme, established as a ten year programme running from 2000 to 2010 and aimed to improve self-care and prevent and reduce complications from type 2 diabetes. From 2011, the DEHKO programme expanded to include raising awareness and reducing risk of non-communicable diseases with common risk factors including cardiovascular disease (CVD), dementia, chronic obstructive pulmonary disease (COPD) and type 2 diabetes. This programme 'One Life' is supported by a collaboration of the Finnish Diabetes, Brain and Heart Associations and focuses on supporting people to make lifestyle changes to improve modifiable risk factors.



The principle elements of DEHKO are:

- Prevention of type 2 diabetes through:
 - A whole population strategy of awareness raising
 - A high risk population strategy encouraging people to undertake a brief risk assessment (The Finnish Diabetes Risk Score test [FINDRISK]). Those at high risk are encouraged to have a health check-up in primary care which includes an offer of education and support to reduce risk either with individual sessions or in groups.
 - A strategy of early detection and management
- Improving quality of care of people with type 2 diabetes with a focus on reducing the risk of cardiovascular disease
- Supporting self-care of people with type 2 diabetes

In addition 'One Life' focusses on:

- Raising awareness of cardio-vascular health amongst the general population
- Improving the health outcomes of patients with cardiovascular disease through education and improved access to care

This case study focuses on the DEHKO risk factor prevention strategy, the high risk population strategy and the more recent 'One life' initiative, which are the parts of the programme most applicable to a CVD prevention initiative in the UK.

KEY TAKEAWAYS

- ▶ The focus on risk reduction of diabetes through DEHKO has led to the development of a much broader approach of reducing risk of chronic non communicable diseases with 'One Life'
- ▶ For those people who received the intervention, there was a small reduction in the number of CVD events expected over the next 10 years

TARGET POPULATION

Whole population strategy aims to prevent metabolic syndrome and the risk factors for type 2 diabetes and targets the whole population. DEHKO has supported the whole population strategy but the main thrust of the project is on a high risk population strategy.

High Risk strategy aims to prevent and delay the development of type 2 diabetes (T2D) in individuals at high risk with a focus on close relatives of individuals with type 2 diabetes, women with a history of gestational diabetes, individuals with hypertension or elevated blood glucose or a disturbance of fat metabolism or metabolic syndrome, individuals with overweight or central obesity.

BENEFITS AND OUTCOMES

One element of DEHKO was the FIN-D2D project conducted in 2003–2008 supporting the implementation of the prevention of T2D in five hospital districts (about 400 health care centres/occupational health care clinics) in Finland with existing resources. This project was evaluated and showed:

- In the FIN-D2D area 25% of men and 48% of women were aware of the programme compared to a control area, where the proportions were 20% and 36% respectively
- Over a 12 month period of the high risk population intervention, those men and women who reported changing their physical activity and diet had a decrease in estimated 10-year risk for CVD events by 3.5% in men and 1.5% in women compared to an increase of 0.15% in men ($p < 0.001$, between groups) and decrease of 0.43% ($p = 0.027$, between groups) in women who did not make the changes
- There was no change in estimated mortality in individuals at high-risk of T2D

Of people who attended the health check-ups and individual/group sessions, men reported:

- an increase in physical activity **and** improved dietary pattern (9.6%)
- an increase in physical activity (4.1%)
- an improved dietary pattern (39.3%)
- no lifestyle changes (47.0%)

Women reported:

- an increase in physical activity **and** improved dietary pattern (14.2%)
- an increase in physical activity (3.8%)
- an improved dietary pattern (39.2%)
- no lifestyle changes (42.7%)

PROGRAMME EXPERIENCES

The focus on risk reduction of diabetes through DEHKO has led to the development of a much broader approach of reducing risk of chronic non communicable diseases with 'One Life'.

The high risk population strategy in the FIN-D2D study may be useful and applicable to primary health care settings when it comes to prevention strategies of T2D and CVD. However, researchers concluded that commitment to lifestyle changes in primary health care was rather low, which is why increased motivation and self-management of people at risk should be emphasised.

THE DETAIL

Context

The Finnish Diabetes Prevention Study (DPS) was one of the first RCTs showing the effect of relatively modest lifestyle changes to prevent type 2 diabetes. Based on results of DPS, a nationwide programme for the prevention of type 2 diabetes, DEHKO was launched in Finland as part of the Finnish National Diabetes Programme. This was established as a ten year programme and ran from 2000 to 2010.

DEHKO aimed to prevent type 2 diabetes and diabetes related complications and conditions; to improve the quality of diabetes care and to support the self-care of people with diabetes. DEHKO has supported the whole population strategy, but the main thrust of the project is on a high risk population strategy.

From the outset of the programme, diabetes was treated as a serious cardiovascular risk factor; “The second most important task is to agree upon measures to reduce the risk of CVD among people with type 2 diabetes – requiring a substantial change of attitude by the decision makers in the healthcare field and the care providers. The central message is that type 2 diabetes is by no means a “mild diabetic disease” but a fatal cardiovascular disease if all the risk factors are not properly treated.” (*Development Programme for the Prevention and Care of Diabetes in Finland, 2000-2010*, Tampere 2001).

The DEHKO programme was co-ordinated by the Finnish Diabetes Association, working with primary health care, specialised medical care, occupational health care, and the National Public Health Institute. It included FIN-D2D, a special programme for the prevention of type 2 diabetes.

From 2011, the DEHKO programme became ‘One Life’, which encompassed the Finnish Diabetes Association, Finnish Brain Association and the Finnish Heart Association. The programme was aimed at raising awareness in the whole population about all risk factors for common non communicable diseases including CVD, dementia, COPD and diabetes, with a focus on prevention, health promotion and seeing the person as a whole.

Goals, Values and Principles

- Prevention of type 2 diabetes through:
 - A whole population strategy of awareness raising
 - A high risk population strategy
 - A strategy of early detection and management
- Improving quality of care of people with type 2 diabetes with a focus on reducing the risk of cardiovascular disease
- Supporting self-care of people with type 2 diabetes

In addition ‘One Life’ focusses on:

- Raising awareness of cardiovascular health amongst the general population
- Improving the health outcomes of patients with cardiovascular disease through education and improved access to care

Population

Current figures according to the Finnish Diabetes Association website (March 2018) are that Finland has a population of 5.5 million. They estimate that there are 50,000 people with type 1 diabetes and about 300,000 people with type 2 diabetes in Finland. About 4,000 children under the age of 15 have diabetes. The number of undiagnosed cases of type 2 diabetes is estimated at 150,000. Approximately 10% of the population has diabetes.

Two strands of the DEHKO strategy targeting different groups are

- **Whole population strategy** aims to prevent metabolic syndrome and the risk factors for type 2 diabetes and targets the whole population DEHKO has supported the whole population strategy but the main thrust of the project is on a high risk population strategy.
- **High Risk population strategy** aims to prevent and delay the development of type 2 diabetes in individuals at high risk with a focus on close relatives of individuals with type 2 diabetes, women with a history of gestational diabetes, individuals with hypertension or elevated blood glucose or a disturbance of fat metabolism or metabolic syndrome, individuals with overweight or central obesity

'One Life' incorporates both the whole population strategy and high risk population strategy for those at high risk of CVD, type 2 diabetes, COPD and dementia.

Service Delivery

Whole population strategy

One of the programme goals was to raise awareness of diabetes and its risk factors in the whole population through various activities such as media campaigns and health fairs. No further information was available on how awareness raising through these routes was achieved.

High risk strategy

The general target of the FIN-D2D program conducted in 2003–2008 was to support implementation of the prevention of T2D in five hospital districts (about 400 health care centres/occupational health care clinics) in Finland with existing resources.

- There was a population wide promotion of screening using the modified Finnish Diabetes Risk Score test (FINDRISC) which can be completed through health care units, pharmacies, the internet and public campaign events.
- People eligible for the intervention were those who scored ≥ 15 points in the FINDRISC or had a history of ischemic cardiovascular events, gestational diabetes, impaired fasting glycaemia (IFG) or impaired glucose tolerance (IGT). They were offered support to reduce their future T2D risk. The initial intervention was an in depth health check-up.
- Health check-ups included:
 - in depth questionnaires about life style (tobaccos smoking, physical activity, diet)
 - an oral glucose tolerance test
 - a test for levels of total and high density lipoprotein cholesterol
 - a measurement of systolic and diastolic blood pressure (mm Hg)
 - use of antihypertensive medication, verified from prescriptions if possible
- Framingham Risk Score (FRS) was calculated for those ≥ 30 years and for those ≥ 45 the 10 year CVD mortality risk (Systematic Coronary Risk Evaluation (SCORE) was calculated.
- Participants were offered the opportunity to participate in individual or group-based lifestyle counselling in primary health care setting conducted by local nurses. The goal was to encourage them to change their lifestyle in the recommended direction and recognise risk factors in their own lifestyle.
- The topics of the individual counselling sessions were based on needs, and the focus was on physical activity, meal frequency, alcohol, fat and fibre intake, salt use, weight and smoking.
- The group sessions included weight maintenance and exercise groups and lectures on diabetes and lifestyle changes.
- Staff were given training for the purpose and for the practical implementation of the program. The programme was promoted in healthcare units which referred people into the programme.

The One Life programme:

One Life, established in 2011 after DEHKO ended, has been established on many of the same principles as DEHKO, with some developments. The programme has not been formally evaluated but discussion with a Project Manager at One Life provided some overview of aims and achievements:

- People have said that they lack money and time for their health, so there is an effort to show that this need not be an obstacle. One Life provides concrete aids to support small decisions that people make about their health every day e.g. small cards to deliver in seminars where people are sitting for a long time, reminding them to spread their feet, move around in their chair
- One Life organise a Health for All day, which includes a 'dream day of exercise', usually 10th May, which might include going to the gym, hiking, climbing etc. Around 2,000 people are thought to have organised an event that day
- Workplaces are engaged, and currently 800 workplaces receive a newsletter every Monday morning outlining exercises and ideas for health. People who attend the workplace activity are sent further information about how to improve their health
- 'Dream Day of work' is normally held on 5th October and encourages workplaces to promote workers' health. Activities include webinars, sharing a healthy breakfast together, exercise tasters, competitions, etc.

Where the general public has been targeted, the focus has been on people at risk or who already have diabetes, heart disease or a brain related illness:

- Gestational diabetes courses are run for pregnant women. This is a free 3 week web-based course on health, diet, exercise and relaxing. The course runs monthly and there are 50-60 attendees on the course at a time
- There is a three week web-based course for women who have previously had gestational diabetes. The course runs every second month, and is very popular, with around 250 people on the course at a time
- For people newly diagnosed with type 2 diabetes there is a nurse-run web-based course. The course is available to 30 people at a time, and they are able to discuss lifestyle, diet and exercise.
- The web courses were viewed by One Life as one of the most effective interventions. The courses are of good quality, engagement is high and feedback has been positive
- Campaigns in the community have included targeting high blood pressure. Events where people can have their blood pressure measured have been popular. In 2017, 100,000 people had their blood pressure measured during a one week campaign
- Finnish television is required to offer public health associations some time slots for free, which One Life has used.

The intention is to give people realistic and achievable goals. Social media has been a good way to share conversations and experiences.

Healthcare providers and policy makers:

- Some interventions are targeted at healthcare providers. They are often given 'stories', by patients, of what it is like to live daily life with diabetes or heart disease and how those people might wish to be treated. Small workshops are delivered and tools provided
- Dialogue with decision makers is key. They are supportive, but financial considerations are very important. They understand that prevention is cheaper and One Life provide examples and evidence to demonstrate this at both regional and national level e.g. around cycling in Helsinki, where 100km of cycle path has been built and One Life were able to prove that it was cheaper to build those than to deal with illness.

- One Life are hoping for policies to be put in place to sustain the changes they have seen, and to some degree this has been achieved. For example, there has been a greater focus in Finland on children's health, and national decision makers have attributed this in part to One Life
- Working together is seen as key to success

More recently, in addition to heart, brain and diabetes, the work of One Life has also incorporated respiratory health and mental health, as many of the risk factors and solutions are shared. One Life continues the work of the DEHKO diabetes programme in the prevention and care of diabetes. There is a stated effort to further work to make rehabilitation and peer support an integral part of care and there are sub-projects that stress the pursuit of:

- Rehabilitation and peer support as part of the care of type 1 and type 2 diabetes, bringing vascular risks under control and promoting lifelong vascular health
- Gaining control over diabetes expertise by ensuring versatile health communications and awareness raising and producing measures with tools, training publications and guidelines

Outcomes

Whole Population strategy

A study carried out a survey of people to understand if DEHKO had any impact of raising awareness and self-reported lifestyle changes in Finnish middle-aged population. (Wilkstrom et al 2015).

'Health Behaviour and Health among the Finnish Adult Population' is a postal survey conducted annually by the National Institute for Health and Welfare. To facilitate the evaluation of the FIN-D2D, questions regarding diabetes prevention programme and self-reported changes in health habits were included into the survey in the years 2004-2008. Based on these questions, it was possible to assess the change in public awareness of diabetes prevention and T2D risk factors over the lifespan of the FIN-D2D project. The participants aged over 35 years were included in this analysis. The dataset included 5,007 men and 5,975 women. After excluding participants with missing data on awareness of diabetes prevention programme (n=151), the final dataset included 10,831 men and women.

Results from this survey showed that:

- In the FIN-D2D area 25% (347/1384) of men and 48% (797/1674) of women reported being aware of the programme
- In the control area, the proportions were 20% (702/3,551) and 36% (1,514/4,222), respectively
- The overall awareness increased among both genders and in all areas during the project period, but the level of awareness was consistently higher in the FIN-D2D area
- Female gender and higher age were associated with increasing awareness of the programme in both areas
- Self-reported lifestyle changes were more common among women, but associated with the level of awareness of the programme more often among men than women

Researchers concluded that the awareness of diabetes and its risk factors increased among men and women in both implementation and control areas during the FIN-D2D project period. The activities of the implementation project may at least partly explain the differences in lifestyle changes between areas, especially among men. The results suggest that health promotion campaigns increase the population awareness about the prevention of chronic diseases and as a result, especially men may be prompted to make beneficial lifestyle changes.

High risk strategy

A study carried out by Rautio et al (2015) showed the impact of the strategy to detect people at high risk of developing diabetes and the impact on CVD risk reduction of the intervention they were offered to support them to change their lifestyle.

Table 1 presents the mean baseline estimated 10 year risk for CVD events and mortality estimated by risk-calculators. During the one-year follow up the FRS decreased in women and the SCORE decreased in men.

Table 1. Cardiovascular disease (CVD) risk factors and predicted 10-year risk of CVD events (Framingham Risk Score (FRS)) and CVD mortality (Systematic Coronary Risk Evaluation (SCORE)) and changes in them during a one-year follow-up in high-risk individuals for type 2 diabetes (T2D).

CVD risk factors	Men				Women			
	n	Baseline %	Follow-up %	p-value	n	Baseline %	Follow-up %	p-value
ST2D	891	12.2	13.9	0.176	1730	9.1	8.3	0.286
Smokers	1257	15.4	14.0	<0.001	2389	9.6	8.4	<0.001
Antihypertensive medication	1339	31.6	39.2	<0.001	2541	26.8	32.3	<0.001
		Mean (SD)	Change mean (SD)			Mean (SD)	Change mean (SD)	
Age	1339	56.0 (9.8)			2541	54.2 (10.7)		
Systolic blood pressure (mm Hg)	1310	142 (16.8)	-1.5 (15.0)	<0.001	2480	139 (18.1)	-2.0 (15.1)	<0.001
Total cholesterol (mmol/l)	1144	5.1 (1.0)	-0.30 (0.9)	<0.001	2169	5.2 (1.0)	-0.14 (0.8)	<0.001
HDL cholesterol (mmol/l)	1131	1.2 (0.3)	0.02 (0.3)	0.006	2137	1.5 (0.4)	0.04 (0.3)	<0.001
FRS ^a	774	19.9 (11.8)	-0.48 (7.8)	0.086	1474	10.0 (7.7)	-0.70 (5.2)	<0.001
SCORE ^b	961	6.9 (6.2)	-0.25 (3.4)	0.024	1766	2.8 (3.4)	-0.02 (1.7)	0.603

HDL: high-density lipoprotein; SD: standard deviation; ST2D: screen-detected T2D.

^acalculated for ≥ 30 years old.

^bcalculated for ≥ 45 years old.

During the one-year follow-up:

- 9.6% of the 1052 men reported both an increase in physical activity and improved dietary pattern
- 4.1% of 1052 men reported an increase in physical activity
- 39.3% of 1049 men reported an improved dietary pattern
- 47.0% reported no lifestyle changes
- 14.2% of the 1995 women reported both an increase in physical activity and improved dietary pattern
- 3.8% of the 1995 women reported an increase in physical activity
- 39.2% of 1995 women reported an improved dietary pattern
- 42.7% reported no lifestyle changes

The estimated 10-year risk for CVD events decreased 3.5% in men and 1.5% in women reporting an increase in physical activity and improvement in diet, compared to an increase of 0.15% in men ($p < 0.001$, between groups) and decrease of 0.43% ($p = 0.027$, between groups) in women with no lifestyle changes after adjustment for age and baseline Framingham Risk Score.

Numbers needed to treat to prevent one CVD event by lifestyle changes were 25 for men and 59 for women.

Researchers concluded that lifestyle counselling offered in primary health care for one year resulted in beneficial changes in dietary pattern and physical activity, which were associated with a reduction in the estimated 10-year CVD event risk, but not with reduction in estimated

mortality in high-risk individuals for T2D. It was felt that this kind of effort may be useful and applicable to primary health care settings when it comes to prevention strategies for T2D and CVD. Researchers felt that commitment to lifestyle changes in primary health care was rather low, which is why increased motivation and self-management of people at risk should be emphasised.

Separate analysis was carried out of the impact of the intervention on women with gestational diabetes (GDM) (Riatio et al 2014).

- Altogether 1,661 women aged ≤ 45 years participated in the programme. One-year follow-up was available for 393 women who did not have screen-detected T2D at baseline, and 265 of them had at least one intervention visit [115 (43.4%) women with history of GDM and 150 (56.6%) without history of GDM]
- At baseline, women with GDM had similar baseline glucose tolerance but better anthropometric characteristics, blood pressure, and lipid profile than women without GDM after adjustment for age
- Beneficial changes in cardiovascular risk profile existed among women with and without GDM during follow-up and the effect of lifestyle intervention was similar between the groups, except that low-density lipoprotein cholesterol improved only in women with GDM. Altogether, 4.0% of those with GDM and 5.0% of those without GDM developed T2D ($p = 0.959$ adjustment for age)
- Researchers concluded that the effect of a 1-year lifestyle intervention in primary healthcare setting was similar regardless of history of GDM, both women with and without GDM benefitted from participation in the lifestyle intervention

There has been no evaluation of the 'One Life' initiative.

Leadership and Governance

The DEHKO Coordination Committee, at the outset of the programme was chaired by a professor from the University of Helsinki, with 16 other members on the committee who appear to represent several working groups: Care Organisation and Resources, Diabetes Cost, The Role of the Person with Diabetes, Education, Type 2 Diabetes, Prevention of Type 2 Diabetes, Type 1 Diabetes, Diabetes Registries. In addition, there were Medical Directors from two Health Care Centres, and representatives from the Finnish Diabetes Association including the Chairperson and Vice-Chairperson, the Managing Director, Chief Physician and Communications Manager.

'One Life' is a joint initiative in partnership with the Finnish Brain Association, the Finnish Diabetes Association and the Finnish Heart Association. DEHKO has continued to focus primarily on diabetes as the broader 'One Life' programme has been implemented and there is coordination between the groups leading the programmes to ensure economies of scale and consistent messaging.

Finances

The Finnish Government supports the DEHKO and other diabetes programmes with revenue generated by Finland's Slot Machine Association (RAY).

The financing for the FIN-D2D Project (2000–2007), which targeted the obese, at-risk population and included screening and lifestyle counselling, early diagnosis, and treatment, came from a variety of sources: RAY, the five district hospitals engaged in the project, the Ministry of Social Affairs and Health, the National Public Health Institute, and the Finnish Diabetes Association.

The transition from DEHKO to One Life was considered relatively simple as financing was available from the Slot Machine Association which funds health services and there was no need to request funding from elsewhere.

Finland's Slot Machine Association (Raha-automaattiyhdistys, RAY) was established in 1938 to raise funds through gaming operations to support Finnish non-profit organizations and foundations in the areas of social welfare and health. RAY has an exclusive right in Finland to operate slot machines, table games and casinos.

Human Resources

No information was available

Infrastructure and Supplies

See Training below

Knowledge and Information

Training

There is little detailed information about other training available to patients or to staff specifically related to the DEHKO programme. The one year diabetes prevention programme was established in a clinical setting in primary health care with no extra facilities or specific longer-term education of the staff, and lifestyle counselling was implemented by local nurses. Under the One Life programme there are a number of training courses related to gestational diabetes and people newly diagnosed with type 2 diabetes, which may have some basis in the studies related to these groups, but this is not explicitly stated.

The Diabetes Centre in Tampere organise a number of counselling and training courses for people with diabetes, their family members and health care professionals and estimate that 1 600 people attend these each year.

Education and further training for health care professionals include several seminars and basic and advanced courses. Tailor-made education and counselling are also offered for health care professionals.

The staff responsible for courses, training and education at the Diabetes Centre includes two physicians, four nurses, two nutritionists, one psychologist, a chiropodist, a physical activities instructor, an exercise planner, kitchen personnel, two course secretaries, an education manager and an education secretary.

Data collection

The Health Behaviour and Health among the Finnish Adult Population survey is an annual postal survey conducted by the National Institute for Health and Welfare. The primary purpose is to obtain information on the current health behaviour of the working-age population with a self-administered questionnaire. The survey examines key aspects of health behaviour such as food habits, physical activity, smoking and alcohol consumption and includes questions on participants' sociodemographic background and medical history. To facilitate the evaluation of the FIN-D2D, questions regarding the diabetes prevention program and self-reported health habits were included in the survey in the years 2004-2008.

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THE ESCAPE TRIAL – a multifaceted intervention on cardiovascular risk factors in high-risk hypertensive patients

A CASE STUDY

PROGRAMME AT A GLANCE

ESCAPE, conducted in France from 2006 to 2008, was a pragmatic cluster randomised controlled prevention trial. It was designed to show whether a multifaceted intervention, aimed at general practitioners (GPs), could significantly increase the proportion of hypertensive patients at high risk of cardiovascular disease (CVD) who achieved all their recommended therapeutic targets.

GPs in the intervention group received one day of medical education on therapeutic targets and strategies featured in the French guidelines on treatment of hypertension and type 2 diabetes, and were given a validated electronic blood pressure measurement device to improve the accuracy of blood pressure measurements and a leaflet that summarised targets and therapeutic strategies.

To be included patients had to, be aged between 45 and 75 years, be treated for hypertension for at least six months, not have any known clinical signs or history of CVD, and have at least two cardiovascular risk factors from a list of eight including age, family history, smoking, type 2 diabetes, LDL or HDL cholesterol levels, known left ventricular hypertrophy and urinary excretion of albumin.

Every six months during the two-year trial GPs held a prevention-dedicated consultation to optimise (if needed and possible) the treatment of the patients who had not achieved their individual targets. The GPs were also asked to discuss systematically the patient's diet, exercise and adherence to drug treatment and to give advice on quitting smoking if the patient smoked. At baseline and one year follow-up GPs received feedback on their patients' clinical and biological data. Prescriptions of drugs for hypertension and metabolic treatment were reported at baseline and 24 months.

In France, at the time of this study, 92% of patients treated for hypertension for prevention of CVD were followed exclusively by GPs. This programme moved the focus from lack of adherence by patients to reducing 'therapeutic inertia' by targeting an intervention to the healthcare providers.



KEY TAKEAWAYS

- ▶ Interventions that target healthcare providers and place less emphasis on patients' lack of adherence can help reduce therapeutic inertia (failure to start or increase treatment when targets are not met)
- ▶ Prevention dedicated consultations were effective
- ▶ Patients did not report an adverse effect on their quality of life caused by more intensive management of their CVD risk

TARGET POPULATION

To be included patients had to, be aged between 45 and 75 years, be treated for hypertension for at least six months, not have any known clinical signs or history of CVD, and have at least two cardiovascular risk factors from a list of eight including age, family history, smoking, type 2 diabetes, LDL or HDL cholesterol levels, known left ventricular hypertrophy and urinary excretion of albumin.

BENEFITS AND OUTCOMES

- This was considered to be an easy-to-perform multifaceted intervention, targeting only GPs
- After two years, the proportion of patients achieving all their therapeutic targets increased significantly in both groups, but significantly more in the intervention group
- Systolic and diastolic blood pressures decreased significantly more in the intervention group than in the usual care group, by 4.8 mmHg and 1.9 mmHg, respectively. The authors suggest that the absolute difference in the reduction of SBP of about 5mmHg in the intervention group was clinically relevant because this difference could be expected to reduce stroke mortality by 20%, and mortality related to cardiac ischaemic events or long-term overall cardiovascular mortality by 15%
- There were no significant differences in changes in physical and mental quality of life between groups. This suggests that there was no 'price to pay' for a more intensive management to reduce cardiovascular risk in terms of quality of life

PROGRAMME EXPERIENCES

The main impact of the intervention was principally due to the proportion of patients achieving their blood pressure targets and the increased prescription of low-dose aspirin for patients with type 2 diabetes. Other components of the primary outcome measures also improved significantly within each group, but their change over time was comparable between the two groups.

In the ESCAPE trial, the percentage of patients achieving all their therapeutic targets at baseline was very low overall (8.2%), and even lower for patients with type 2 diabetes (1.5%). This raises questions, not only about the quality of care provided by the GPs regarding the practice guidelines, but also about the accessibility and relevance of the therapeutic targets recommended for primary care settings.

It is likely that both the higher blood pressure and the higher prescription of low-dose aspirin seen at baseline in the intervention group were due to the intervention itself. During the training seminar, prior to the inclusion of patients, GPs were given an electronic measurement device and were asked to report the exact values on the case report forms, which almost certainly improved the accuracy of their BP measurements by reducing substantially end-digit preference. The BP was shown to be underestimated in the usual care group because of a much higher end-digit preference. The report suggests that GPs involved in the trial tended to round down BP results to the lower 0 mmHg or 5 mmHg values systematically because it is considered better for the physician, as well as for the patient, to have a lower value under treatment.

GPs recruited to take part all belonged to the French National College of Teachers in General Practice and so they may be more motivated than those who were not GP trainers to apply themselves to the programme.

THE DETAIL

Context

Several observational studies on hypertensive patients have shown a gap between therapeutic targets recommended in guidelines and those achieved in daily practice. The ESCAPE trial aimed to determine whether a multifaceted intervention focused on general practitioners (GPs), could increase significantly the proportion of hypertensive patients at high risk of cardiovascular disease (CVD) who achieved all their recommended therapeutic targets.

Goals, Values and Principles

French and European guidelines for the prevention of cardiovascular complications in patients with hypertension are mainly based on blood pressure (BP) targets that should be achieved along with other risk reducing strategies. As these patients are at an increased cardiovascular risk, the recommendations also set targets for low-density lipoprotein cholesterol (LDL), smoking cessation, and, in patients with type 2 diabetes, HbA1c and low-dose aspirin treatment.

The primary endpoint for this programme was the change in the proportion of patients achieving all of their therapeutic targets at two years.

Three therapeutic targets were defined for patients without type 2 diabetes: BP \leq 140/90 mmHg, LDL \leq 3.36 mmol/l, and no smoking.

Five therapeutic targets were defined for patients with type 2 diabetes: BP \leq 130/80 mmHg, LDL \leq 2.59 mmol/l, HbA1c \leq 7%, no smoking, and a prescription for low-dose aspirin.

Key secondary endpoints were the change in the proportion of patients achieving each of their individual targets and the values for BP, LDL, and HbA1c.

Other secondary endpoints were the variation in the Framingham-Anderson score for coronary risk, the occurrence of the first clinical cardiovascular event (validated by a committee blinded to randomization), change in antihypertensive drug prescriptions, and quality of life.

There was an intention to address the 'diagnosis and treatment gap' by targeting health providers and moving the focus from lack of patients' adherence.

The approach was pragmatic using existing resources and guidance but requiring more consultation and, potentially, prescription/ treatment.

Population

This was a national programme, involving 257 GPs in clusters randomised by region, from 23 colleges that were all members of the French National College of Teachers in General Practice (CNGE).

A total of 905 patients received the intervention, and 927 received usual care: analysis at primary endpoint was 860 for usual care group and 860 for intervention.

Patients' inclusion criteria

To be included patients had to, be aged between 45 and 75 years, be treated for hypertension for at least six months, not have any known clinical signs or history of cardiovascular disease, and have at least two of the following cardiovascular risk factors:

- Age \geq 50 years for men and \geq 60 years for women
- Family history of myocardial infarction or sudden early death (at \leq 55 years for a first-degree male relative or \leq 65 years for a first-degree female relative) or stroke at \leq 45 years for a first-degree relative
- Active smoker or having quit smoking < three years ago
- Treated or untreated type 2 diabetes (fasting hyperglycaemia \geq 7 mmol/L at two occurrences or use of an anti-diabetic drug)
- LDL \geq 4.14 mmol/L or use of lipid-lowering drug
- High-density lipoprotein cholesterol (HDL) \leq 1.04 mmol/L (one risk factor was subtracted if HDL \geq 1.55 mmol/L)
- Known left ventricular hypertrophy (diagnosed by ultrasound or electrocardiography)
- Urinary excretion of albumin \geq 20 mg/L

GPs were asked to include the first eligible patients they saw over a week, with a minimum of seven patients.

Exclusion criteria:

Patients were not eligible if:

- They had type 1 diabetes
- Were unable to participate in a two-year trial
- Had a serious life-threatening disease with a poor short-term prognosis
- Or could not understand French

Recruitment of GPs:

- Eleven colleges (173 GPs) were randomised to the usual care group and 12 (162 GPs) to the intervention group
- Attendance at the one-day training in the intervention group or the 90 minute-meeting in the usual care group was mandatory for GPs to include patients
- 145 GPs (90%) in the intervention group attended the one-day training, of which 126 (87%) recruited at least one patient in the trial
- 144 GPs (83%) in the usual care group attended the 90 minute-meeting, of which 131 (90%) included at least one patient
- The characteristics of the active GPs were similar in both groups in terms of gender, age, type and duration of practice
- The mean number of patients recruited per GP was 7.1 (minimum = 1, maximum = 16)

Recruitment of patients:

- Between November 2006 and July 2007 1,832 patients were included in the trial, 927 in the usual care group and 905 in the intervention group
- On average they were 62 (standard deviation (SD) 7.8) years old, and the sex ratio of men to women was 2:1. All patients were receiving treatment for prevention of CVD, had been treated for hypertension for an average of 10.9 years (SD 8.1), and 71% had more than two other cardiovascular risk factors associated with hypertension. The average body mass index was 30.5 kg/m². The average diabetes duration of the 1,047 patients with type 2 diabetes was 7.5 years (SD 6.5)
- At baseline patient characteristics were comparable in both groups, except for systolic BP (SBP) and diastolic BP (DBP), which were significantly higher in the intervention

group by 7 mmHg and 3 mmHg respectively ($p < 0.001$). In addition, significantly fewer diabetic patients had a prescription for aspirin in the usual care group compared with the intervention group: 26.9% versus 42.7% ($p < 0.001$). Finally, the percentage of patients achieving all of their therapeutic targets at baseline was significantly lower in the intervention group: 6.2% versus 10.2% ($p = 0.005$)

Service Delivery

The programme ran for a two year fixed period from 2006 to 2008.

The intervention consisted of:

- One day of medical education for GPs, including some focus on the therapeutic targets and strategies for achievement, featured in the French guidelines on hypertensive and type 2 diabetes (T2D) patients' care
- An electronic blood pressure (BP) measurement device for GPs
- A leaflet for GPs summarising the guidelines
- Four prevention dedicated consultations for each patients twice a year, performed by the GP. During these, the GP was to negotiate drug changes if guidelines targets were not achieved, and systematically assess patient's compliance, dietetics, exercise, and smoking issues if needed
- Feedback for GPs on patients' results at baseline and at 1 year follow-up

Outcomes

The programme was evaluated by a pragmatic cluster randomised trial comparing intervention ($n=905$), GPs having attended training, offering patients 6 monthly consultations focused on optimizing treatment and discussing lifestyle, versus usual care ($n=927$). A total of 1,832 high-risk (of CVD) hypertensive patients were included.

The primary endpoint for this programme was the change in the proportion of patients achieving all of their therapeutic targets at two years.

Three therapeutic targets were defined for patients without type 2 diabetes: BP $\leq 140/90$ mmHg, LDL ≤ 3.36 mmol/l, and no smoking.

Five therapeutic targets were defined for patients with type 2 diabetes: BP $\leq 130/80$ mmHg, LDL ≤ 2.59 mmol/l, HbA1c $\leq 7\%$, no smoking, and a prescription for low-dose aspirin.

Key secondary endpoints were the change in the proportion of patients achieving each of their individual targets and the values for BP, LDL, and HbA1c.

Other secondary endpoints were the variation in the Framingham-Anderson score for coronary risk, the occurrence of the first clinical cardiovascular event (validated by a committee blinded to randomisation), change in antihypertensive drug prescriptions, and quality of life.

Key results:

- After two years the proportion of patients achieving all their therapeutic targets increased significantly in both groups, but significantly more in the intervention group: Between group OR (odds-ratio) 1.89, (95% confidence interval (CI) 1.09 to 3.27, $p = 0.02$)
- Significantly more patients achieved their blood pressure targets in the intervention group than in the usual care group: OR 2.03 (95% CI 1.44 to 2.88, $p < 0.0001$)

- Systolic and diastolic blood pressures decreased significantly more in the intervention group than in the usual care group, by 4.8 mmHg and 1.9 mmHg, respectively ($p < 0.0001$ for both SBP and DBP)
- There were no significant difference in changes in physical and mental quality of life between groups
- At baseline patient characteristics were comparable in both groups, except for SBP and DBP, which were significantly higher in the intervention group by 7mmHg and 3 mmHg, respectively ($p < 0.001$)
- In addition significantly fewer diabetic patients had a prescription for aspirin in the usual care group compared with the intervention group at baseline: 26.9% versus 42.7% ($p < 0.001$)
- The percentage of patients achieving all of their therapeutic targets at baseline was significantly lower in the intervention group: 6.2% versus 10.2% ($p = 0.005$)

Primary endpoint

Due to missing values at every time point, the primary endpoint could not be modelled for six patients; therefore, the analysis for the primary endpoint was based on 1,826 patients. Over two years of follow-up, the proportion of patients achieving all of their therapeutic targets increased in both groups, but the increase was significantly higher in the intervention group: OR 1.89, 95% CI 1.09 to 3.27, $p = 0.024$ (Table 1). Similar trends were observed in patients with and without type 2 diabetes, but did not achieve statistical significance.

Table 1 Primary outcome: changes within groups and differences between groups at month 24 (M24) in the proportion of patients achieving all their therapeutic targets

Endpoint	Group	M0 n/N (%)	M24 n/N (%)	OR (95% CI) for within group	P	OR (95% CI) for between group	P-value
All patients 3 or 5 targets	Intervention	56/900(6.2)	110/860(12.8)	3.23(2.12 to 4.94)	<0.001	1.89(1.09 to 3.27)	0.024
	Usual care	94/923(10.2)	118/860(13.7)	171(1.19 to 2.47)	0.004		
Hypertension + T2D (5 targets)	Intervention	7/527 (1.3)	24/526 (4.6)	3.90 (1.60 to 0.52)	0.003	2.36 (0.68 to 8.18)	0.175
	Usual care	9/520 (1.7)	14/513 (2.7)	1.65 (0.69 to 3.98)	0.262		
Hypertension (3 targets)	Intervention	49/373 (13.1)	86/334 (25.8)	3.12 (1.94 to 5.03)	<0.001	1.63 (0.99 to 3.01)	0.120
	Usual care	85/403 (21.1)	104/347 (29.0)	1.91 (1.27 to 2.88)	0.002		

CI, confidence interval; M0, month 0 or baseline; M24, month 24; T2D, type 2 diabetes; OR, odds ratio

Secondary endpoints

Individual therapeutic targets

The proportion of patients achieving their BP targets did not change significantly in the usual care group. However, significantly more patients in the intervention group achieved their BP targets at two years. The difference between the two groups was significant: OR 2.03, 95% CI 1.44 to 2.88, $p < 0.001$ (Table 2). The proportion of patients achieving their targets for LDL and not smoking increased in both groups, with no significant difference between the groups. There was no change in the proportion of patients with HbA1c $\leq 7\%$ in either group in the type 2 diabetes sub-population.

Table 2 Within group and between group differences in the percentages of patients achieving their individual therapeutic targets

Target	Group	M0 n/N (%)	M24 n/N (%)	OR (95% CI) for within group comparison	P	OR (95% CI) for between group comparison	P-value
Blood pressure ^a	Intervention	207/900 (23.0)	303/823 (36.8)	2.55 (1.96 to 3.30)	<0.001	2.03 (1.44 to 2.88)	<0.001
	Usual care	392/923 (42.6)	382/825 (46.3)	1.25 (0.99 to 1.58)	0.060		
LDL cholesterol ^b	Intervention	370/884 (41.9)	458/793 (57.8)	2.65 (2.05 to 3.41)	<0.001	1.25 (0.88 to 1.78)	0.205
	Usual care	395/910 (43.4)	435/778 (55.9)	2.11 (1.65 to 2.71)	<0.001		
No smoking	Intervention	712/905 (78.7)	664/804 (82.6)	3.75 (1.92 to 7.30)	<0.001	0.81 (0.41 to 1.60)	0.550
	Usual care	709/926 (76.6)	659/808 (81.6)	2.98 (1.81 to 4.93)	<0.001		

CI, confidence interval; M0, month; M24, month 24; T2D, type-2 diabetes; OR, odds-ratio

^a≤140/90mmHg or ≤130/80mmHg for type 2 diabetic patients

^b≤3.36mmol/l or 2.59 mmol/ for type 2 diabetic patients

^c≤7%

Other endpoints

- SBP was reduced by 1.2 mmHg in the usual care group and by 6.0 mmHg in the intervention group. The 4.8 mmHg difference between the two groups was statistically significant, in favour of the intervention group ($p < 0.001$). Similarly, for DBP, the difference between the groups at the end of the trial was 1.9 mmHg, statistically significant in favour of the intervention group ($p < 0.002$)
- At baseline the Framingham-Anderson scores were comparable in the two groups and decreased by 1.2% in the usual care group and by 2.2% in the intervention group over the 2 year period. The difference between the two groups was statistically significant in favour of the intervention group ($p < 0.001$)

Sensitivity analysis of blood pressure

- Restricting the analysis to centres that measured blood pressure with an automatic device (900 patients in the intervention group and 248 in the usual care group) gave similar results, with a significant difference in favour of the intervention group for the change in systolic (3.5 mmHg, $p = 0.001$) and diastolic blood pressure (1.3 mmHg, $P = 0.045$) over the 2 year period of the trial

Analysis of changes in blood pressure adjusted on baseline values

- Blood pressure data was analysed with an adjustment on baseline values to assess the extent to which the differential changes observed during follow-up were independent of the between-groups difference at baseline. The results still demonstrate a significant effect of the intervention. For SBP, time effect was significant ($p = 0.018$) and the intervention effect ($p < 0.0001$) and the interaction between group and time were also significant ($p < 0.0001$). The adjusted difference over two years of follow-up was 4.8 mmHg. For DBP, time effect was significant ($p = 0.0003$) and the intervention effect ($p < 0.0001$) and the interaction between group and time were also significant ($p < 0.0001$). The adjusted difference over two years of follow-up was 1.9 mmHg

Antihypertensive drugs

- At baseline the average number of antihypertensive drugs per patient was similar in the two groups, 2.16 (SD 1.04) in the intervention group and 2.18 (SD 1.04) in the usual care group. After two years, this number increased in both groups but increased significantly more in the intervention group: 2.41 (SD 1.05) versus 2.29 (SD 1.06) in the usual care group, ($p = 0.020$). In addition, significantly more patients in the intervention group received at least one additional antihypertensive drug over the two-year study period than in the usual care group ($p = 0.009$)

Cardiovascular events

- During the study 89 cardiovascular events were reported, and 61 were validated using patient records by a committee blind to randomization. The incidence of the first cardiovascular event was 3.0% in the intervention and 3.7% in the usual care groups, ($p = 0.513$)

Quality of life

- Changes in scores for physical and mental quality of life were very small and not significantly different between the two groups

Leadership and Governance

Leadership and governance was provided by the lead researchers, trial protocols and the colleges providing the training materials for the one day training session.

Finances

The study was funded by unrestricted research grants from the French National College of Teachers in General Practice, Takeda France, and Merck-Serono, France.

Human Resources

The physicians were all GPs and were members of the French National College of Teachers in General Practice (CNGE). Firstly, all the 33 French regional colleges belonging to the CNGE were invited to participate in 'a randomized trial with hypertensive patients'. Twenty three of these colleges agreed to participate. Eight hundred and seventy-seven GPs, members of these 23 colleges, were contacted by each regional research leader by telephone and/or Email, or during a usual meeting, and 335 agreed to participate.

Infrastructure and Supplies

The study used current infrastructure and supplies. Training sessions and supplies were held as a normal part of the GP training programme.

Knowledge and Information

Training

- A one day training session for GPs was delivered by four trained university GP lecturers using a common teaching kit
- GPs were given blood pressure measurement device and a leaflet that summarized targets and therapeutic strategies recommended in the guidelines which they were asked to keep on their office desk
- As part of the trial, GPs randomised to the usual care group attended a 90 minute meeting to learn about the inclusion and exclusion criteria and how to complete the study case report forms

Data

- Outcomes were collated locally by GP:
 - At baseline, and every six months for two years along with usual follow-up, the GPs in both groups collected patients' clinical and biological data
 - Prescriptions of drugs for hypertension and metabolic treatment were reported at baseline and 24 months
- Questionnaires were given by GP to patient, and responses sent directly to 'data treatment centre': At inclusion, 12-months and 24-months, patients of both groups were given a sealed envelope containing five short questionnaires on quality of life (SF-8), adherence, diet, exercise, and smoking habits to be completed at home and sent directly to the data treatment centre in a pre-paid envelope

REFERENCES

- Pouchain et al.: Effects of a multifaceted intervention on cardiovascular risk factors in high-risk hypertensive patients: the ESCAPE trial, a pragmatic cluster randomised trial in general practice. *Trials* 2013 14:318.

VASCULAR RISK MANAGEMENT PROGRAMME IN THE NETHERLANDS

A CASE STUDY

PROGRAMME AT A GLANCE

The programme, based in the Netherlands, assessed the effectiveness of adding internet-based, nurse-led vascular risk factor management to usual care for patients with clinically manifest vascular disease. Eligible patients, recruited between 2008-2010, had a recent clinical manifestation of a vascular disease and a number of risk factors that were not at the recommended levels.



Key elements of delivery for patients in the intervention group included:

- A personalised website detailing the patient's risk factors that required additional treatment.
- A separate internet page for each risk factor with a history of risk factor measurements, drug use, treatment goal, advice from the nurse, correspondence between nurse and patient and news items for that particular risk factor
- Patients were asked to log in fortnightly to submit new measurements (blood pressure, weight, smoking status, cholesterol) and to read and send messages
- Patients were encouraged to measure their own blood pressure at home or ask their GP to measure their blood pressure. The nurse posted patients laboratory forms for blood tests to measure plasma lipids and glucose
- Prescriptions for changes in drug regimen were posted to patients

Patients were asked to complete an online questionnaire every three months to report newly diagnosed diseases and hospital admissions. When a cardiovascular event was suspected, medical records were retrieved and assessed. Patients were invited to a follow-up appointment at 12 months.

Treatment of vascular risk factors by nurse practitioners has been found to be effective, but is costly and time consuming for patients and health care professionals. Delivery of the programme via the internet was tested as a low cost method of support compared to regular clinic attendance. CVD Specialist Nurses who were already delivering care were trained to carry out the intervention so this provided enhanced contact compared to patients usual care.

KEY TAKEAWAYS

- ▶ Patients that had experienced a recent clinical manifestation of vascular disease were often concerned about mortality and more likely to take the required action
- ▶ CVD Specialist Nurses who were already delivering care were trained in the function of the website and so this provided enhanced contact with existing staff
- ▶ The intervention in addition to usual care does not result in QALY gain at 1 year, but has a small effect on vascular risk factors and is associated with lower costs

TARGET POPULATION

Eligible patients were aged 18 to 80 with a recent clinical manifestation of a vascular disease e.g. myocardial infarction, stroke or peripheral arterial disease. Patients had to have at least two of six treatable risk factors that were not at recommended levels, related to systolic blood pressure, low density lipoprotein (LDL), triglycerides, body mass index (BMI) diabetes and smoking.

BENEFITS AND OUTCOMES

- The relative change in Framingham Risk score of the intervention group compared to the usual care group was not statistically significant when adjusted for differences in patient attributes
- Larger percentage differences between groups were seen in reaching the LDL recommended levels (18.4% 95%CI 5.9 to 30.9, $p=0.004$) and quitting smoking (7.7% 95%CI 0.4 to 14.9, $p=0.038$), but there was no significant difference between groups for other risk factors
- The cost effectiveness analysis measured societal costs, quality-adjusted life-years (QALYs) and incremental cost effectiveness. It concluded that the intervention in addition to usual care does not result in QALY gain at 1 year, but has a small effect on vascular risk factors and is associated with lower costs
- Treating patients at the point where they are likely to be concerned about mortality and may be self-motivated to take action was considered to be effective and lower cost

- It was seen as productive for the patient and nurse to work together collaboratively to reduce risk factors. Patients take responsibility for their health and are part of the solution. It is also an opportunity to involve carers in cardiovascular risk management, rather than just surgery or medication straight after the event

PROGRAMME EXPERIENCES

The ability of patients to see their results online as soon as they were available was a controversial step. One view was that patients may access results without health professional support which could be distressing. In some areas there is a delay of a day or a week between request to access results by the patient and the result being available to view by them to give health professionals time to check their significance.

After the programme was finished (1 year) the functionality of the website for patients to retrieve their own records was incorporated in to the local health electronic record system. During the trial people could enter their own numbers, lab results from the GP, or blood pressure taken at home, but they cannot do that in the current system.

Other features of the programme including an extended outpatient appointment to review risk factors and ongoing communication to review progress in changes to modifiable risk factors have been incorporated into the usual care of patients. Nurses can set up this system of enhanced support if they think it might be effective for patients coming through the CVD outpatients department after an event.

THE DETAIL

Context

The Vascular Risk Management Programme was based in the Netherlands and assessed the effectiveness of adding internet based, nurse-led vascular risk factor management to usual care for patients with clinically manifest vascular disease.

Goals, Values and Principles

The aim of the programme is to assess the effectiveness of an internet based nurse led programme for the management of vascular risk factors on vascular risk and vascular risk factors in patients with clinically manifest vascular disease

The premise of the programme is that a large proportion of patients with a clinical manifestation of a vascular disease are still at high residual cardiovascular risk due to not reaching treatment targets.

Treatment of vascular risk factors by nurse practitioners has been found to be effective, but is costly and time consuming for patients and health care professionals. Delivery of the programme via the internet was tested as a low cost method of support compared to regular clinic attendance.

Population

Patients were recruited from two centres in the Netherlands. 638 patients were invited to participate and 330 were randomised.

Eligible patients were aged 18 to 80 with a recent clinical manifestation of a vascular disease e.g. myocardial infarction, stroke or peripheral arterial disease. Patients had to have at least two of six treatable risk factors that were not at target levels. These risk factors were:

- Systolic blood pressure >140mmHg
- Low density lipoprotein cholesterol >2.5mmHg
- Triglycerides >1.7mmol/L
- BMI > 25
- Diabetes or fasting glucose >6.1mmol/L
- Smoking

Patients also had to have access to internet at home, be able to read and write Dutch, and be independent in daily activities. Patients with an estimated life expectancy of <2 years or a malignant disease were excluded.

Service Delivery

Patients were recruited between October 2008 and March 2010. At the start of the programme patients had a one hour outpatient appointment where they received information on their risk factor levels. Participants randomised to the intervention group received instructions about the internet programme and a username and password for their personalised website.

Patients were asked to complete a questionnaire by internet every three months to report newly diagnosed diseases and hospital admissions. When a cardiovascular event was suspected, medical records were retrieved and assessed. Patients were invited to a follow-up appointment at 12 months. The nurses conducting the follow-up measurements were blinded to the patient's group.

Patients randomised to the intervention received an internet based programme of vascular risk management on top of usual care. This involved:

- A personalised website focusing on the patient's risk factors that required additional treatment. This included an overview of the status of all risk factors (green=at goal; yellow=close to goal; red=needs attention) and drug use
- A separate internet page for each risk factor with a history of risk factor measurements, drug use, treatment goal, advice from the nurse, correspondence between the nurse and patient and news items for that particular risk factor
- Patients were asked to log in at least every other week to submit new measurements (blood pressure, weight, smoking status, cholesterol) and to read and send messages
- Patients were encouraged to measure their own blood pressure at home or ask their general practitioner to measure their blood pressure. The nurse posted patients laboratory forms for blood tests to measure plasma lipids and glucose
- Prescriptions for changes in drug regimen were posted to patients
- Patients were sent a summary of a news item by email every other week, to prompt the patients to visit their website
- The internet programme was provided in addition to usual care provided by the treating hospital physician and the general practitioner

Usual care was provided by the treating hospital physician and the general practitioner and was based on the 2006 Dutch cardiovascular risk management guideline. The physician and general practitioner were informed of the patient's risk factor status.

Outcomes

Randomised controlled trial (RCT)

The programme was evaluated by a multicentre prospective RCT comparing intervention via the internet in addition to usual care (n=155) versus usual care alone (n=159) (Vernooij et al 2012). The mean (standard deviation (SD)) age was 59.9 (8.4) and 75% were male. 16 (5%) patients dropped out during the study and did not have follow-up measurements.

Key results:

- The relative change in Framingham risk score of the intervention group compared to the usual care group was statistically significant at -14% (95%CI -25% to -2%)
- Adjusted for differences in the baseline score, the relative change in Framingham risk score of the intervention group compared to the usual care group was not statistically significant at -8% (95%CI -18% to 2%)
- The difference between groups in patients reaching the low density lipoprotein goal was 18.4% (95%CI 5.9% to 30.9%, p=0.004)
- The difference between groups in change in patients who quit smoking at 12 months was 7.7% (95%CI 0.4 to 14.9, p=0.038)
- There was no significant difference between groups for other risk factors

Table 1: Proportion of patients achieving risk factor targets (Veronij et al, 2012)

	Intervention		Usual care	
	Baseline	12-months	Baseline	12-months
Mean (SD) number of risk factors on target	2.9 (1.2)	3.4 (1.2)	3.1 (1.2)	3.3 (1.2)
Systolic blood pressure <140mmHg	48%	54%	50%	54%
LDL cholesterol <2.5mmol/L	39%	65%	41%	48%
HDL cholesterol women ≥1.3; men ≥1.0mmol/L	60%	66%	69%	72%
Triglycerides <1.7mmol/L	55%	68%	64%	71%
Fasting glucose <6.1mmol/L	55%	52%	55%	58%
BMI <25.0kg/m ²	16%	17%	26%	23%
Waist women <88; men <102cm	45%	42%	53%	44%
No smoking	73%	78%	74%	72%
Platelet aggregation inhibitor drug	94%	98%	97%	97%
Lipid lowering drug	86%	90%	86%	88%
Blood pressure lowering drug	79%	80%	69%	75%

SD, Standard deviation, LDL, low density lipoprotein, HDL, High density lipoprotein, BMI, Body Mass Index

Forty patients reported a total of 50 vascular events (vascular interventions, stroke, myocardial infarction, vascular mortality) and 38 patients reported 47 other severe adverse events (death, life threatening events requiring at least one night of hospital stay or prolonging of hospital stay, events causing significant invalidity or labour incapacity)

- Intervention group: 16 patients had 18 vascular events
- Usual care group: 24 patients had 32 vascular events
- Intervention group: 22 patients had 26 other severe adverse events
- Usual care group: 16 patients had 21 other severe adverse events

Hazard ratio for vascular events 0.66 (95%CI 0.35 to 1.24) (not statistically significant)

- 152 of 155 patients in the intervention group logged in to the website with a median of 56 (interquartile range 35 to 83) logins during the year
- 131 patients entered a median of 7 (3 to 14) measurements during the year, mostly blood pressure and weight
- The monthly number of logins reduced during the 12 months from a maximum of 1,099 logins in month three to 435 logins in month 12
- 134 patients sent a median of 14 (7 to 22) messages
- Patients using the website more often tended to have the highest Framingham scores at baseline (highest CVD risk) and had the largest improvements
- During the 12 month period the nurse practitioner used a mean (SD) time of 23 (12) minutes per month per patient

Measures

The Framingham heart risk score represents the 10 year risk for coronary heart disease. A 10% change was considered to be the minimal clinically relevant difference.

Cost-effectiveness analysis (Greving et al 2015)

The cost-effectiveness analysis used the data from the RCT

Key findings:

- At a threshold value of €20,000 for each QALY gained, there is a 65% probability that nurse-led, internet-based intervention is cost-effective
- No significant difference was found in health benefit in terms of QALYs (mean 0.86 for the intervention group vs 0.85 for usual care)

Table 2: Cumulative mean costs (in €) for patients during the 12 month programme (Greving et al 2015)

	Intervention	Usual care	Difference
Medical costs:			
GP consultation	151	142	+9
Complementary medicine practitioner consultation	13	6	+7
Paramedic healthcare professional consultation	192	294	-102
Specialist consultation	353	333	+20
University hospital inpatient days	249	935	-685
General hospital inpatient days	421	462	-41
Medication	451	464	-13
Internet-based vascular management programme	220	0	+220
Subtotal medical costs	2,052	2,635	-583
Indirect non-medical costs:			
Absence from paid work	2,289	1,675	+614
Reduced productivity at paid work	326	566	-240
Absence from unpaid work	159	164	-4
Subtotal indirect non-medical costs	2,775	2,405	+370
Total costs	4,859	5,078	-219

Table 3: Change in number of health professional visits between intervention and usual care (Greving et al 2015)

	Intervention	Usual care	Difference
GP visits	1	1	0
Complementary medicine practitioner visits	0	0	0
Paramedic healthcare professional visits	3	4	-1
Specialist visits	22	20	+2
Inpatient hospital visits	6	12	-6
Total number visits	32	38	-6

Leadership and Governance

The SMART Study Group members were from the University Medical Center Utrecht.

The study received ethical approval from the University Medical Center Utrecht and the Rijnstate Hospital Arnhem.

The nurse practitioners were supervised by internists.

Finances

The programme was funded by a grant from ZonMw, The Netherlands Organization for Health Research and Development.

The cost of the 1-year internet-based vascular risk factor management programme was €220 (2009 prices) per patient.

Human Resources

The nurse practitioner personalised the website for each patient depending on the presence of risk factors that needed additional treatment. This took an average of 10 minutes.

The nurse practitioner could view all pages for all patients and could see an overview of the current status and last log-in attempts and new messages sent. The treating nurse logged in every working day and replied to messages, and sent messages to patients who were not using the programme at least every other week. In cases of non-response the nurse contacted patients by phone. During the 12 month period the nurse practitioner used a mean (SD) time of 23 (12) minutes per month per patient.

A research nurse completed the follow-up appointments.

Infrastructure and Supplies

A website was constructed for the programme and tested in a pilot study. The internet programme was linked to the University Medical Center Utrecht for general information on risk factors and vascular disease.

At the start and end of the programme patients had a one hour outpatient appointment. Further contact between the patient and nurse practitioner in the intervention group was through the internet.

Knowledge and Information

Training

No training requirements were mentioned.

Data

Patients were assessed in an outpatient clinic at a baseline and 12-month follow-up visit. Data was also collected through a diary (recording frequency of visits to the medical specialist, nurse practitioner, general practitioner, paramedics or complementary medicine) and questionnaires completed at baseline, 3, 6, 9 and 12 months. Hospital admissions and use of medications were recorded through electronic patient files. Patients also completed the Short-Form Health and Labour Questionnaire at baseline, 6 months and 12 months.

Costs

A cost-effectiveness analysis was completed alongside the randomised controlled trial.

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CARDIOVASCULAR HEALTH AWARENESS PROGRAM (CHAP)

A CASE STUDY

PROGRAMME AT A GLANCE

The Cardiovascular Health Awareness Program (CHAP) was developed in Ontario, Canada. CHAP aims to improve the process of care related to the cardiovascular health of older adults.

CHAP started as a research study piloting a community based model of cardiovascular disease (CVD) prevention in two communities. CHAP encourages older people to become more aware of their cardiovascular risk and to acquire self-management skills. Key elements are:

- Free cardiovascular risk assessment and education sessions held in community pharmacies
- Family physicians invite their patients over 65 to attend and sessions are also advertised in the local community
- Sessions are run by volunteer peer health educators
- Community Health Nurses train the volunteers, provide quality control and are on call to assess people with elevated blood pressure
- During the sessions volunteers assist patients to take and record their blood pressure using an automated device and complete a CVD risk profile (based on blood pressure, previous hypertension diagnosis and lifestyle risk factors)
- Patients are told about the importance of reducing lifestyle CVD risk factors and signposted to community agencies and resources for support
- Family physicians receive feedback on patients attending sessions

CHAP is a community-driven and community-owned initiative. It is designed to be a scalable service that minimises centralised support over time to achieve a long-term sustainable service. Since it began, the CHAP model has also been applied in a range of different types of communities where it is tailored to maximise participation from the target group. For example:

- South Asian community in Ontario, Canada
- Rural community in Alberta, Canada
- Social housing developments in Ontario, Canada
- Rural community in the Philippines



KEY TAKEAWAYS

- ▶ A community-driven and owned initiative
- ▶ Using aged matched volunteers considered very important for the community intervention to be seen as peer advice not medical advice
- ▶ Use of personalised invitation letters resulted in the highest attendance numbers
- ▶ Designed as a scalable, sustainable service that can be tailored to different target groups

TARGET POPULATION

People aged ≥ 65 years who are community dwelling and mobile.

BENEFITS AND OUTCOMES

A randomised controlled trial comparing 20 CHAP communities with 19 control communities has found:

- Exposure to CHAP was associated with a 9% relative reduction in a composite measure of hospital admissions for acute myocardial infarction, stroke and congestive heart failure. This was equated to 3.02 fewer annual hospital admissions per 1,000 people aged ≥ 65
- No significant difference in all-cause mortality or in-hospital death from CVD

A longitudinal study of 13,596 people who attended ≥ 2 CHAP sessions in 22 communities has found:

- Average blood pressure for patients with initially high blood pressure improved from 142/78mmHg to 123/69mmHg over the 18-months follow-up
- The authors suggest that a decrease of 10/5mmHg reduces the risk of developing heart failure by about 50%, stroke by 38%, heart attack by 15% and death by 10%

PROGRAMME EXPERIENCES

Peer Health Educators

- 577 peer health educators (volunteers) were trained to deliver CHAP in 20 communities
- 11 of 20 participating communities re-allocated funds to hire an assistant coordinator to supervise concurrent sessions, manage volunteers and/or help the local coordinator
- Approximately half of the 20 participating communities provided additional support to volunteers e.g. refresher training and meetings to discuss problem areas

Family Physicians

- 47% of family physicians participated in the two pilot communities
- 99% of family physicians participated in 20 communities with 63% actively encouraging their patients to attend sessions
- The programme provided office assistance to some practices in producing lists of patients to be invited to a CHAP session

Pharmacies

- 79% of pharmacies participated in the two pilot communities
- 89% of pharmacies participated in 20 communities
- Challenges experienced included the busy pharmacy environment and limited or inadequate space. Solutions included attempting to set up sessions in quieter areas, recruiting alternative pharmacies or working within the constraints

Patients

- 39% of invited people attended a session in the two pilot communities (from 2,493 invitations sent)
- 66% of invited people attended a session in 20 communities (from 24,196 invitations sent). 43% of people attended two or more sessions
- Use of personalised invitation letters resulted in higher attendance
- Challenges included a tendency for patients to arrive all together at the start of sessions. The solution was to divide sessions into 2 time slots
- Another challenge was a lack of adherence to protocol (i.e. talking or moving whilst taking blood pressure). The solution was to reinforce the need for volunteers to monitor patients
- The use of aged matched peer volunteers was viewed as important in the programme, being seen as peer advice rather than medical advice

THE DETAIL

Context

The CHAP model focuses on the management of CVD risk, particularly hypertension and was first used in 39 communities in Ontario targeting the older ≥ 65 age group. Subsequently the model has been used to targeted CVD risk reduction in a variety of populations.

Goals, Values and Principles

CHAP is a community-based approach that encourages people to become more aware of their cardiovascular risk, link with a range of community and health care supports and agencies and acquire self-management skills.

The objective of CHAP is to improve the process of care related to the cardiovascular health of older adults in Ontario, Canada and shift the distribution of risk at the population level.

The CHAP programme integrates primary care and existing community resources to provide cardiovascular risk assessment including repeated accurate measurement of blood pressure among older adults. CHAP aims to overcome poor/selective uptake and improve follow-up ('closing the loop').

CHAP was developed as a low cost, community-driven initiative with the aim of minimising centralised support over time to achieve a long-term sustainable community-owned programme. CHAP is designed to be:

- A scalable programme that could be implemented system wide
- Inexpensive, quick and easy to implement in any community

Population

Thirty nine communities in Ontario involved, not including two communities where the programme was piloted. The total population in 2005 was 973,246 including 140,642 people aged ≥ 65 years. Community size ranged from 10,000 to 60,000. Communities had five or more family physicians and two or more pharmacies. Currently nine of the communities have integrated CHAP as one of the regular community programmes.

In the study assessing the effectiveness of CHAP, 20 communities were allocated to receive CHAP and 19 communities acted as controls. People aged ≥ 65 years were invited to attend community pharmacy CHAP sessions. Family physicians were asked to identify people who had visited their practice at least once in the last 12 months and who were community dwelling and mobile.

Service Delivery

The CHAP working group was originally formed in 2000. The components of the CHAP programme were developed through various pilots and community-wide demonstrations to develop a standardised programme implementation guide with a toolkit of downloadable resources and templates.

Community CVD Risk Awareness Sessions:

- Free awareness sessions were held in community pharmacies. Generally three hour sessions but some pharmacies offered extended sessions. The typical duration for an individual patient was 20 minutes

- Volunteer peer health educators ran the sessions (at least three volunteers per session) and Community Health Nurses provided quality control and trained volunteer peer health educators and mentors
- Community-based family physicians referred patients to awareness sessions and received feedback on patients attending them. The programme was also advertised in the community through local media and posters in pharmacies and primary care practices
- During the sessions volunteers assisted patients to take and record their blood pressure using an automated device and complete a CVD risk profile. The volunteers also distributed information about community resources and health-related topics to support people in changing lifestyle which may impact on their CVD risk. A community health nurse is on call to assess people with elevated blood pressure and people are advised to see their physician or pharmacist if appropriate. Reports were also sent to the family physician with permission
- CVD risk factors collected at baseline include age, gender, BMI, blood pressure, history of transient ischemic attack, stroke, heart attack, high cholesterol and high blood pressure, smoking status, drinking habits, eating habits (high fat food, vegetables, fruit, salt), stress level, physical exercise, and whether they lived alone
- People of any age attending a pharmacy could be assessed, but people aged ≥ 65 years were targeted

Outcomes

Multiple publications present details of the programme and its implementation and outcomes from early implementation in 2003 to roll-out to 20 CHAP areas. The CHAP programme was also evaluated through a cluster randomised controlled trial (in 2006) and there has been ongoing work looking at wider implementation.

Early outcomes of the community health awareness program in 2003 (Chambers et al 2005)

- 56 sessions held in 27 community pharmacies
- 79% of eligible pharmacies and 47% of eligible family physicians participated in CHAP
- 983 of 2,493 invited patients (39%) attended a session. 59% returned for a 2nd pharmacy session. Average age 74.8 years, 53% female. All patients agreed for their results to be sent to their physician
- Positive feedback from volunteers and pharmacists

Challenges faced by the cardiovascular health awareness program and approaches to resolving these:

Peer Health Educators

- Challenge: some media and community organisations refused to promote the programme without funding. Solution: approached alternative media and community organisations
- Challenge: Inability to give volunteers advance notice regarding pharmacy session locations and times. Solutions: provided explanation and recruited a surplus of volunteers

Family Physicians

- Challenge: Unwillingness to participate after initial agreement. Solution: recruited additional physicians
- Challenge: Overloaded with work or inaccessible. Solution: recruited alternative physicians
- Challenge: Inability to produce patient lists. Solution: assisted office staff to produce lists; if this failed, recruited alternative physicians

Pharmacies

- Challenge: Busy environment with high levels of customer traffic. Solution: Attempted to set up sessions in unobtrusive areas
- Challenge: Limited or inadequate space. Solution: recruited alternative pharmacies or worked within constraints

Patients

- Challenge: Tendency to arrive all at the same time, at the start of sessions. Solution: Divided sessions into two time slots
- Challenge: Lack of adherence to protocol (i.e. patients talked or moved whilst blood pressure being taken). Solution: Reinforced need for volunteers to monitor patients

Experiences of implementing the CHAP community health awareness program in 20 communities (Carter et al 2009)

- 338 (99%) family physicians participated with 16 opinion leaders identified. 97% received feedback on patients who attended sessions. 214 (63%) actively encouraged their patients to attend CHAP sessions
- 129 (89%) pharmacies participated. 16 champions identified
- 595 volunteer peer health educators recruited and 577 (97%) trained
- Invitations sent to 24,196 people. 27,358 blood pressure measurements taken from 15,889 patients (66%). 43% of patients made two or more visits. Use of personalised invitation letters resulted in the highest attendance numbers
- 1,488 (9%) patients were referred to family physicians for follow-up. 570 (4%) followed-up by on-call community health nurse who completed 559 assessments. 554 (4%) referred to pharmacist, of whom 2016 (37% of those referred) had medication assessment completed by pharmacist

Amendments made to processes included:

- 11/20 communities re-allocated funds to hire an assistant coordinator to supervise concurrent sessions, manage volunteers and/or help the local coordinator at high traffic sessions
- In three communities the nurse was present for the whole session (rather than being on call)
- Approximately half of the communities provided additional support to volunteers e.g. refresher training, meetings to discuss problem areas and collaborative development of solutions and/or to recognise volunteer contributions

Key factors in programme success:

- Community and organisational factors

- Guidance and support by the advisory group
- Devolution of responsibility to communities
- Community mobilisation and recruitment of physicians and pharmacists
- Support for volunteer led activities
- Protocols for participants at high risk of CVD and availability of health professional for support
- Accurately tracking participation and community-level data
- Providing results to family physicians and pharmacists
- Achieving a balance of standardised programme process and flexibility to fit the specific community context

Findings of the community cluster randomised trial of CHAP with impact on hospitalisations (Kaczorowski et al 2011)

Twenty communities randomised to provide CHAP and 19 communities to no intervention controls. Communities stratified by population size and geographical location. In CHAP communities residents aged ≥ 65 were invited to volunteer to run cardiovascular risk assessment and education sessions (also known as awareness sessions) held in community pharmacies over a 10 week period (see below for further details). In both arms, usual health promotion and care services were available to residents. The primary outcome was a composite of hospital admissions for acute myocardial infarction, stroke and congestive heart failure in the year before and year after CHAP. Relative rates were calculated (event rates for intervention communities compared to control communities):

- The mean age of residents in both intervention and control communities was 75 and the mean proportion of men was 43% in both groups
- Exposure to CHAP was associated with a 9% relative reduction in the composite primary endpoint (rate ratio 0.91, 95%CI 0.86 to 0.97, $p=0.002$) or 3.02 fewer annual hospital admissions per 1,000 people aged ≥ 65
- There were also statistically significant reductions favouring the intervention for acute myocardial infarction (rate ratio 0.87, 95%CI 0.79 to 0.97, $p=0.008$) and congestive heart failure (rate ratio 0.90, 95%CI 0.81 to 0.99, $p=0.029$)
- There was no significant difference for stroke (rate ratio 0.99, 95%CI 0.88 to 1.12, $p=0.89$)
- When calculated as number of unique people admitted to hospital there was a significant difference favouring CHAP in those with newly prescribed antihypertensive drug treatment (rate ratio 1.10, 95%CI 1.02 to 1.20, $p=0.02$)
- There was no significant difference in all-cause mortality (rate ratio 0.98, 95%CI 0.92 to 1.03, $p=0.38$) or in-hospital death from CVD (rate ratio 0.86, 95%CI 0.73 to 1.01, $p=0.06$)
- In the year after the intervention public health units and agencies in the study areas were contacted to assess potential co-intervention or contamination from any other cardiovascular health initiatives during the study period. No other such initiatives were identified

Longitudinal cohort study on the impact of CHAP in reducing blood pressure for people attending CHAP sessions between 2008 and 2010 (Ye et al 2013)

This study included 13,596 people who attended CHAP sessions between 2008 and 2010. Sessions were delivered weekly in 22 communities after the completion of the cluster RCT using the same CHAP process. Participants were divided into three groups for analysis: attendance at one session ($n=9,531$), attendance at two sessions ($n=1,567$), attendance at >

2 sessions (n=2,498). Only patients with more than two visits were used for the longitudinal analysis. The average age was 67 years and 37% were male:

- The proportion of patients with high blood pressure at baseline was 28.8% who attended 1 visit, 27.4% for those attending 2 visits and 32.2% for those attending >2 visits
- For participants with initially high blood pressure, systolic blood pressure (SBP) dropped by 0.79% and diastolic blood pressure (DBP) by 0.71% every month in CHAP (SBP ratio 0.992, 95%CI 0.991 to 0.994, p<0.01; DSP ratio 0.993, 95%CI 0.991 to 0.994, p<0.01)
- Average blood pressure for the high blood pressure group improved from 142/78mmHg to 123/69mmHg over the 18-month period
- The authors reported that a decrease in blood pressure of 10/5mmHg reduces the risk of developing heart failure by about 50%, stroke by 38%, heart attack by 15% and death by 10% (referencing Hypertension Canada)
- There was no significant change in SBP and DBP for people without high blood pressure at baseline
- Older adults who lived alone, had hypertension at baseline, reported healthier eating habits and presented with a higher SBP at baseline were more likely to attend more than one session

Leadership and Governance

The programme is a collaboration of family physicians, pharmacists, public health authorities and their personnel, community organisations e.g. the Kidney Foundation of Canada and trained volunteer peer health educators working within a community setting.

The CHAP Working Group provided centralised support at all stages of programme delivery, including a launch meeting, weekly teleconferences with local coordinators, monthly newsletters, an interactive web forum and site visits to assist with recruitment and promotion. Programme coordination was done by Local Lead Community Organisations.

The use of a cluster RCT to evaluate the programme required consistency of delivery across the 20 sites. However, standardisation needed to be balanced with flexibility to varying contexts and resources of individual communities e.g. in support, processes, materials and resources.

Finances

A 2005 publication states that the programme is funded in part by the Canadian Institutes of Health Research, by a contract with the Ministry of Health and Long-Term Care, Government of Ontario and by The Team for Individualizing Pharmacotherapy in Primary Care for Seniors. The Kidney Foundation is also acknowledged for contributions in kind for coordinating older adult volunteers.

Government Investment included:

- CHAP programme development: Ontario Stroke Strategy and Ontario Ministry of Health Promotion - \$2.3 million 2004-2011
- CHAP evaluation: Canadian Stroke Strategy ; Canadian Institutes of Health Research; Host organisations including Institute for Clinical Evaluative Science - >\$2 million 2001-2012

In the cluster RCT, lead organisations were asked to submit proposals for up to \$5,000 in funding to lead a 2-month community mobilisation phase (26 agencies from the 20

communities applied, with agencies ranging from the local hospital to the YMCA and Meals on Wheels). Organisations were then invited to submit proposals to implement CHAP (20 agencies in the 20 communities applied). Funding was calculated according to the population size of the community and the proposed scope of the programme. Communities received between \$20,000 and \$40,000 to support the implementation of CHAP. (In the 2011 paper \$20,000 is given as equivalent to £13,000).

Funding agreements were re-negotiated during the project in several cases to respond to local challenges and circumstances (figures not provided).

Costs (Goree et al 2013)

Resource use and cost consequences of CHAP (Canadian dollars):

- Average cost \$30,494 per community (£17,007) across all intervention communities
- Cost varied from \$11,976 to \$57,113 (£6,680 - £31,855) depending on community size, internal volunteer support and availability of 'in-kind' infrastructure support
- CHAP central costs \$804,304 (£448,521) – an average of \$40,215 (£22,425) per community for a one year time period
- Overall this equated to approx. \$71,000 (£39,591) per community or \$20.20 (£11.26) per older adult resident

The additional cost of the CHAP intervention (i.e. \$20.20 per resident) was offset by slightly lower health care costs in the intervention communities such that the total cost in the year after the intervention was equal in both groups at approximately \$4200 per elderly resident (mean cost difference -\$1.69; 95%CI -\$156.76 to -\$152.39; p= 0.982).

Costs from a CHAP Pragmatic Trial (screening, referral, education, pharmacy support for elderly hypertensives) to reduce CVD hospital admissions plus death from any cause: \$1.4 million in 2007 (£780,678); cost per patient \$10 (£5.58) for 140,642 over 65 year olds or \$110 (£61.33) for 13,379 screened.

(Sterling costs calculated using March 2018 exchange rate)

Human Resources

Community pharmacies provided awareness sessions using volunteer peer health educators and mentors with support from community health nurses and community-based family physicians. Volunteers included retired nurses, (about 50% of the volunteers), health professionals trained outside of Canada, and aspiring medical students.

Pharmacists were asked to hold at least two CHAP sessions. Volunteers were asked to attend at least two awareness sessions (in addition to training sessions).

Two regional coordinators, each covering 10 CHAP communities, provided regular support to local CHAP coordinators who were responsible for operating CHAP in their respective communities. CHAP sessions at different pharmacies were scheduled on different days.

The contribution of family physician opinion leaders was seen as fundamental in achieving a high rate of participation by family physicians. Actions included sending personalised letters, speaking at hospital rounds and/or contacting colleagues directly to discuss potential concerns/questions.

Infrastructure and Supplies

Centralised services include preparation of data forms, posters and press release templates, provision of the CHAP Implementation Guide, with week-by-week guidance plus

downloadable customisable materials for volunteer recruitment and communications, and electronic data management services.

Community pharmacy awareness sessions run by volunteers required the recruitment and training of volunteers in the use of blood pressure monitors.. Volunteers were recruited by a peer health educator coordinator through liaison with community organisations, seniors groups and advertising in local media.

GPs were also required to send invitation letters sent to people aged ≥ 65 , identified and were reimbursed for this activity.

Knowledge and Information

Training

Volunteers for the pharmacy awareness sessions were trained by a community health nurse in three sessions using a standardised training package, with topics on cardiovascular health awareness, healthy eating, physical activity, stress management and cardiovascular health and high blood pressure, and practice in the setting up and operation of the pharmacy session including the use of the blood pressure monitoring devices.

An 'enhanced educator' training module was created to support skill development for volunteers with a background or interest in providing additional health resources and peer-counselling. This training was not consistently delivered due to time constraints.

Data

Data collected at pharmacy awareness sessions are sent to a computerized database (run by a data management company), with patient consent. The software prepares a tailored patient report that is sent to the family physician. These reports rank patients by their most recent systolic blood pressure within diagnostic/treatment groups (i.e. potentially new cases of hypertension, and potentially under-treated, non-adherent patients) and reflect different blood pressure targets for patients with diabetes. Family physicians also get an overview report six months later with the percentage of patients in their practice with high blood pressure and who reached systolic blood pressure target levels compared to other anonymised practices.

Community health nurses document assessments of high-risk participants on a standardised form which includes confirmation of the high blood pressure, assesses possible contributing factors and documents actions to ensure appropriate follow-up.

The pharmacist on duty during CHAP sessions documents consultations with high-risk patients using a standardised form focusing on determining whether high blood pressure was due to sub-optimal drug therapy or adherence issues.

A secure web portal to community-specific databases allows local coordinators to schedule sessions, manage volunteers and input and track physician and pharmacy participation.

In addition:

- Participating communities produced a report on implementation using a standardised template, designed to elicit common successes and challenges
- Telephone interviews were conducted with local coordinators in all 20 CHAP communities
- Community CHAP partners, pharmacists, family physicians and local lead organisation staff participated in a post-program debriefing meeting to discuss facilitators and barriers

to implementation and characteristics essential for successful implementation. This was used to plan for a sustainable long-term programme model

- Data on outcomes for the RCT was taken from hospital discharge abstracts, physician service claims from an insurance programme and prescription drug claims. These were described as having high levels of completeness and validity

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Healthy Japan 21: Life style intervention for Metabolic Syndrome and cardio-metabolic risk factors A CASE STUDY

PROGRAMME AT A GLANCE

As part of the Healthy Japan 21 strategy, Japan has embarked on a national health policy change to prevent lifestyle-related diseases, including cardiovascular disease (CVD) and diabetes. National legislation requires employers and local governments to offer annual 'health check-ups' focussed on CVD, cancer and life style risk factors. There are financial incentives for employers, so uptake is typically high.

The basic health check-up includes: a blood pressure test, waist circumference, height and weight, blood tests (lipids, triglycerides, HDL and LDL cholesterol, blood sugar (HbA1c, fasting blood sugar), hepatic function, red blood cell count, haemoglobin level, haematocrit), electrocardiogram and urine tests for chronic kidney disease. A questionnaire about lifestyle is focused on diet, tobacco smoking, physical activity, work life balance and family history of disease. Results of tests are graded A to D and sent to individuals and their employer (if the test was provided by the employer). For those at risk of CVD or metabolic syndrome:

- Sessions of 20 minutes or more for each individual or 80 minutes or more to a group, by a physician, public health nurse or registered dietician, were offered
- In the sessions a facilitator provides motivational support, explains the necessity of lifestyle improvement, the relationship between lifestyle and the health check-up data and the person's lifestyle
- An explanation was given about the advantages of lifestyle improvement and the disadvantages of failing to improve lifestyle
- The facilitator suggested changes needed to improve the lifestyle (e.g. diet and exercise) and set goals for actions and signposted people to community resources for support
- The facilitator showed how to measure body weight and abdominal circumference
- A follow-up interview was performed if the facilitator and participant felt it would be helpful
- An evaluation of progress via interview, telephone or other method was carried out six months after the first session



KEY TAKEAWAYS

- ▶ Annual testing detects CVD risk
- ▶ For those at risk of CVD or metabolic syndrome lifestyle behaviour change sessions are offered
- ▶ Education information and goal setting are key elements of the sessions
- ▶ Follow up support may be offered and at six months the progress towards meeting goals is checked

TARGET POPULATION

All people over the age of one year are eligible to have an annual health check-up and are part of the Healthy Japan 21 risk reduction programme. This case study focusses on lifestyle change interventions offered to those aged 40-74 with a risk of CVD or metabolic syndrome.

BENEFITS AND OUTCOMES

- High uptake of annual health checks-ups, as this is it is a mandatory offer to the population and employers are offered incentives to ensure a high uptake
- Individuals have continuous awareness of areas where improvements in health could be made as they are screened annually
- Community based activities support change in behaviour and are implemented locally
- Optional focused lifestyle change support is offered to those with test results where risk factors are identified and are considered to be effective by those evaluating the outcomes
- People who took up the offer of lifestyle change support following health check-ups, compared to those who did not, had clinically significant reductions in systolic blood pressure, waist circumference and BMI, an effect which was still apparent at three years follow up

Outcomes from lifestyle change intervention:

Clinically relevant reduction in waist circumference (>5%) intervention versus no intervention, odds ratio 1.33(95% CI1.31 to 1.36) $p<0.001$

Clinically relevant reduction in BMI(>5%) intervention versus no intervention odds ratio1.36(95% CI1.33 to 1.38) $p<0.001$

Reversal of metabolic syndrome intervention versus no intervention odds ratio 1.31(95% CI 1.29 to 1.33) $p<0.001$

CHALLENGES AND SOLUTIONS

- Employers receive the results of tests and can call a meeting with an employee to ask how they will address the areas where they didn't achieve an 'A' grade
- Current workplace culture does not always match the actions required of employees e.g. consumption of alcohol expected at work events

THE DETAIL

Context

Despite previous national health promotion programmes in Japan, lifestyle-related diseases still remained a major cause of death. The combination of a rapidly ageing society and declining birth rates led to fears that lifestyle related diseases would increase healthcare costs and the burden of nursing care in the 21st century. Healthy Japan 21 was established to create a society where all nationals can live healthy and fulfilling lives.

The 4 basic policies are:

- The importance of prevention
- Creation of a supportive environment for the enhancement of health
- Goal setting and assessment
- The promotion of effective well-coordinated activities by the various implementing bodies

Goals, Values and Principles

The aim of Healthy Japan 21 is to reduce late-middle age deaths, to extend healthy life expectancy and to improve quality of life. Since April 2008, Japan has embarked on a national health policy change to prevent lifestyle-related diseases, such as CVD and diabetes, involving health check-ups and the invitation to participate in a lifestyle change programme if specific risk factors are detected, which is the focus of this case study. This case study is focused on interventions to reduce metabolic syndrome and cardio-metabolic risk factors. A wide range of information is gathered from screening tests and questionnaires completed by the individual.

Population

This is a national programme targeted at the whole population from age 1 year, all whom are eligible for annual health check-ups.

Service Delivery

Healthy Japan 21 included 70 specific goals in nine focus areas; six related to lifestyle and three directly related to high risk conditions for CVD. These were: diet and nutrition, physical activity and exercise, leisure and mental health, smoking, alcohol, dental health, diabetes, cardiovascular disease and cancer.

This particular case study focuses on offering lifestyle change interventions for people who have been identified via the annual health check to have a high risk of CVD or metabolic syndrome.

Where people did not meet the following target values, lifestyle change interventions were offered:

- Waist circumference >85 cm (men)/>90 cm (women) as a measure of abdominal obesity
- Waist circumference <85 cm (men)/<90 cm (women) with a body mass index >25 kg/m², with at least one of the following: (1) high glucose tolerance (fasting blood glucose >100 mg/dl or haemoglobin A1c ≥5.6%), (2) dyslipidaemia (triglyceride >150 mg/dl or high-density lipoprotein-cholesterol <40 mg/dl), (3) high blood pressure (systolic blood pressure >130 mm Hg or diastolic blood pressure >85 mm Hg)

The risk stratification table below indicates the level of support people are offered based on their health check-up results.

Table 1: Stratification of lifestyle intervention by risk(Nakao et al 2018)

Abdominal obesity (Waist circumference ≥ 85 cm in men and ≥ 90 cm in women)	Risks	Smoking	Age	
	1.High BP		40-64	65-74
	2.Dislipedemia			
	3.High FBG			
No abdominal obesity BMI < 25 kg/m ²	Any risk	Yes or no	Written information	
Abdominal obesity BMI < 25 kg/m ²	≥ 2 risks	Yes or no	Positive support	Intensive support
	1 risk	Yes		
		No	Written information	
No abdominal obesity BMI ≥ 25 kg/m ²	3 risks	Yes or no	Positive support	Intensive support
	2 risks	Yes		
		No	Written information	
	1 risk	Yes or no		

BP, Blood pressure, FBG, Fasting blood glucose, BMI, body mass index

Written information

Regardless of the presence/absence of the need of lifestyle intervention, written information is supplied to all people receiving this specific health check-up once a year (simultaneously with notification of the check-up results). It provides information tailored to individual subjects based on the health check-up data and responses to the questionnaire filled in at the time of the check-up.

Lifestyle intervention (positive support)

Support is provided to help the individual become aware of the lifestyle factors that require improvement, and of the factors which should be further considered.

The person is guided to take actions towards achieving their goals during a session lasting 20 minutes or more. If it is a group session this takes 80 minutes or more (eight individuals or less per group) at which an action plan is prepared.

On the basis of the specific health check-up data and the results of the questionnaire carried out to determine the status of lifestyle (smoking, exercise, diet, rest, etc.), support is provided by a one to one or group session and the results (evaluation made six months after the date of preparation of the action plan) are evaluated.

Lifestyle intervention (intensive support)

At the beginning, support is provided by a face to face session, followed by continuous support for three months or longer. Each session is for 20 minutes or more when provided to

each individual separately and for 80 minutes or more when provided to groups (8 individuals or less/group).

On the basis of the specific health check-up data and results of the survey carried out to determine lifestyle status (smoking, exercise, diet, rest, etc.), support sessions are provided, and the progress of the action plan implementation (interim evaluation) and the results (six months after the date of preparation of the action plan) are evaluated.

Content of lifestyle intervention sessions

Interventions were provided for 20 minutes or more to each individual separately or for 80 minutes or more to a group by a physician, public health nurse, or registered dietician.

- The facilitator explained the necessity of lifestyle improvement, the relationship between lifestyle and the specific health check-up data, the patient's lifestyle, knowledge about metabolic syndrome and lifestyle-related chronic diseases, and the influence of these factors on the daily lives of the individuals receiving the motivational support
- Explanation was given about the advantages of lifestyle improvement and the disadvantages of failing to improve lifestyle
- The facilitator suggested changes needed to improve the lifestyle (e.g. diet and exercise)
- The facilitator set goals for actions and the timing of the outcome evaluation, accompanied by a discussion of the social resources available and needed for lifestyle improvement
- The facilitator showed how to measure body weight and abdominal circumference
- Goals for actions and the action plan were prepared by the individual receiving the motivational support under guidance via the sessions
- A follow-up session was undertaken if helpful for the participant and thought beneficial by the facilitator
- The evaluation was made via interview or other method (telephone, e-mail, etc.), six months after the first session

Outcomes

One nationwide cohort study (Nakao et al 2018), looked at the effectiveness of these lifestyle change interventions offered to people identified as being at high risk of metabolic syndrome and cardiovascular disease. Known as the Metabolic Syndrome and Comprehensive Lifestyle Intervention Study (MetS ACTION-J), researchers used the data from the National Database of Health Insurance Claims and Specific Health Check-ups of Japan (NDB). The national data captured examination records and laboratory data to diagnose metabolic syndrome (MetS). Anonymised data regarding subjects who underwent a health check-up between year 2008-09 and 2011-12 from the Ministry of Health, Labour and Welfare (MHLW) was extracted. The main findings are:

- Clinically relevant reductions, i.e. >5% at year 3, were achieved in a significantly higher percentage of participants of the lifestyle intervention compared to non-participants (Waist circumference (WC), 21.4% vs 16.1% and BMI, 17.6% vs 13.6%; $p < 0.001$, each)
- Higher weight reductions (>10%) were also observed in a significantly higher percentage of participants
- Both abdominal and overall obesity, measured by categorical weight reductions, improved significantly more in participants compared to non-participants
- Participants who received lifestyle intervention had significantly more improvements in MetS, as compared with non-participants who did not receive a lifestyle intervention

(reversal of MetS: 47.0% vs. 41.5%, $p < 0.001$). After adjusting for confounders, lifestyle intervention was associated with an adjusted odds ratio (OR) of 1.33 (95% confidence interval [CI]: 1.31 to 1.36, $p < 0.001$) for 5% reduction in WC; 1.36 (95% CI 1.33 to 1.38, $p < 0.001$) for 5% reduction in BMI; and 1.31 (95% CI: 1.29 to 1.33, $p < 0.001$) for reversal of MetS)

- The mean WC changes were -1.34 and -0.44 cm in participants and non-participants, respectively, with a difference of -0.89 cm (95% CI: -0.92 to -0.86)
- The mean BMI changes were -0.29 and -0.08 kg/m² in participants and non-participants, respectively, with a difference of -0.22 kg/m² (95% CI: -0.22 to -0.21)
- The intervention program also resulted in significantly greater reductions in both abdominal and overall obesity parameters
- Participants, compared to non-participants, had significant reductions in systolic blood pressure (SBP, -1.15 vs -0.72 mm Hg), diastolic blood pressure (DBP, -0.97 vs -0.64 mm Hg)
- Participants also improved their HDL-cholesterol level more than non-participants (-1.48 vs -0.94 mg/dl)

Further results from the National Health and Nutrition Survey are available from the website of Health Japan 21. The second phase started in 2013 with new targets for 2022 which are outlined in the table below.

Table 2 National Health and Nutrition Survey results and targets to 2022 (Udagawa K 2008)

Measure	2010	2011	2012	2013	2014	2015	2022 target
Average SBP pressure (mmHg) men 40-89 years	138	138	137	138	137	136	134
Average SBP (mmHg) women 40-89 years	133	133	131	133	132	130	129
Total cholesterol >240mg /dL men 40-79 years	13.8%	10.7%	10.8%	11.3%	12.0%	10.4%	10%
Total cholesterol >240mg /dL women 40-79 years	22.0%	20.3%	17.5%	19.9%	20.2%	20.9%	17%
LDL cholesterol >160mg /dL men 40-79 years	8.3%	8.0%	7.5%	8.4%	7.6%	8.3%	6.2%
LDL cholesterol >160mg /dL women 40-79 years	11.7%	13.6%	11.0%	11.7%	12.8%	12.7%	8.8%
Individuals maintaining ideal body weight (BMI>18.5<25) men 20-60 years	31.2%	31.7%	29.6%	29.0%	30.2%	31.6%	31.2%
Individuals maintaining ideal body weight (BMI>18.5<25) women	22.2%	23.0%	20.5%	19.6%	22.2%	20.5%	22.2%

40-60 years							
Mean salt intake (g) (adults >20 years)	10.6	10.4	10.4	10.2	10.0	10.0	8.0
Mean daily intake vegetables (g) (adults >20 years)	282	277	287	283	292	294	350
Individuals consuming <100g fruit/ day (adults >20 years)	61.4%	61.4%	58.9%	56.4%	58.8%	57.2%	30%
Smoking (adults >20 years)	19.5%	20.1%	20.7%	19.3%	19.6%	18.2%	12%
Individuals who regularly exercise men 20-64 years	26.3%	25.9%	26.5%	22.3%	20.9%	24.6%	36%
Individuals who regularly exercise women 20-64 years	22.9%	24.8%	21.5%	19.4%	17.5%	19.8%	33%
Individuals who regularly exercise men >65 years	47.6%	47.4%	49.6%	47.6%	42.4%	52.5%	58%
Individuals who regularly exercise women >65 years	37.6%	36.2%	39.4%	37.8%	35.7%	38.0%	48%

	2012	2013	2014	2015	2016	2022 target
Number of registered companies that supply food products low in salt and fat	14	65	67	91	95	100
Number of restaurants that supply food products low in salt and fat	17284	n/a	21163	23322	25388	30000
Number of local governments who offer community development and environments to promote physical activity	17		29	26	30	47

SBP, systolic blood pressure, LDL, low density lipoprotein, BMI, body mass index

Leadership and Governance

The programme was launched by the Ministry of Health and Welfare as a national health promotion movement. A Health Promotion Law was passed in 2002 to enhance health promotion measures, stipulating that each prefecture/ municipality in Japan should establish

health promotion plans under the basic policies of Healthy Japan 21. There are 47 local government areas (prefectures).

Organisations responsible for implementation, including local public organisations, were expected to formulate common goals amongst participating organisations which are relevant to their actual situations but consistent with the overall goals of Healthy Japan 21.

Specific plans for the promotion of health were to be formulated in the manner best suited to the local area by enlisting the co-operation of residents and various community health organisations to promote the plan.

Finances

Local governments assumed the main responsibility for financing health promotion. A financial adjustment policy was implemented in the form of financial assistance from national to local governments, to account for variation in the availability of local revenues. This policy aimed to balance revenues of local governments and ensure a minimum level of public health services was provided equally across the country.

In April 2008, a decision was made to finance disease prevention with Japan's social health insurance scheme that aims to help individuals to have control over their own health. The universality of social health insurance coverage is an important factor for Japan.

Social health insurance also facilitates effective integration of health promotion into health service delivery and financing arrangements.

Human Resources

Health promoting leaders have been identified and nominated by community members and trained to conduct health promoting activities in their communities. These include advocacy of healthy lifestyle, behaviour, attitudes, dietary habits, access to health-related information and improvement of health literacy and education at community level. Studies suggest that a community participation approach suited to the socioeconomic setting has been effective in improving health-related behaviour and promoting health in Japan.

Infrastructure and Supplies

Municipal governments, health centres and urban communities play a major role in implementing health promotion activities.

Knowledge and Information

An annual National Health and Nutrition Survey is used to systematically and continuously monitor the progress of Healthy Japan 21 against numerical targets.

This is conducted every November by the Ministry of Health, Labour and Welfare. 300 survey districts are randomly selected through Japan, each district with approximately 30 households. All household members aged >1 year are invited to participate. Public health centres of local governments are responsible for conducting the survey.

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FRANKLIN COUNTY CARDIOVASCULAR HEALTH PROGRAM (CVD risk reduction) A CASE STUDY

PROGRAMME AT A GLANCE

Franklin County is a low income rural community in Maine, USA. An integrated, community-wide comprehensive cardiovascular risk reduction programme was started in 1970 with a 40-year follow-up assessing the impact of risk factor improvements on reductions in morbidity and mortality.



The programme aimed to focus public, individual and health professional attention on the importance of long-term risk factor detection and control.

- In the 1970's the programme emphasised the detection and control of hypertension. Volunteer nurses and trained community volunteers ran screening, education and follow-up clinics in community centres
- Volunteer citizen and professional task forces initiated, promoted and staffed diverse projects promoting healthy eating
- The programme promoted various initiatives to increase physical activity and improve access to facilities
- In the 1980's the programme emphasised the detection and control of hyperlipidaemia using the same community-outreach model used for hypertension
- Between 1988 and 2011 a number of initiatives promoted smoking cessation. These were run by teachers, volunteer health professionals and high school students
- From 2000 nurses were located in medical practices to facilitate the care of complex patients
- The programme developed relationships with local media, with regular programme updates and features on health topics

KEY TAKEAWAYS

- ▶ A community initiative focusing on long-term risk factor detection and control
- ▶ Multifaceted programme that adapted over time
- ▶ Collaboration between health care professionals and community volunteers
- ▶ Improved health care access and integrated clinical care with population-wide prevention programmes

Health promotion projects later combined into a hospital-supported Healthy Community Coalition which served as the policy, co-ordinating and goal-setting body for the area's health education, promotion and prevention activities. Volunteer citizens and professionals formed regional task forces.

The programme is no longer operational, but some of the interventions have been continued by the local Healthy Community Coalition and the local hospital's network of primary and speciality medical practices.

TARGET POPULATION

In 1970 the population of Franklin County was 22,444, rising to 30,768 in 2010. In the first four years (1970 to 1974) of the programme about 50% of the adult population had community based blood pressure checks.

BENEFITS AND OUTCOMES

- In Franklin County (part of the US state of Maine) mortality rates (age and income adjusted) decreased below Maine rates during 1970 to 2010, with the greatest differences coinciding with the peak programme activities
- From 1994-2006 Franklin County's observed hospitalisation rate was significantly lower than predicted by household income (observed vs expected difference -17 discharges per 1,000 population)
- The lower than expected hospitalisation rates were associated with \$5,450,362 (£3,919,300) reductions in total in and out of area hospital charges for Franklin County residents per year
- The proportion of people with treated and controlled hypertension improved from 1974/75 to 1977/8 (an absolute increase of 24.7%)
- The proportion of people with treated and controlled cholesterol levels improved from 1986 to 2009 (an absolute increase of 28.5%). People with more programme visits had better control
- Smoking quit rates (ever smokers who report they have quit) improved from 48.5% in 1994-5 to 69.5% in 2006-10, with Franklin County quit rates significantly higher than those seen in Maine and the US

PROGRAMME EXPERIENCES

During the years when regional businesses (often paper and wood mills) thrived, employers paid for screening, follow-up and coaching services for their employees and helped institute effective non-smoking policies. When the mills were sold to more distant owners, there was less cooperation with the programme.

The programme responded to changing demographics and financial support by taking the service to the people. For example, senior citizens initially had access to free grant-supported buses to attend community blood pressure clinics. When this transport became less available, the programme took the service to seniors' group meetings. When attendance at these meetings diminished, the programme used a donor-sponsored mobile van that took services to a wide variety of locations including shopping centres. This van provided risk factor screening, referral and coaching.

THE DETAIL

Context

An integrated, community-wide comprehensive cardiovascular risk reduction programme which focused public, individual and health professional attention on the importance of long-term risk factor detection and control. The programme is no longer operational, but some of the interventions have been continued by the local Healthy Community Coalition and the local hospital's network of primary and speciality medical practices.

Goals, Values and Principles

The Franklin Cardiovascular Health Program was a community-wide prevention programme targeting cardiovascular risk factors. The programme strategies included:

- Using evidence-based targets, interventions and standard operating procedures
- Measureable and monitored objectives
- Lay and professional leadership
- Primary care clinician and community participation in programme design, implementation and evaluation
- Co-ordination with and supplementation of medical practices
- Risk factor screening, referral and follow-up with education and individual health coaching predominantly by a large cadre of volunteer local nurses in multiple community, school, workplace and health care settings
- Patient, physician and health coach collaboration, including practice-based nurse care management
- Monitoring and tracking systems created by the programme

Population

At the start of the programme in 1970, Franklin County Maine was a rural, low income population of 22,444. In 1990-92 the population was 29,008 and in 2010 the population was 30,768. The population was predominately white. The residents become older and poorer over the 40 years follow-up, but the ratio of population to primary care physicians improved. All adults were eligible to participate in the programme.

The 15 other counties in Maine were used as comparators. The population of Maine was 992,048 in 1970, 1,227,928 in 1990-2 and 1,328,361 in 2010.

Service Delivery

The programme started in 1970 and emphasised education and detection using a community-based clinic model with nurses and trained community volunteers sent into town halls, churches, schools, grocery stores, restaurants, pharmacies, dental and medical offices and workplaces:

- Nurses reviewed personal and family history, symptoms, medications and lifestyle and measured weight, blood pressure and non-fasting serum cholesterol
- Each encounter ended with personal counselling
- People with uncontrolled health conditions were referred to physicians for treatment
- Ongoing results of patient monitoring were sent to the patient's physician and entered into the programme database

- People were encouraged to return for monitoring, counselling and periodic rescreening and physicians often referred patients to the programme for interval monitoring between physician visits

Programme elements

- **Hypertension:** In the 1970's the programme emphasised the detection and control of hypertension with at least monthly clinics in each county town. More than 200 health coaches and volunteer nurses provided multifactorial, integrated cardiovascular risk factor education, screening, referral and follow-up of all adults in age groups in diverse settings. There was active follow-up with patients and primary care physicians by mail, telephone and home visits to improve tracking and control
- **Healthy eating:** From the outset, the programme promoted healthy eating. Volunteer citizen and professional task forces initiated, promoted and staffed diverse projects including community-wide heart healthy menu campaigns involving restaurants, schools and grocery stores, nutritionist-guided healthy grocery tours and consultations with school food services to serve heart-healthy meals
- **Physical activity:** From the outset, the programme promoted physical activity. The local university added a community health education department and, aided by a community fund drive, built a health and fitness centre in 1992 with the area's only indoor pool, open to students and community residents. Programme staff helped open school facilities for indoor adult walking, make outdoor recreation areas smoke-free, produced and distributed brochures on local, year-round fitness opportunities and mapped safe walking routes
- **Hyperlipidaemia:** In 1986 a programme was added to detect and control hyperlipidaemia. This used the same community outreach model as the hypertension programme, using three person teams of patient, clinician and nurse. In 1986, programme nurses also began risk factor coaching in selected physician practices
- **Smoking:** In 1988, a programme was added to minimise tobacco use with a number of initiatives between 1988 and 2011. Teachers and 50 volunteer health professionals collaborated in developing and delivering in-class tobacco-related curriculum. State-wide and national tobacco guidelines and initiatives were adopted locally e.g. adult, youth and clinician education, community organisation and advocacy, public policy change (i.e. smoke-free areas) and individual and group intervention. Programme staff, together with motivated high school students, conducted tobacco sales 'sting' interventions on under-age tobacco sales, with education and follow-up of all regional tobacco product sources
- **Complex patients:** In 2000, a programme was added to co-manage diabetes in medical practices. This was a collaborative nurse care management programme facilitating care for complex patients with lipid disorders, diabetes and/or heart failure. The programme was later integrated with all hospital-affiliated primary care physician practices

The programme responded to changing demographics and financial support by taking the service to people. For example, senior citizens initially had access to free grant-supported buses to attend community blood pressure clinics. When this transport became less available, the programme took the service to seniors' group meetings. When attendance at these meetings diminished the programme used a donor-sponsored mobile van that took services to a wide variety of locations including shopping centres. This van provided risk factor screening, referral and coaching.

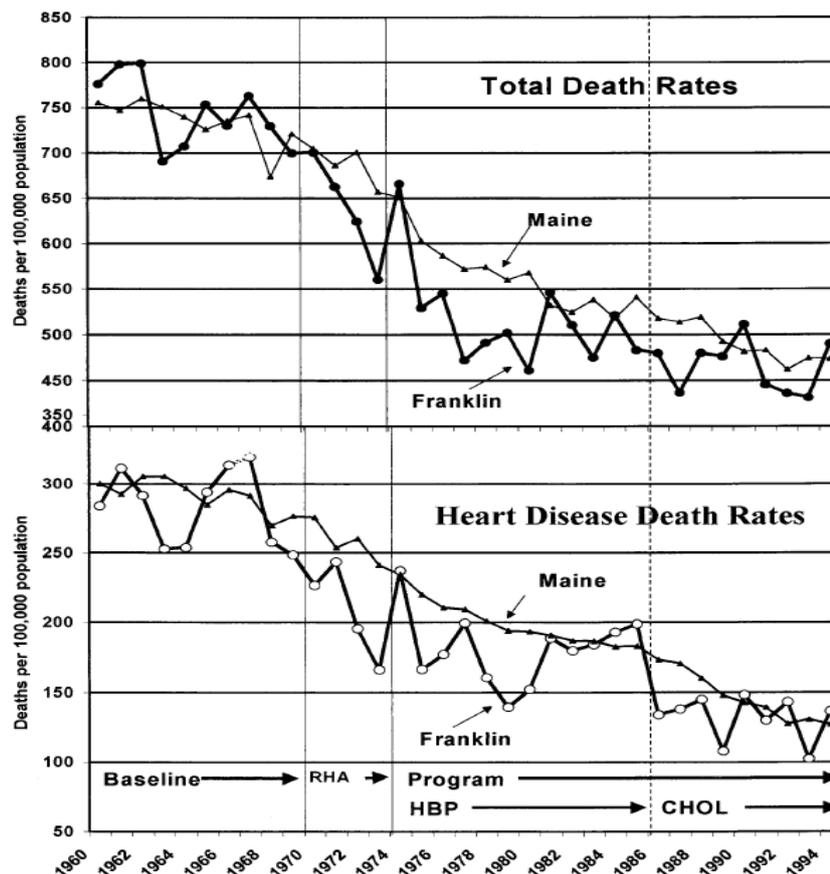
The programme developed relationships with local radio and newspapers. Early in the programme a local station broadcast weekly live reports with competitive tallying of the number of blood pressure checks done in towns and workplaces. For decades the radio station hosted interviews with programme staff on health topics.

Outcomes

Mortality

- Franklin County age and income adjusted mortality rates decreased below Maine mortality rates during 1970 to 2010, with the greatest differences coinciding with peak programme activities
- From 1970-89 Franklin County mortality rates were the lowest in Maine (observed vs expected difference -60.4 deaths/100,000; 95%CI -97.9 to -22.8, $p < 0.01$)
- From 1990-2010 Franklin County's household income decreased relative to other Maine counties but they still had significantly lower mortality than predicted by income (observed vs expected difference -41.6 deaths/ 100,000; 95%CI -77.3 to -5.8, $p = 0.005$)

Figure 1: Age adjusted total and heart disease death rates for Franklin county and Maine (1960 to 1994) with Franklin program phases (Record et al 2000)



HBP, Programme phase detecting high blood pressure

CHOL, Programme phase detecting high blood pressure and high cholesterol

RHA, Rural Health Associates – not for profit health corporation with federal funding established

Morbidity

Maine hospitalisation rates are strongly associated with household income. From 1994-2006 Franklin County's observed hospitalisation rate was significantly lower than predicted by household income (observed vs expected difference -17 discharges per 1,000 population; 95%CI -20.1 to -13.9, $p < 0.01$).

Hypertension

The proportion of people with treated and controlled hypertension increased from 18.3% in 1974/5, to 43.0% in 1977/8; an absolute increase of 24.7%; 95%CI 21.6% to 27.7%, $p < 0.01$.

Hyperlipidaemia

The proportion of people with treated and controlled cholesterol levels improved from 0.4% in 1986 to 28.9% in 2009; an absolute increase of 28.5%; 95%CI 25.3% to 31.6%, $p < 0.01$.

From 1986 to 2010 people with more visits were more likely to have treatment for high cholesterol that resulted in reaching the recommended levels.

Table 1: Visits with programme staff

Number of encounters with programme staff	Proportion of patients with treated high cholesterol at target level
1	12.5%
2	16.6%
3-4	23.1%
5-8	25.0%
9-16	32.2%
<16	38.5%

Smoking

- Smoking quit rates (ever smokers who reported they had quit) improved from 48.5% in 1994/5 to 69.5% in 2006-10
- Quit rates were significantly higher for Franklin County compared to the rest of Maine from 1996-2000 (observed vs expected difference 11.3%; 95%CI 5.5% to 17.7%, $p < 0.01$)
- Quit rates were significantly higher for Franklin County compared to the US

Table 2: Quit rates in Franklin County compared to the US

Time period	Observed vs expected difference
1996-2000	17.7% (95%CI 12.4% to 23.0%)
2001-2005	7.7% (95%CI 1.6% to 13.9%)
2006-2010	10.2% (95%CI 6.6% to 13.7%)

Participation rates

- Encounters with programme staff averaged 5,000 per year from 1974 to 1994 and 3,000 per year afterwards
- There were over 150,000 encounters by 2010; an average of more than 5 encounters per resident

Leadership and Governance

Local community groups identified CVD prevention as a priority in the late 1960's and a new Community Action Agency, a new non-profit medical and dental group practice (Rural Health Associates (RHA), and later the community's hospital, initiated and coordinated their efforts to reduce cardiovascular risk.

In 1974, the RHA, with hospital medical staff sponsorship, established the community-wide Franklin Cardiovascular Health Program. Leadership was provided by a nurse manager, medical director and diverse advisory groups.

Health promotion projects later combined into a hospital-supported Healthy Community Coalition which served as the policy, co-ordinating and goal-setting body for the area's health education, promotion and prevention activities. Volunteer citizens and professionals formed regional task forces.

Over time, many local public and non-profit organisations collaborated on various components of community efforts. Participants included the hospital, local businesses, schools, and the University of Maine, which developed a health education degree programme and trained local Community Action Agency outreach workers.

Continuous quality improvement became the standard operating procedure for regional risk factor identification and management at individual, population and programme levels. The programme promoted adherence to national guidelines and guideline based information systems.

Finances

Funding came from grants (averaging \$20,000 annually), client donations and modest fees for services. Annual budgets averaged \$50,000 during 1986-1994, excluding volunteer efforts and in-kind contributions.

Federal support from 1972 to the mid-1980s came from the Office of Economic Opportunity and the Rural Health Care Service Outreach grant programme. The programme received multiple small grants of \$10,000 to \$80,000, mostly during the initial 20 years, from the Federal Health Underserved Rural Area grant program, the Bingham Program, the Regional Medical Program, Maine Bureau of Health, Maine Department of Human Services grants, Western Maine Community Partnership, the Healthy Communities Coalition, Franklin Memorial Hospital and the United Way. Federal grants also funded planning and implementation of a comprehensive capitated health insurance plan for 3,000 indigent residents.

During the years when regional businesses (often paper and wood mills) thrived, employers paid for screening, follow-up and coaching services for their employees and helped institute effective non-smoking policies. When the mills were sold to more distant owners there was less cooperation with the programme.

Costs

The lower than expected hospitalisation rates were associated with \$5,450,362 (£3,919,300) reductions in total in-and out of area hospital charges for Franklin County residents per year.

Human Resources

The programme initiatives were mostly delivered by volunteer nurses and local citizens. There was also involvement from primary care and the local hospital. Health-coaching was provided by nurses, health educators and other health professionals and trained lay volunteers.

Infrastructure and Supplies

The programme sought to integrate current and new clinical and community resources. Interventions were delivered in a variety of community settings. A health van was used for screening, education and coaching services in schools, workplaces and health care and other community settings.

Knowledge and Information

Training

The programme used trained outreach workers, with the local university providing the training.

Data

Medical record systems provided aggregated data from 1974 to 2009 on screening and follow-up encounters, demographics, behavioural risk factors and hypertension and cholesterol control. Additional data was available from routinely collected sources such as census and local and national disease control centres.

Patients and health-care workers received personalised scorecards to encourage attainment of personalised goals and to find 'lost' at-risk patients and provide performance feedback to patients, coaches, clinicians, workplaces, practices and other organisations.

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Hearts Beat Back:—the Health of New Ulm (HONU) project

A CASE STUDY

PROGRAMME AT A GLANCE

New Ulm is a small community of 17,000 people. Local health organisations were keen to track the cardiovascular health of the population before and during the implementation of community wide interventions. The Health of New Ulm (HONU) project implemented individual, family and community level interventions in order to influence behaviour and reduce modifiable cardiovascular disease (CVD) risk factors. HONU gathered cardiovascular risk data either from electronic records or from community based CVD risk assessments held 3 times a year in New Ulm.

- People at risk of CVD or with pre-diabetes were assigned a health coach to support lifestyle change
- Families were invited to come together once a month and do physical activity and cook together and take part in taste testing
- HONU worked with employers to support them to offer health and wellness activities in the workplace
- A systematic method was used to assess how nutritionally healthy all food outlets were and supported a shift to more healthy options including smaller portion sizes
- HONU implemented community health challenges around diet and activity
- The project worked with local government on integrating a health approach when planning changes to the built environment
- Safe walking and cycling routes to school and other school based activities were promoted to parents and children

Part way through the programme funding period, plans for ongoing sustainability were put in place to ensure continuation of the multifaceted approach.



KEY TAKE AWAYS

- ▶ Long term whole population approach to prevention
- ▶ The project worked with individuals, families, workplaces, food outlets and local government for multifaceted approach to prevention
- ▶ Mid way through the 10 year funding period (2009 to 2019) a sustainable system was set up so the community could continue the work once funding had ended
- ▶ Consistent well organised communications and a strong leadership team from all sectors of the community were key elements to success of the programme

TARGET POPULATION

Community prevention approach applied to whole population of 17,000 in New Ulm, Minnesota with focused cardiovascular disease assessment and tracking for those aged 40-79.

BENEFITS AND OUTCOMES

Outcomes of a study assessing population-level CVD risk factors over a 6-year time frame before and during project implementation are outlined in Table 1

Table 1: Change in CVD risk factors with the Hearts beat back HONU project (Sidebottom et al 2016)

	2008-9	2010-11	2012-13
Blood pressure at goal*	79.3%	82.3%	86.4%
On blood pressure medication*	41.8%	43.5%	44.0%
Low-density lipoprotein at goal*	68.9%	72.3%	71.1%
High-density lipoprotein at goal	63.8%	59.0%	58.0%
Cholesterol at goal*	59.2%	64.2%	64.1%
Triglycerides at goal*	66.3%	68.7%	70.2%
On lipid medication*	25.3%	27.7%	29.1%
Not obese	56.0%	55.5%	55.1%
Fasting glucose at goal [†]	46.9%	49.7%	48.2%
On aspirin medication*	29.3%	33.5%	36.0%
Smoking	11.3%	12.6%	13.6%
Mean (\pm SD) ASCVD 10-year risk score*	12.1 \pm 0.2	11.6 \pm 0.2	11.5 \pm 0.2
ASCVD 10-year risk score <7.5%	27.8%	28.9%	27.5%

*Change between 2008/9 and 2012/13 p<0.001

[†] Change between 2008/9 and 2012/13 p=0.023

ASCVD – atherosclerotic cardiovascular disease 10 year risk score

The study by Sidebottom et al (2016) shows improvements (p<0.001) in meeting blood pressure cholesterol and triglycerides recommended levels. There were also improvements in the proportion of people on recommended levels of blood pressure and, lipid medications and mean reduction in CVD risk score. Other outcomes include an increase in CVD risk awareness and increased participation of members of the community in a range of initiatives focused on increasing physical activity, improving diet and reducing tobacco smoking.

CHALLENGES AND SOLUTIONS

The programme began with funded researchers dedicated to working with particular sectors of the community such as schools, health services, employers and food outlets. This funding was available for 10 years and the community is now in the process of taking on the full scope of the prevention programme.

This is a long term approach which needs to be sustained and supported by all sectors of the community in order for a reduction in CVD risk factors to continue.

The New Ulm community is relatively small and it is not clear whether if implemented in a larger more varied population similar reductions in CVD risk would be achieved. This may however be an approach useful to more rural towns.

THE DETAIL

Context

The focus is on reducing heart attacks and modifiable CVD risk factors through prevention.

Goals, Values and Principles

The project was developed to address all levels of the social-ecological model with a strong focus on sustainability following the funding period. Interventions were developed to fill gaps where current intervention options did not exist and to align with recently identified evidence based strategies. Where existing interventions did exist, such a smoking cessation, these were promoted. This project started in 2009 with a 10-year timeframe and is currently ongoing. It will continue to be run by the community from 2019.

Population

The health promotion campaign was targeted at the rural Minnesota communities of New Ulm (population 13,500), Springfield (population 2,215) and Sleepy Eye (population 3,600).

The priority population is described as adults aged 40 to 79 living in New Ulm, which has a total population of 16,759 and 7,855 residents aged 40 to 79 years. This population is 98% white and insurance levels are high (an estimated 8.7% residents <65 years lack insurance).

The 2009 CVD risk assessment programme was free to adults who resided or worked in the target community of New Ulm, which had a working age population of about 10,000.

Service Delivery

Between 2009 and 2013 a range of interventions were delivered.

Community Interventions

- **Heart Health Screenings:** Free to all adults and conducted in 2009 (5,221 screened) and 2011 (3,215 screened). Participant recruitment for the 2009 screening programme was through media adverts, direct mail and email, physician referral, website, social media and announcements by employers and community groups. Screening events were held at community and workplace locations. Screening involved a 30 minute visit where participants completed a health survey and had anthropometric (e.g. BMI) and blood biomarkers collected. Participants received a CVD risk report, including information on lifestyle risk factors and guidance for medical follow-up as required. Participants also received health coaching on creating goals for lifestyle risk factors and were referred to available community or programme-specific resources to help achieve those goals
- **Community Health Summits:** Annual community-wide events focused on lifestyle changes with national motivational speakers. Attendance ranged from 250 to 700 per year
- **Three formal run/ walk events per year:** 5 and 10 km distances with participation ranging from 150 to 600 per event
- **Six Community Health Challenges:** Using broad annual campaign themes varying in duration from 6-8 weeks to 12 months. These encouraged small manageable changes related to physical activity, healthy eating, weight management and stress management. Enrolment ranged from 539 to 2,236

- **General Education:** Cooking classes, grocery store tours, smoking cessation classes and presentations on a variety of topics. The 'What's Cooking New Ulm TV show' was presented on a local cable access channel seven times per week (>100 new episodes produced between 2010 and 2013)
- **Small Community Events:** Volunteer leaders were trained to promote opportunities for increased physical activity and health events e.g. physical activity classes, walking clubs, healthy potluck or dance-a-thon between 2010 and 2011
- **Food Environment Improvements:** Working with local restaurants, grocery stores and convenience stores to increase the availability, identification and selection of healthier options. A Farmers Market Promotion Programme (2012-13) included the distribution of educational materials and cooking demonstrations. Restaurant initiatives included assessment using the Nutrition Environment Measures Survey; gold, silver and bronze achievement levels based on the number of healthy eating practices offered (e.g. more fruit and vegetables, fewer calories, healthier fats, whole grain options); point-of-decision prompts e.g. in menus.
 - 18 participating restaurants in 2014 (up from 9 in 2011)
 - Restaurants report healthy items are easy to make and profitable
 - 67% customer awareness of restaurant programme in 2012
 - 80% agreed healthy choices in restaurants are easy to identify (up from 76%)
 - New food co-op opened
 - Farmers markets often closed early due to produce sold out
- **Social marketing campaign:** An 8-month (2012-13) community-wide social marketing campaign SWAP IT to DROP IT focused on 100 calorie food and beverage swaps for weight management. This included simple visual messages, mass media, partnerships and point-of-decision messages at shops, restaurants and local workplaces and 1-hour educational tour by registered dietitians at grocery stores with experiential food tasting opportunities. At the end of this period:
 - 70% of adults recognised the 'SWAP IT to DROP IT' logo
 - 85% swapped unhealthier items for healthier items
 - 92% were confident they could make healthier food and beverage choices
 - Males particularly showed increases in perceptions of healthy foods availability and ability to identify healthier choices
 - 95% grocery tour participants were referred by a clinical dietician
- **Media:** Annual communications plan to strategically blanket the community with CVD prevention messages and promote other programme initiatives. Included press releases, cable access advertising, radio promotions, billboards, newspaper adverts and articles and direct mail. This resulted in:
 - 94% of adults in the New Ulm community were aware of the project after the first year
 - 49% of adults heard about the project from their employer or co-worker
- **Social Media:** Facebook and Twitter strategies. Monthly project newsletter distributed online and in the local newspaper sharing success stories, promoting healthier lifestyles and highlighting key activities

Health care Interventions

- **HeartBeat Connections:** free phone coaching programme targeting individual patients at high cardio-metabolic risk with the goal of improving use of preventative medications and reducing lifestyle related risks. People invited to participate through electronic health record data or referral. Talk via phone for 15-20 minutes with a professional health coach (registered dietician or registered nurse), typically once a month. Served 1,022 patients in 2010 to 2013. 1 in 3 eligible people engaged with programme
 - 200% increase in percentage of patients eating 5+ daily servings of fruits and vegetables
 - 50% decrease in smoking
 - 30% increase people meeting recommended level of 150 minutes physical activity/week
 - 70% improved cholesterol
 - 95% would recommend phone coaching
 - 94% medication adherence to cholesterol medication
- **Heart & Vascular Prevention Clinic:** Staffed by a nurse practitioner with specialised lipid knowledge for referred individuals at high risk of heart disease as well as those with existing heart or vascular disease who need more intensive clinical management. Available to all people served by the New Ulm Medical Center
- **Weight Management Phone Coaching:** For individuals with a BMI ≥ 30 kg/m² who were referred by their primary care provider or who were taking part in the LOSE IT to WIN IT community health challenge. Focused on behavioural strategies such as tracking food and activity, regular self-weighing, goal-setting and relapse prevention techniques. Served 235 patients in 2013
- **11 Grand Rounds events for physicians and midlevel providers:** Raising awareness about CVD risk reduction, preventative treatment therapies and information about the project. >90% local health professionals attended at least 1 session with most attending ≥ 4 sessions.

Workplace Interventions

- **Workplace Assessments:** Assessment of wellness policies and environment completed by 46 businesses. Recommendations made e.g. workplace smoking and nutrition policies.
 - 89% employers now promote community programmes and resources for health – prefer community programmes to workplace programmes
 - 72 workplaces engaged in LOSE IT to WIN IT with 1,500 participants
 - 116 employers now engaged in some level of wellness programme (previously in 2009 only 5 of largest 100 employers had a wellness programme)
 - 5,703 participants in workplace programmes through to December 2013
- **Free Heart Health Screenings conducted at workplaces:** Aggregate reports given to participating workplaces showing prevalence of risk factors among employees and providing recommendations for wellness programmes targeting those risk factors
- **Workplace Behavioural Change Programmes:** Short (6-8 week) and long (12 month) behaviour change programmes focused on weight loss, nutrition, self-care and exercise. 14 programmes implemented at 95 workplaces from 2009 to 2013 with 4,879 employees participating. 24 educational presentations with 1,287 employees at 16 companies and freedom from smoking classes conducted at 2 workplaces

- **Business leader engagement and education:** Annual employer summits with motivational speakers, attended by 23-35 companies in 5 years. 7 educational events offered through the New Ulm Area Chamber of Commerce

Additional Interventions described

- **SWAP IT to ROCK IT campaign with schools and sports organisations:** Aimed to make healthier food stalls available at sporting events e.g. availability of healthier options such as fresh fruit, whole grain bread, water, granola bars; stealth improvements e.g. pizza with lower calories or popcorn made with trans-free fat oil; pricing incentives to encourage selection of healthier items; life-size photos of coaches and players promoting campaign messages; strategic promotions at selected events and default modifications such as water rather than soda in combo meals
 - Participating organisations made a profit or broke-even from the outset
 - Fruit options sold out at local basketball event
 - Healthier pizzas cut into 10 rather than 8 pieces promoting fewer calories per serving
 - Positive reviews
- **Food explorers programme:** Integrating nutrition into the core school's curriculum in collaboration with school principals, teachers, food service and other school leaders; connected classroom, cafeteria and home; trained teachers and parent volunteers to deliver Food Explorers Programme; taught 1,100 kindergarten and 1st grade students to cook in the classroom using parents and volunteers
 - Increased preference for fruits and vegetables among kids
 - Kids more likely to try new foods at home and school
 - More cooking together at home
 - 100% teachers and food service managers agree programme would build support for school wellness among students, parents and teachers
 - 100% of teachers and parent volunteers desire to do program again
- **Complete Streets:** Aim to create more opportunities for people to safely walk and bike in the community. Engaged community leaders in new Coalition for 'Active, Safe and Healthy Streets'; national planning and transportation experts toured the community and made safety improvement recommendations; coalition teams created 'Safe Routes to School', and town bike trail connections were revitalised.
 - City Council incorporated improvements to make streets near school safer, incorporated into already planned resurfacing project
 - Street redesign to eliminate parking on residential side of street, add bike lanes and provide pedestrian crossings 20 mph speed limits

Outcomes

Outcomes are reported in three published analyses for sub-groups of the population.

Study assessing population-level CVD risk factors over a 6-year time frame before and during project implementation (Sidebottom et al 2016)

Electronic health record data was used to assess changes in CVD risk factors for 7,855 people aged 40-79 at baseline (2008-09) and 2 follow-up periods (2010-11 and 2012-13). Mean (standard deviation) age ranged from 56.4 (10.5) years at baseline to 57.6 (10.4) at last follow-up and 53% were female.

Table 2: CVD risk factors over a 6-year time frame before and during project implementation

	2008-9	2010-11	2012-13
Blood pressure at target(<140/90 Hg)*	79.3%	82.3%	86.4%
On blood pressure medication*	41.8%	43.5%	44.0%
Low-density lipoprotein at target (<130mg/dL)*	68.9%	72.3%	71.1%
High-density lipoprotein at target (40+mg/dL men; 50+mg/dL women)	63.8%	59.0%	58.0%
Cholesterol at target(<200mg/dL)*	59.2%	64.2%	64.1%
Triglycerides at target (<150mg/dL)*	66.3%	68.7%	70.2%
On lipid medication*	25.3%	27.7%	29.1%
Not obese (BMI <30kg/m ²)	56.0%	55.5%	55.1%
Fasting glucose at target(<100mg/dL) [‡]	46.9%	49.7%	48.2%
On aspirin medication*	29.3%	33.5%	36.0%
Smoking	11.3%	12.6%	13.6%
Mean (±SD) ASCVD 10-year risk score*	12.1±0.2	11.6±0.2	11.5±0.2
ASCVD 10-year risk score <7.5%	27.8%	28.9%	27.5%

*Change between 2008/9 and 2012/13 p<0.001

[‡] Change between 2008/9 and 2012/13 p=0.023

* ASCVD – atherosclerotic cardiovascular disease 10 year risk score

The number of non-obese adults and the number achieving the high-density lipoprotein goal did not significantly improve. The number of smokers increased from 11.3% to 13.6%. The mean atherosclerotic (AS) CVD score improved but the number considered at low risk (<7.5%) for a cardiovascular event did not significantly improve.

These results are also presented separately for men and women. Significant differences by gender included greater increase in lipid use among women (improvement of 5.5% vs 1.8% for men, p=0.001) and greater increase of men with fasting glucose at target (improvement of 3.6% vs fluctuating scores for women, p=0.024). Women showed a significant improvement in the proportion with an ASCVD score <7.5% (from 25.2% to 28.7%, p=0.013). The corresponding improvement in men was not statistically significant.

Significant improvements in mean values for adults who had uncontrolled levels at baseline were seen for blood pressure, low-density and high density lipoprotein, total cholesterol, triglycerides, glucose and BMI. The proportion of this sub-group of adults who achieved targets at follow-up was not reported.

The study authors reported that these improvements in the Heart of New Ulm population were better than changes seen in national data over a similar time period.

2-year lifestyle changes and prevention of metabolic syndrome (VanWormer et al 2017)

Analysis of 2 year changes in lifestyle risk factors and incidence of metabolic syndrome for 1,059 people who completed a risk assessment in both 2009 and 2011, were aged 18 to 79 and did not have metabolic syndrome at baseline.

- 12% developed metabolic syndrome by 2011
- Optimum Lifestyle Score (OLS) (see below): 29% improved, 57% remained stable; 14% decreased
- In multivariate analysis:
 - 2 year decrease in OLS was associated with greater odds of metabolic syndrome compared to stable OLS (OR 2.92 95%CI 1.69 to 5.04, p=0.001)
 - Risk of metabolic syndrome was significantly associated with older age (OR 1.03 95%CI 1.01 to 1.04, p=0.003); CVD at baseline (OR 3.04 95%CI 1.26 to 7.29, p=0.013) and diabetes at baseline (OR 5.64 95%CI 2.01 to 15.83, p=0.001)
- In sensitivity analysis, significantly greater odds of metabolic syndrome were significantly associated with:
 - Change of BMI from <30 to ≥30 (OR 7.65 95%CI 3.45 to 17.00, p<0.001)
 - Change from eating ≥5 to <5 servings/day fruit and vegetables (OR 3.94 95%CI 1.29 to 12.08, p=0.016)
 - Change from 0-14 to >14 alcoholic drinks /week (OR 6.22 95%CI 1.06 to 36.67, p=0.043)

Measures

Metabolic syndrome includes the presence of at least three of: abdominal obesity, high blood pressure, low HDL cholesterol, high triglycerides and/or high blood glucose.

An Optimal Lifestyle Score was created with participants achieving 2 points (to a maximum of 10 points) for optimal lifestyle thresholds. These were BMI <30kg/m², being a non-smoker, drinking <14 alcohol drinks per week, eating ≥5 servings fruit/vegetables per day and ≥150 minutes per week of moderately equivalent physical activity. Difference between 2009 and 2011 OLS was classed as greatly improved (increase ≥4 points); modestly improved (increased by 2 points); stayed the same (reference category); decreased (decreased by ≥2 points).

2-year outcomes for employed adults (VanWormer et al 2015)

Analysis of the 2-year outcomes of a sub-group of 1,273 employed adults who had a CVD risk assessment in 2009. This sub-group were 62% female and had a mean ±standard deviation age of 47.5 ± 10 years). Key findings:

- Overall, adults lost 3.7% (± 11.2) of their work hours due to health reasons in 2011 (2009 figure not reported)
- Significant association between smoking and productivity loss (9.3% for adults who continued to smoke vs. 2.5% for adults who did not smoke during the 2 year period, p=0.031)
- No other lifestyle changes were significantly associated with workplace productivity loss
- No figures reported for change from baseline for lifestyle measures

Measures

Productivity loss: Assessed using the Work Productivity and Activity Impairment Questionnaire. This captures the percent decrease in total work time over the previous week as a result of combined absenteeism due to health reasons and is scored from 0% to 100% with higher scores indicating lower productivity.

Change in lifestyle factors: Assessed using questions on smoking (never, current or former smokers), alcohol use (drinks per week), fruit/vegetable consumption (servings per day) and physical activity (minutes per week of moderately equivalent physical activity).

Leadership and Governance

The project is a collaborative partnership between the Minneapolis Heart Institute Foundation, Allina Health (health care system operating the New Ulm Medical Centre) and the New Ulm community.

Intervention development was conducted by project staff in collaboration with a community steering committee with key stakeholders from many sectors of the New Ulm community. This group provided regular feedback and developed project strategy.

A Clinical Leadership team was formed to drive the health care objectives and included the hospital president, local medical director, cardiologist medical director and physicians and midlevel providers. This team met quarterly to discuss project initiatives.

Programmes were tailored to the local culture with the help of the steering committee and informed by focus group and survey data from target audiences for specific programmes.

In order to ensure sustainability, part way through the funding period the researchers began putting in place systems to support the continuation of the work across the community. A main leadership group was formed with 11 sub-groups focused on progressing different community approaches.

A leadership group of 12 key stakeholders strategically assess health needs and drive the community priorities. The leadership team comprise representatives from schools, local health services, large employers, chamber of commerce, local government, grocery stores and food outlets. There are 11 action teams progressing the different community approaches.

Finances

Heart of New Ulm interventions were primarily funded by Allina Health, the health care system operating the New Ulm Medical Center, with additional funding from government and foundation grants.

The social marketing campaign 'Swap It to Drop It' was grant-funded. The 'local health system' continued funding for dietician-led tours and the local grocery store hired a part-time dietician.

The Farmers Market Promotion Program was funded by a USDA grant.

Complete Streets was helped by federal grant funding.

In order to ensure sustainability, part way through the funding period the researchers began putting in place systems to support the self-funding and continuation of the work across the community.

Human Resources

A small number of people were funded by the project at the outset, including trained nurses who could undertake the screening sessions in the community and at workplaces. Health workers funded by the project also worked with employers to help put new health education or other activities in place for employees. Researchers funded by the programme undertook the communications role across all sectors. A dietician worked with food outlets to assess the nutritional health of the food they offered and develop and implement plans to improve the healthy options offered.

At the end of the funding period when these externally funded roles disappeared, the responsibility for these activities was integrated into the leadership team. The team is formed of representatives working in a range of organisations across the community and these organisations have committed a member of staff to be part of the team and the roles and responsibilities are incorporated into their job descriptions.

Infrastructure and Supplies

The thrust of the programme was to put activities and support into existing community and health settings. Researchers and supplies were funded over a 10 year period. This included communications and educational materials and equipment for undertaking health screening.

Knowledge and Information

Data collection

Health information was tracked from electronic health records and community health screening. Resident surveys and assessments of food outlets and health needs assessments were collated.

The vast majority of the community get medical care from the New Ulm Medical Center, which facilitated data tracking via electronic health records.

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HYPERTENSION CANADA

A CASE STUDY

PROGRAMME AT A GLANCE

Hypertension Canada was formed in 2010 from the merger of the Canadian Hypertension Society, the Canadian Hypertension Education Program and Blood Pressure Canada. Previously, all three organisations had worked independently to improve hypertension diagnosis and management. Hypertension Canada focusses on three main areas of activity:

- Research - Building capacity and undertaking hypertension surveillance
- Education – Improvement of diagnosis and management through dissemination of guidelines and recommendations
- Advocacy - Collaboration with stakeholders and governments to create supportive environments through improved awareness, prevention, and treatment

The main goal for Hypertension Canada is to ensure that Canada continues to be effective in controlling hypertension within the population. To do this Hypertension Canada is reducing misdiagnosis by ensuring that all healthcare professionals in Canada are appropriately trained to diagnose hypertension and follow recommended guidance to manage the condition.

Hypertension Canada is responsible for a number of the key elements of hypertension control in Canada including:

- The production of annual evidence based guidelines on hypertension treatment and management
- The establishment of a national healthcare public and professional education programme
- Encouraging the development of community interventions and programmes
- Monitoring the progress of hypertension treatment and prevention initiatives in Canada.

In addition, Hypertension Canada and its predecessor organisations have also worked with partners to achieve:

- The establishment of the nationally funded position of Canadian Institute of Health Research (CIHR) Hypertension Prevention and Control Chair in 2006 and
- The publication of the Pan Canadian Hypertension Framework in 2011, a national hypertension strategy.



KEY TAKEAWAYS

- ▶ Hypertension Canada has worked to improve the diagnosis and control of hypertension across Canada
- ▶ Canada controls hypertension in those diagnosed with the condition better than most other countries.
- ▶ Hypertension Canada's work is based around the creation of annually updated guidelines and recommendations
- ▶ Implementation of the guidelines is supported by an education programme targeted at health professionals and the public

TARGET POPULATION

The efforts of Hypertension Canada are aimed at all Canadians.

Hypertension Canada identified key clinical opinion leaders and educators and specifically targeted them and sought to directly involve them in the delivery of the programme. Hypertension Canada created a network of educators across Canada in pharmacy and medical schools and networked them together with use of technology to facilitate the dissemination of their guidelines.

BENEFITS AND OUTCOMES

The main outcome of the work of Hypertension Canada's and its previous incarnations has been an improvement in the rate of controlled hypertension in those diagnosed with the condition. The proportion of Canadians with hypertension that is treated and controlled increased from 13.2% in 1986-1992 to 68.1% in 2012/13. The proportion of Canadians with hypertension receiving appropriate drug therapy has increased from 35% to 80%. The proportion of people diagnosed with hypertension of those estimated to have the condition in the population increased from 57% in 1992 to 84.3% in 2013.

The number of antihypertensive prescriptions issued has increased steadily since 2007, but prescribing costs have fallen, primarily due to cheaper generic medication being available. Mortality rates amongst Canadians with hypertension have also reduced.

PROGRAMME EXPERIENCES

Hypertension Canada uses a commercial database to monitor trends in drug prescriptions for people with hypertension, allowing them to monitor increases in antihypertensive medication prescriptions.

The National Health Measures Survey is used to obtain data on the diagnosis, treatment and hypertension and routine administrative data is also used to monitor hypertension at a regional level.

Hypertension Canada suggests that key success factors have been:

- Improving the acceptability of the guidelines to health care professionals by ensuring they are independent and transparently developed.
- Building coalitions and partnerships involving government and non-government organisations and the public.
- Having clear and consistent messaging from multiple sources has been important for engaging patients and the public.

THE DETAIL

Context

Historically, in Canada the diagnosis and treatment of hypertension had been left to family doctors with little or no involvement of secondary care. This approach resulted in only 13% of patients diagnosed with hypertension having their disease properly controlled in the late 1980's.

In 1986 a joint federal/provincial committee developed a hypertension prevention and control strategy. One of the main recommendations from this strategy was to develop a national coalition of government and non-government organisations to implement measures to improve hypertension and control across Canada.

The coalition (which became known as Blood Pressure Canada) worked with the Canadian Hypertension Society to develop a series of guidelines for assessing blood pressure (BP), improving adherence to lifestyle and pharmacotherapy and home/self-assessment of blood pressure. The coalition also developed a set of lifestyle recommendations that systematically assessed and graded evidence and recommendations, as well as provided an update to pharmacotherapy and diagnosis.

A refreshed national strategy was produced in the 1990's led by Blood Pressure Canada. In considering how to operationalise the strategy an enhanced guideline development process was created, which became known as the Canadian Hypertension Education Program (CHEP). Over time it became clear that help was needed to implement and evaluate the impact of the CHEP guidelines and recommendations. This led to the creation of an Implementation Task Force and subsequently an Outcomes Task Force.

In 2009, a process was developed that merged Blood Pressure Canada, CHEP, and the Canadian Hypertension Society into a new organisation called Hypertension Canada that has operated since 2010.

Goals, Values and Principles

Hypertension Canada is a not for profit organisation committed to the prevention and control of hypertension and its complications.

It cites its mission as being *“Advancing health through the prevention and control of high blood pressure and its complications”* and has a vision that *“Canadians will have the healthiest and best managed blood pressure in the world”*.

There are a number of key principles that govern how Hypertension Canada operates.

These include:

- **Evidence based** - ensuring that all their work is evidence based, particularly in relation to guideline development
- **Innovative** – Hypertension Canada tries to encourage innovative practice, for example in supporting single pill combination therapy, which avoids patients having to take 3 – 4 different pills
- **Multi-disciplinary collaborative** – the work of Hypertension Canada involves professionals from many disciplines who collaborate to deliver the different elements of Hypertension Canada's work
- **Transparency** – Hypertension Canada believes their work and guideline development methodology should be transparent and open to challenge
- **Volunteer leadership** – initially, the organisation was entirely volunteer-led, but now there is a small number of paid staff in more managerial/director level roles.

However, all the members of the various committees and sub-groups are still volunteers

- **Respectful** – in order to foster collaborative working there is a culture of professional respect across the organisation.

Hypertension Canada strives to ensure that it engages healthcare professionals across all disciplines to continually build credibility and relevance.

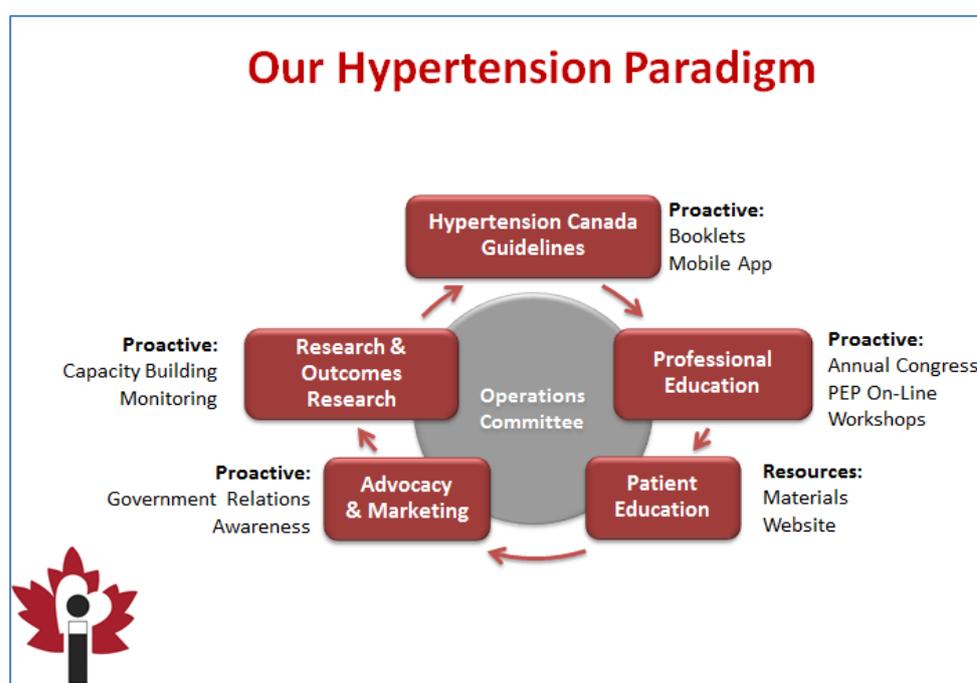
Population

Hypertension Canada's work is aimed at all Canadians.

Service Delivery

Hypertension Canada use the diagram below to illustrate the key components of their work programme.

Figure 1: Main components of the work of Hypertension Canada



The work being taken forward by Hypertension Canada to better prevent, diagnose and treat hypertension in Canada is an ongoing effort.

The interventions currently being provided include:

- The annual publication of evidence based guidelines and updates to previously published guidelines on hypertension management as part of the Canadian Hypertension Education Program (CHEP)
- The education of healthcare professionals in hypertension management via an annual conference, workshops and online Professional Education Program (PEP) accessed via: <https://lowersodium.ca/en/pep-online>. Hypertension Canada is currently reviewing how best to update this programme as some of the content is starting to become dated
- Raising awareness of hypertension and its risk factors amongst the Canadian public through healthcare professionals and also by providing patient education materials, such as the 'Get Down BP' mobile phone app

- Undertaking advocacy to create environments in which the guidelines can be successfully implemented and Canadians feel empowered to take control of their health and ensure that government and the public are aware of the importance of keeping blood pressure under control.

Canadian Hypertension Education Program (CHEP) Guidelines:

A Guidelines Taskforce comprising an unpaid voluntary group of clinical and healthcare professionals oversees the production of the guidelines. The taskforce currently has 81 members.

The Taskforce has two co-chairs, a GP and a pharmacist. There are 16 sub-groups each with a Chair and a small number of volunteer members and access to a librarian who does all of the literature searching. The draft guidelines are reviewed and commented on by a Central Review Committee which comprises experts in evidence based medicine and clinical epidemiology. Once the Central Review Committee is happy with the draft guideline it goes forward for presentation at an annual congress where all 81 members of the Taskforce vote on whether to adopt the guideline or not, with 70% voting in favour being required for a guideline to be adopted. After the Congress, a further round of on-line voting takes place, so that any Taskforce members unable to attend the congress also get the chance to vote and here a 75% majority is required for the guideline to be adopted.

In terms of implementation, the guideline manuscript is provided to the Education and Implementation Committee. The members of this committee go through the approved guidelines and highlight the key messages and the most important points to highlight to healthcare professionals each year. Historically, the Education and Implementation Committee has produced a 'What's new' booklet that highlights the most pertinent information from that year's new guidelines and updates of existing guidelines. Following feedback from healthcare professionals, in 2018 a 28 page booklet was produced that walks healthcare professional through the key information from the guidelines from diagnoses to treatment and follow up.

There are up to 40 publications a year in medical journals based on Hypertension Canada's guideline recommendations.

CHEP Educational Activities:

Key messages from the Canadian Hypertension Education Program (CHEP) aimed a healthcare professionals have included:

- Know the current blood pressure of all your patients
- Encourage the use of approved devices and proper technique to measure blood pressure at home
- Assess and manage CV risk in hypertensives including: high dietary sodium intake, smoking, dyslipidemia, dysglycemia, abdominal obesity, unhealthy eating, and physical inactivity.
- Sustained lifestyle modification is the cornerstone for the prevention and control of hypertension and the management of CV disease.
- Treat blood pressure to <140/90 mmHg.
- In people with diabetes target to <130/80 mmHg and more than one drug is usually required including diuretics to achieve BP targets.

Hypertension Canada has succeeded in getting the importance of diagnosing and treating hypertension included in the syllabus at a number of medical schools across the country.

Hypertension Canada works mostly with healthcare professionals, but does also produce some resources for the public, including a mobile phone app (Get Down BP) and information about blood pressure and risk factors available on the PEP website. During Blood Pressure month, Hypertension Canada usually partners with a blood pressure device manufacturer to run an awareness campaign and encourage people to have their blood pressure checked at least annually.

Outcomes

Outcomes from Hypertension Canada’s work have been reported in published papers and in a conference presentation and a webinar prepared for Public Health England.

A published paper detailing the history and development of Hypertension Canada (Shiffrin et al, 2016) states that the Canadian Hypertension Education Program (CHEP) was associated with increases in the proportion of diagnosed hypertension cases in Canada (from 57% in 1992 to 84.3% in 2013), the proportion of diagnosed cases receiving drug treatment (35% to 80%) and the control of hypertension (13% to 80%). It was also associated with large reductions in the rates of death and hospitalisation from cardiovascular disease, acute myocardial infarction, heart failure and stroke.

A conference presentation produced for a Public Health England conference in 2015 highlights the success of the programme in improving awareness of hypertension amongst those with the disease and improving control of hypertension amongst diagnosed cases.

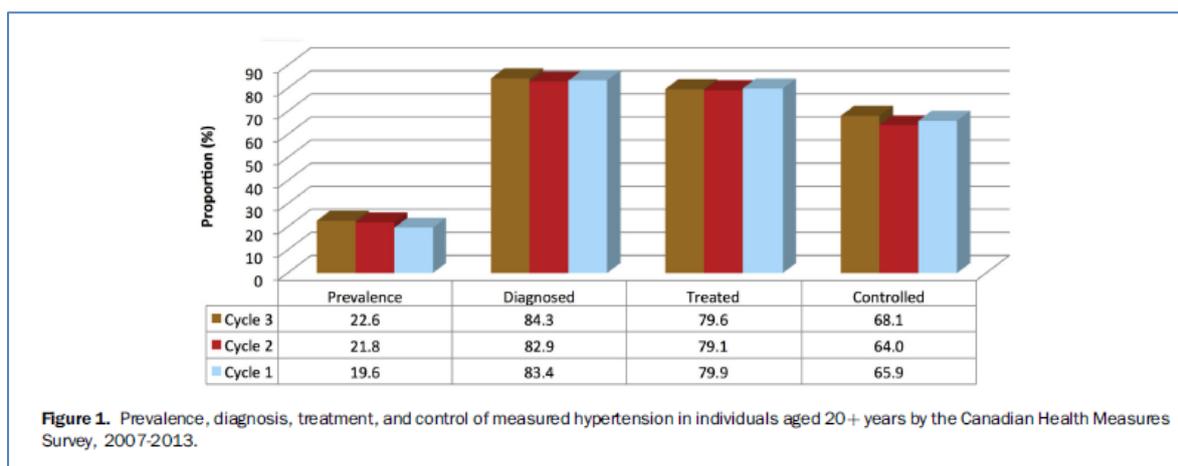
Table 1: Trend in hypertension awareness and control

	Canada (1986-1992)	Ontario (2006)	Canada (2007-2009)	Canada (2009-2011)
Treated and controlled	13.2%	65.7%	65.9%	63.9%
Treated but not controlled	21.4%	14.7%	14.0%	15.1%
Aware but not treated	22.4%	5.8%	3.5%	3.8%
Unaware	43.0%	13.7%	16.6%	17.2%

A published paper provided to SPH by Hypertension Canada (Padwal et al, 2016) about the epidemiology of hypertension in Canada described a number of trends in aspects of hypertension diagnosis and treatment.

The paper reported that the proportions of Canadians with hypertension detected and treated had remained relatively stable since 2007-2009, but the proportion of hypertension patients with controlled disease has increased from 65.9% in 2007-2009 to 68.1% in 2012/13 (Figure 2). The prevalence of hypertension was also found to have increased from 19.6% to 22.6% over the same period.

Figure 2: Trends in hypertension prevalence, proportions diagnosed, treated and with controlled hypertension, 2007 - 2013



Cycle 1 = 2007-2009

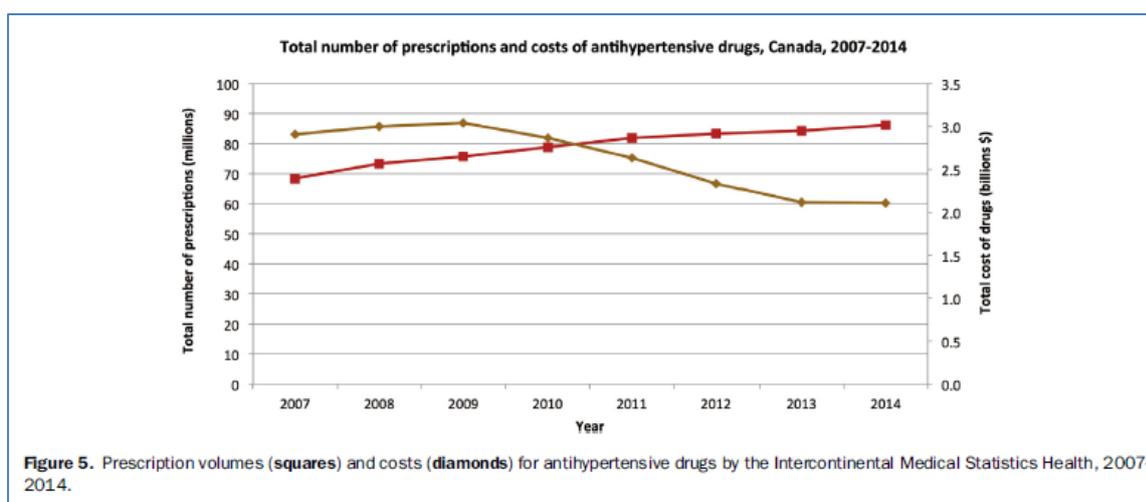
Cycle 2 = 2009-2011

Cycle 3 = 2012-2013

The paper also reported that in the diabetic population for the period 2012/13 the prevalence of hypertension was 67.1% based on a threshold of 130/80 mm Hg. Of those with hypertension 60.1% were treated and hypertension was controlled with a further 33.1% were treated but hypertension was uncontrolled. If a threshold of 140/90 mm Hg was used for the diagnosis of hypertension in respondents with diabetes, then 88.6% of respondents were treated and the disease was controlled.

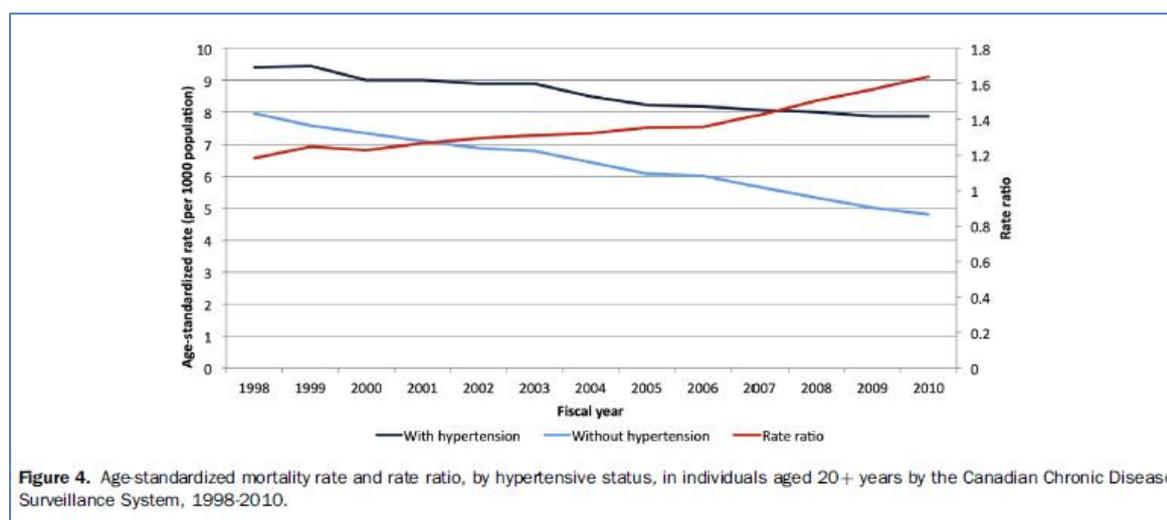
The paper noted that the number of antihypertensive prescriptions has increased steadily since 2007, but prescribing costs have fallen, primarily due to cheaper generic medication being available.

Figure 3: Trends in the prescribing of antihypertensive drugs, 2007 to 2014



The paper stated that analysis of mortality data shows declining death rates in Canada for both individuals with hypertension and those without hypertension. However, the relative risk of death for those with hypertension is compared to those without hypertension is increasing (relative risk 1.2 in 1998 rising to 1.6 in 2010). The authors concluded that this reflects that fact that control of hypertension is less than 100% in Canada and that uncontrolled hypertension often clusters with other risk factors such as coronary artery disease, high cholesterol and low physical activity.

Figure 4: Trends in age-standardised mortality rates and relative risk ratio for those with and without hypertension, 1998 - 2010



The October 2015 update to the 2011 Pan Canadian Hypertension Strategy written in 2015 detailed the progress made so far in achieving the various targets set within the 2011 strategy to be achieved by 2020. It suggested that based on the current trajectory, most of the Framework targets are unlikely to be achieved by 2020. Based on survey data from the Canadian Measurement Survey, there has been little change since 2011 in the prevalence of hypertension, awareness of hypertension, diagnosis and control rates, suggesting that preventative interventions have so far been less successful than interventions aimed at those already diagnosed with hypertension.

Table 2: Progress towards 2020 targets set out in the 2011 Pan-Canadian hypertension strategy

	2007-2009	2010-2011	2012-2013	2020 Target
Hypertension Prevalence	19.6%	21.8%	22.6%	13%
Awareness of condition	83.4%	82.9%	84.3%	95%
Diagnosed with hypertension with normal BP while not on antihypertensive drug treatment a (i.e. lifestyle control of hypertension)	8.5%	11.1%	6.6%	40%
Appropriate drug therapy	79.9%	79.2%	79.6%	87%
Blood pressure under control	65.9%	64.1%	68.1%	78%

The report makes a number of recommendations to national and regional government to improve performance against these targets, calling for a national physical activity strategy, a national healthy food policy and better implementation of the 2010 Sodium Reduction Strategy and for established and effective community programmes (such as CHAP) to be

scaled up and sustained as well as new programmes to be developed for deprived and hard to reach groups.

Leadership and Governance

Hypertension Canada has a volunteer Board of Directors drawn from medical disciplines, government and business leaders, which includes the CEO, President and the Treasurer. There are 14 members in total drawn from a wide range of professional backgrounds.

There is a small paid staff of 5 full time equivalent posts, with the majority of Hypertension Canada's work being delivered by volunteers on various committees, sub-groups and taskforces.

The Hypertension Canada Guidelines Committee (HCGC) comprises a multidisciplinary panel of content and methodological experts, divided into 16 sub-groups, each representing a distinct area of hypertension. Activities of the HCGC are supported by Hypertension Canada. The members of the HCGC are unpaid volunteers who contribute their time and expertise to the annual development and dissemination of the Hypertension Canada guidelines.

Hypertension Canada's guideline development process has been externally reviewed and found to be in accordance with the Appraisal of Guidelines for Research and Education II (AGREE II) instrument for guideline development.

The organisational structure of Hypertension Canada is shown in Figure 5 below:

Figure 5: Organisational structure of Hypertension Canada



Finances

Hypertension Canada is a not for profit organisation and receives no government funding.

Funding is provided via sponsorships, from membership fees, from donations and from sales. The latter relates to the Hypertension Canada's Blood Pressure Measurement Device Recommendation Program which allows manufacturers of blood pressure measurement devices to submit their devices for validation by Hypertension Canada. Hypertension Canada looks at the evidence base for the device and if it is in line with the evidence, the manufacturer is allowed to use an approved by Hypertension Canada log in their advertising/marketing material.

Human Resources

The programme is delivered by a multidisciplinary team and relies heavily on over 80 volunteers from all parts of Canada. The team includes:

- Primary care physicians
- Medical specialists in cardiology, internal medicine, endocrinology, nephrology, neurology, paediatrics, maternal-fetal medicine
- Nursing
- Pharmacy
- Dieticians
- Psychologists
- Researchers

From 2000 to 2010 the number of people involved in the work now being taken forward by Hypertension Canada increased from 20 to about 150.

Infrastructure and Supplies

There is not a very significant manpower infrastructure as Hypertension Canada has only 5 FTE salaried staff. A lot of Hypertension Canada's work is carried out by volunteers.

Knowledge and Information

Most training is provided to healthcare professionals and is connected with implementation of the Hypertension Canada clinical guidelines.

The Hypertension Canada Research and Evaluation Committee (formerly the Outcomes Research Taskforce) conducts surveillance studies on hypertension and reviews existing Canadian health surveys to identify gaps between current and best practices.

Progress towards the targets included in the 2011 Pan Canadian Hypertension Framework is monitored via the Canadian Measures Survey and by the Canadian Primary Care Sentinel Surveillance Network.

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MILLION HEARTS INITIATIVE[®]

A CASE STUDY

PROGRAMME AT A GLANCE

In 2012 the Million Hearts initiative was established by the US Department of Health and Human Services, the Centre for Disease Control and Prevention (CDC) and Centres for Medicare and Medicaid (CMS). This national initiative had a first phase, 5-year goal, of preventing 1 million cardiovascular events by 2017, and is now in its second phase, Million Hearts 2022.

Million Hearts works to align CVD prevention efforts across 50 states and 120 partners in the US by focussing on a small set of evidence-based priorities selected for their impact on heart disease, stroke and related conditions.

Promoting clinical quality improvement such as the implementation of the ABCS approach to CVD management (Aspirin when appropriate, Blood pressure control, Cholesterol management, and Smoking cessation) and meaningful use of health tools and technology such as electronic records for identifying and monitoring patient groups are key activities. Community approaches include introducing policies to eliminate artificial trans-fat intake, reduce tobacco use and reduce sodium intake.

Million Hearts 2022 continues these activities but new emphasis is placed on achieving 70% participation in cardiac rehabilitation by 2022. Key to achieving these aims are:

- Health care teams prioritise detection, treatment and control and review data regularly to keep on track
- Using technology that includes decision support, patient portals, registries, and algorithms to find gaps in care
- Processes around treatment protocols, proactive outreach and finding patients with undiagnosed high BP, cholesterol or tobacco use
- Patient and Family Supports – training in home BP monitoring, problem solving in medication adherence, counselling on nutrition, physical activity, tobacco use, referral to community-based physical activity programs and cardiac rehabilitation
- Health care professionals and health care organisations promote activities that reduce the likelihood of CVD such as increased physical activity, healthy eating and smoking cessation.



KEY TAKE AWAYS

- ▶ The public, private and non-profit sectors have been encouraged to work together in a coordinated way to achieve targets and share goals.
- ▶ The aim to prevent a million CVD events was easily understood and resonated with diverse stakeholders. Focus on a limited set of proven, high-impact interventions helped partners prioritise their efforts.
- ▶ Million Hearts has been integrated into nursing and inter-professional educational curricula and community settings

TARGET POPULATION

In its first phase, of Million Hearts the programme targeted the US population to support activities and policies to develop healthier habits and environments for people in all communities. The second phase Million Hearts 2022 continues to develop effective public health strategies but also identified priority populations including African Americans, 35-64 year olds, people who have had a heart attack or stroke and people with mental and/or substance use disorders.

BENEFITS AND OUTCOMES

During the first two years of the initiative, it is estimated that about 115,000 cardiovascular events were prevented, relative to the number of events in 2011 and 500,000 between 2012 and 2016. These events include emergency department visits, hospitalizations, and deaths due to myocardial infarction, stroke, heart failure, and related conditions. However final numbers will not be available until 2019. The reduction in events cannot be attributed solely to the initiative, but the reduction is noteworthy because, until 2011, there had been a flattening trend in CVD mortality. Outcomes include:

- ABCS measures were widely adopted with an overall controlled hypertension rate for the US of 58% in 2016 up from 53% in 2009/10
- Controlled hypertension was reported in 80% of hypertensives by 59 hypertension control champions covering 13.8 million people
- Reduction in smoking: 7 million fewer people smoked cigarettes in 2015 than in 2011.
- Increase of 48.1% to 58.8% between 2011 and 2016 of population covered with comprehensive smoke free law
- Millions of Americans are now served by health care systems that recognise or reward performance in the ABCS e.g. the Million Hearts Hypertension Control Challenge
- Health Tools and Technology: CMS Electronic Health Record (EHR)

incentive programs rewarded health care practices for achieving meaningful use of EHRs. Use of EHRs for outpatient care increased from 34% in 2011 to 87% in 2015. Health information technology has helped identify more than half a million people who may have hypertension.

- Innovations in Care Delivery: Health care systems have been able to use millions of dollars in public and private funds to improve performance on the ABCS.

PROGRAMME EXPERIENCES

- The strength of the network and its partnerships are viewed as key to the success of Million Hearts. Organisations apply to be partners through the Million Hearts website and a range of resources are available providing platforms of communication and shared learning.
- The first phase Million Hearts 2017 informed the strategy of Million Hearts 2022, identifying priority populations and additional areas of focus such as cardiac rehabilitation.
- There was delayed federal action on guidance to the food industry for voluntarily reduction in sodium in processed and commercially prepared food was issued in June 2016 which slowed progress.
- There was delayed federal action on announcing that partially hydrogenated oils were not safe so. Policy in place during 2018.
- Key indicators have been slow to improve but it is hoped that with a raft of guidance, training policies and initiatives now in place there will be an acceleration of progress.

THE DETAIL

Context

Million Hearts supports community activities and policies that it is hoped will result in healthier habits and environments for people across the US, such as reducing smoking, reducing sodium intake and eliminating trans-fat intake. It also focuses on clinical quality improvements related to ABCS measures (Aspirin when appropriate, Blood pressure control, Cholesterol management, and Smoking cessation), use of health tools and technology to detect CVD risk and innovations in care delivery. The engagement of partners and ongoing collaboration was a key and clear aim of preventing a million events, a message easily understood by stakeholders. Some interventions are implemented at national level affecting the whole population, for example, policy change on trans-fats and guidance on sodium reduction, and others, such as meeting the ABCS, are enacted at local level and are targeted at those identified as having specific high risk factors.

Goals, Values and Principles

Million Hearts was established by the US Department of Health and Human Services the Centre for Disease Control and Prevention (CDC) and Centres for Medicare and Medicaid (CMS) in 2012. This national initiative had a first phase five year goal of preventing 1 million cardiovascular events by 2017, and is now in its second phase, Million Hearts 2022.

Million Hearts 2022 continues these activities but new emphasis is placed on achieving 70% participation in cardiac rehabilitation by 2022, and priority populations have been identified.

The program is challenging the clinical health system and the public health community to increase their collaboration to prevent cardiovascular disease by focusing on the ABCS, increasing use of health information technology including electronic health records, and integrating team-based care into everyday practice. Public health helps clinical care by making the case for effective public policies such as reducing salt and trans-fat in prepared foods and establishing smoke-free environments to help prevent heart attacks and strokes.

Working with communities, health systems, non-profit organisations, federal agencies, and private sector partners, the collaborative approach is an important feature of the initiative. Varda et al (2018) used a social network analysis approach to assess the Million Hearts network partnerships and identify potential implications for policy and practice. The authors conclude that the Million Hearts network is unique in its membership at the national level, agreement on outcomes and information-sharing abilities that require few resources. There is a decentralized structure with the core team and stakeholders continuing to find ways to strengthen the network.

Frieden et al (2017) note that the programmes aim to prevent a million events was easily understood and resonated with diverse stakeholders, as did the concept of public health and health care working together toward a common goal. The five year time frame gave a sense of urgency and focusing on a limited set of proven, high-impact interventions helped partners prioritize their efforts. Flexibility implementing interventions made diverse participation possible.

Million Hearts supports individuals and organisations that are currently or aiming to put resource into CVD prevention and encourage them to focus on implementing the ABCS and other evidence based interventions that are likely to make a difference. "Waste no will" is a key principle which leads to inclusivity of all organisations that have the goal of reducing the risk factors that lead to CVD. This inclusivity results in diverse partners networking with each other who may not otherwise have met.

Million Hearts® 2022

The program is ongoing, with a second phase running from 2017 to 2022, committed to preventing 1 million cardiovascular events over the period. Million Hearts® 2022 will focus on improving the use of ABCS, participation in cardiac rehabilitation as well as reducing tobacco use, sodium intake and promoting physical activity.

Ades et al (2016) outline a 'road map' to achieving 70% participation in cardiac rehabilitation and secondary prevention programs by the year 2022. Current participation rates for cardiac rehabilitation in the United States generally range from only 20% to 30%. The road map focuses on interventions, such as electronic medical record-based prompts and staffing liaisons that increase referrals of appropriate patients to cardiac rehabilitation services and adherence to cardiac rehabilitation programmes. The authors calculate that increasing cardiac rehabilitation participation from 20% to 70% would save 25,000 lives and prevent 180,000 hospitalizations annually in the United States.

Population

The Million Hearts program covers the whole of the US and the initial goal was to prevent a million CVD events nationally, between 2012 and 2017.

Million Hearts 2022 identifies priority populations:

- Black/ African Americans with hypertension - improving hypertension control
- 35 to 64 year olds - improving hypertension control & statin use and decreasing physical inactivity
- people who have had a heart attack or stroke – increasing cardiac referral and participation. Avoiding exposure to particulate matter
- people with mental and/ or substance use disorders - reducing tobacco use.

Service Delivery

The Million Hearts small core team is based in CDC where they:

- oversees partnerships with government
- develops surveillance, evaluation and research translation of effective interventions
- develops products such as the action guides, often in collaboration with external partners
- supports partnerships and collaboration

Organisations can apply for funding from Million Hearts for short term projects to implement an initiative that the organisation will sustain after this time. This funding is for innovative projects that further the specific objectives of Million Hearts which include:

- encouraging health care teams to prioritise detection, treatment and control and review data regularly to keep on track
- using technology that includes decision support, patient portals, registries, and algorithms to find gaps in care
- processes around treatment protocols and the ABCS, proactive outreach and finding patients with undiagnosed high BP, cholesterol or tobacco use
- patient and family supports – training in home BP monitoring, problem solving in medication adherence, counselling on nutrition, physical activity, tobacco use, referral to community-based physical activity programs and cardiac rehabilitation.

Partner organisations vary in size (from individual practices to large corporate organisations) and health focus (from prevention to cardiac rehabilitation) so will deliver services differently and on different scales.

Outcomes

Data suggest that the Million Hearts initiative has made progress and will achieve about half of its overall goal to prevent a million CVD events (events include emergency department visits, hospitalizations, and deaths due to myocardial infarction, stroke, heart failure, and related conditions).

Outcomes achieved through a combination of interventions and mechanisms include:

- Legislative change regarding trans-fat during 2018
- Guidance/ Voluntary Industry adoption of reduction of sodium in processed foods in 2016
- Embedding ABCS clinical quality measures in national reporting and performance programs
- Introducing 'competition' that recognises achievements ABCS implementation with 'Hypertension Control Champions' (there were 24 in 2017).
- Better use of health tools and technology including financial incentive programs for health care practices achieving meaningful use of electronic health records

The public, private and non-profit health sectors were encouraged to work together in a coordinated way to achieve these targets and share goals.

In addition Million Hearts has been integrated into nursing and inter-professional educational curricula and community settings (Gawlik et al 2015). The National Inter-professional Education and Practice Consortium to Advance Million Hearts was created, and a free on-line educational module was developed to help health care professionals and students learn about the Million Hearts initiative, conduct community CVD risk factor screening, and refer people who screen positive to appropriate resources. After completion of the module, individuals receive certification as a Million Hearts Fellow. The module and CVD risk factor screening has been incorporated into health sciences curricula. Academic institutions and health science professions partnering together as part of the National Inter-professional Education and Practice Consortium to Advance Million Hearts provide a unique opportunity to demonstrate the impact that a unified approach can have on improving population health through the use of screening, education, and prevention.

Primary prevention

Reduction in smoking: 7 million fewer people smoked cigarettes in 2015 than in 2011.

Reduction in sodium intake: Draft guidance to the food industry for voluntarily reducing sodium in processed and commercially prepared food was issued in June 2016. This step was intended to help Americans gradually reduce their sodium intake to the recommended level of less than 2,300 mg per day, which will improve their blood pressure

Eliminate trans-fat intake: Partially hydrogenated oils were expected to be removed from the food supply by 2018 with the intention of preventing thousands of fatal heart attacks every year. Legislation passed in June 2015 required that within three years, all food prepared in the US must not include trans-fats, unless approved by the Food and Drug Administration (FDA). In May 2018 the FDA agreed to give companies one more year to find an alternative ingredient.

Detection and management of CVD risk factors: ABCS implementation

ABCS clinical quality measures have been embedded in national reporting and performance programs and performance in the ABCS has been rewarded e.g. the Million Hearts

Hypertension Control Challenge – an annual competition that recognizes practices, clinicians, and health systems that have achieved blood pressure control rates at or above 70%. Fifty-nine doctors, health care practices, and health systems serving more than 13.8 million patients had been recognized at the time that the ‘Final Report’ was written in 2016.

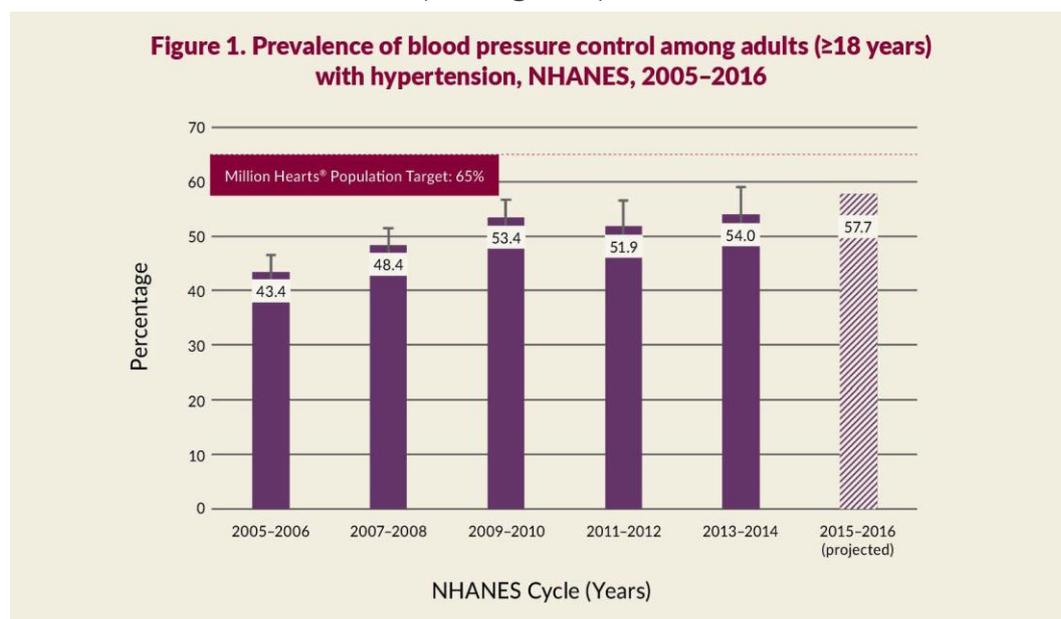
A focus on the ABCS has generated slow but steady improvement nationally in aspirin use, blood pressure control, and statin use among people who are eligible based on current guidelines. There is some variability in compliance with the ABCS quality measures and there are opportunities for improvement (Eapen et al 2014).

Aspirin When Appropriate

- Data on aspirin use are from the National Health and Nutrition Examination Survey (NHANES) and represent the self-reported use of aspirin among adults aged 40 years or older with a history of CVD. These data were not available before 2011–2012
- In 2011–2012, aspirin use among adults aged 40 years or older with CVD was 81.1%
- There is need for improvement in some populations (e.g., non-Hispanic blacks: 70.4%; Hispanics: 65.4%; people aged 40–64 years: 71.3%)
- Actual 2013–2014 aspirin data will be available in 2017; actual 2015–2016 data will be available in summer 2018.

Blood Pressure Control

- Blood pressure control among adults aged 18 years or older with hypertension is monitored using NHANES, which measures population-level control. NHANES participants include people who are not currently receiving medical care
- The Million Hearts® population-level target for blood pressure control is 65%. The target for clinical settings is 70%.
- Population level blood pressure control has been improving slowly since at least 2005; it is projected to increase from 53.4% in 2009–2010 (Million Hearts® baseline) to 57.7% in 2015–2016 (see **Figure 1**).



NHANES = National Health and Nutrition Examination Survey

- Pockets of improvement to at least 70% have been demonstrated across diverse clinical settings.

Young et al (2018) identified characteristics of health care practices and systems effective in achieving control rates at or above 70% by using data collected via applications submitted from April through June 2017 for consideration in the Million Hearts Hypertension Control Challenge.

They included 96 practices serving 635,000 patients with hypertension across 34 US states in the analysis. Mean hypertension control rate was 77.1% with 27.1% of practices having a control rate of 80% or greater. Although many practices served large populations with multiple risk factors for uncontrolled hypertension, high control rates were achieved with implementation of multiple evidenced-based strategies.

There were some factors common to these practices including:

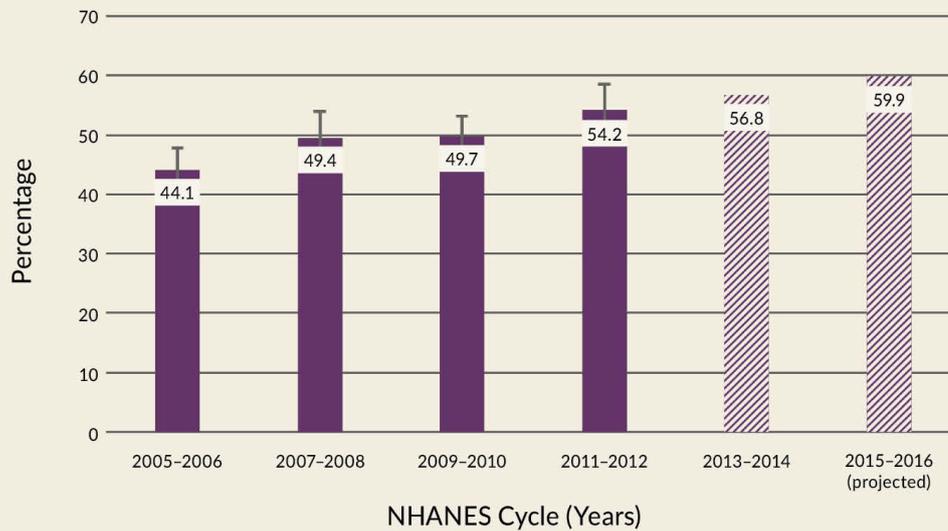
- Using multiple strategies to achieve high BP control rates aligned with the World Health Organization's Innovative Care for Chronic Conditions recommendations, and strategies recommended by the Centers for Disease Control and Prevention funded State Public Health Actions grantees and Million Hearts.
- Having electronic health records with features such as electronic prescribing, patient registries, and clinical decision support tools
- Implementing hypertension treatment protocols. This helps standardize and coordinate care and facilitates a team approach to BP management
- Some practices were offered financial and other incentives to clinicians and patients to encourage greater attention to BP control by health insurers
- Engaging patients in BP home monitoring to assess progress, inform decision making, and encourage adherence to treatment regimens

Freidan et al (2017) >125,000 physicians who were part of the electronic health records Medicare incentive programme reported an average blood pressure control rate of 62% across >17 million people with hypertension.

Cholesterol Management

- In 2013, the American College of Cardiology (ACC) and the American Heart Association (AHA) released new clinical guidelines on the treatment of blood cholesterol to reduce atherosclerotic CVD (ASCVD) risk in adults.
- The new guidelines focus only on statin use in (1) adults with clinical ASCVD, (2) adults with LDL \geq 190 mg/ dL, (3) adults aged 40–75 years with type 1 or 2 diabetes, and (4) adults aged 40–75 years with an estimated 10-year ASCVD risk of at least 7.5%.
- A federal workgroup drafted a new “Statin Therapy for the Prevention and Treatment of Cardiovascular Disease” measure. This measure assesses statin use among the first three of the four risk groups (see above bullet point) and will be available during 2018 for electronic health record reporting.
- Retrospective analysis reflecting statin use among all four groups of eligible people, using 2005–2012 NHANES data, show that statin use has been steadily on the rise since at least 2005–2006 (see **Figure 2**).

Figure 2. Prevalence of statin use among adults (≥21 years) for whom statin therapy is recommended, NHANES, 2005–2016

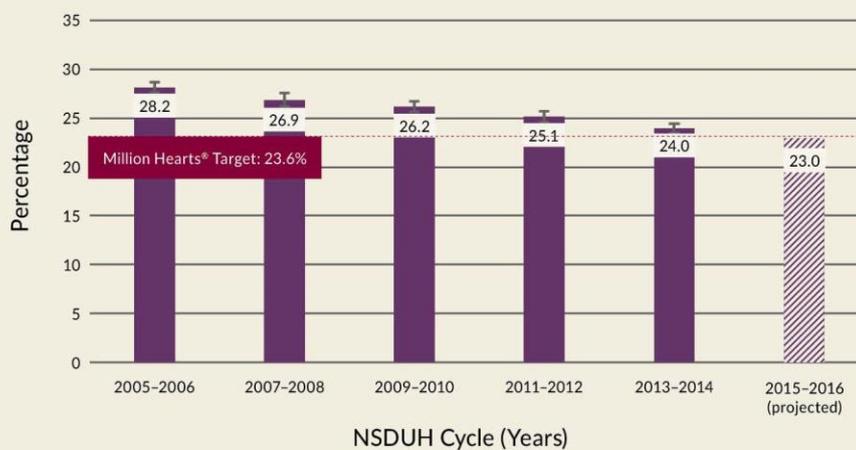


NHANES = National Health and Nutrition Examination Survey

Smoking Prevalence—Combustible Tobacco

- The use of combustible tobacco products, including cigarettes, cigars, and pipes, is monitored in the Substance Abuse and Mental Health Services Administration’s (SAMHSA’s) National Survey on Drug Use and Health (NSDUH).
- Combustible tobacco use has been declining since at least 2005–2006 and is projected to surpass the Million Hearts® target of 23.6% by 2017 (see **Figure 3**).

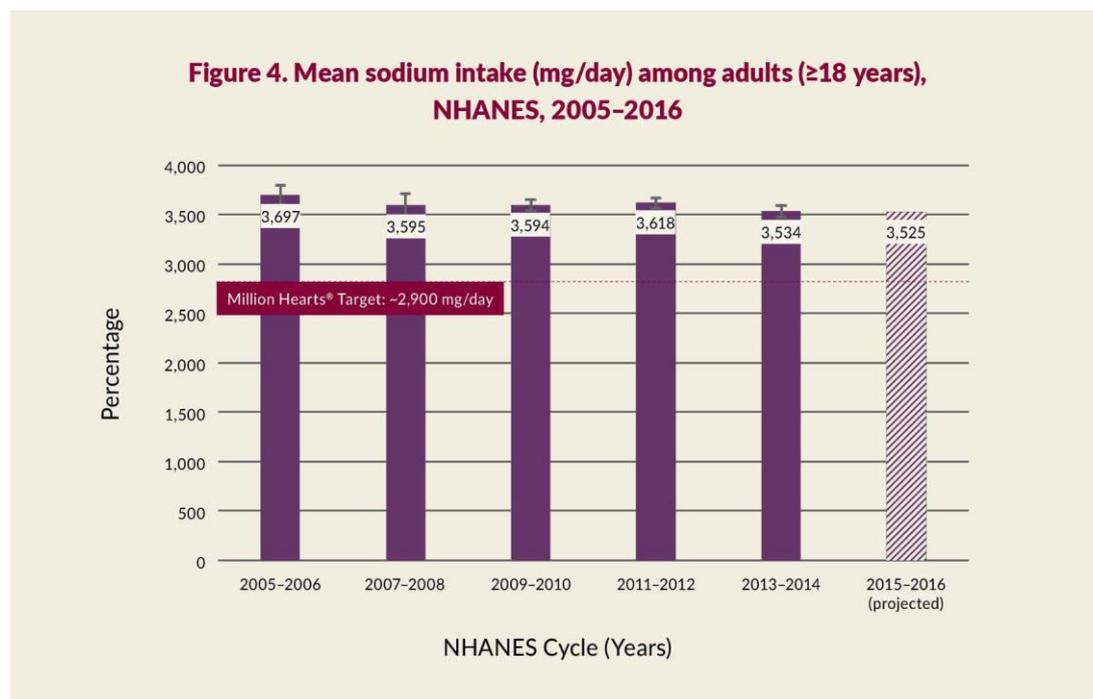
Figure 3. Prevalence of current combustible tobacco use among adults (≥18 years), NSDUH, 2005–2016



NSDUH = National Survey on Drug Use and Health

Sodium Intake

- Mean sodium intake (mg/day) among adults aged 18 years or older is estimated using NHANES dietary intake data.
- Mean daily sodium intake has decreased slightly since 2005, but during Million Hearts®, the values have levelled off (see **Figure 4**). In 2011–2012, mean daily sodium intake was highest among adults aged 18–44 years (3,907 mg/day) and men (4,255 mg/day). The Million Hearts® target is a 20% reduction from the 2009–2010 mean daily sodium intake (~2,900 mg/day).



NSDUH = National Survey on Drug Use and Health

Health Tools and Technology: Electronic Health Record (EHR) Incentive Programs rewarded health care practices for achieving meaningful use of EHRs. Use of EHRs for outpatient care increased from 34% in 2011 to 87% in 2015. Health information technology has helped identify more than half a million people who may have hypertension.

Leadership and Governance

The US Department of Health and Human Services established Million Hearts. The initiative is co-led by the Centers for Disease Control and Prevention and the Centers for Medicare and Medicaid Services.

Organizations can apply to be partners through the Million Hearts website and a range of resources are available providing platforms of communication and shared learning. The Million Hearts network is comprised of a core group of federal and private sector partners that regularly participate in Million Hearts activities.

Varda et al (2018) conducted a social network analysis. This too analysed how partners are connected, how resources are exchanged, the levels of trust and perceived value among

partners and links between the outcomes and the process of collaboration, and other more customized questions were added for the Million Hearts project. The analyses show a network that is decentralized, has strong perceptions of trust and value among its members, and strong agreement on intended outcomes. Interestingly, partners report a desire and ability to contribute resources to

The perceptions between partners are that resources are not being contributed at the level they potentially could be. The majority of partners reported that being in the network helped them achieve their goals related to cardiovascular disease prevention. The largest barrier to successful activities within the network was cited as lack of targeted funding and staff to support participation in the network. However the network is unique in its membership at the national level, agreement on outcomes, information-sharing abilities that require few resources. It has a decentralized structure, with a core team identifying ways to strengthen the network.

Finances

The core team, funded through CDC that works to distribute funding and support networks of partners, and information gathering.

Organisations can apply for funding from Million Hearts for short term projects to implement an initiative that the organisation will sustain after this time. This funding tends to be for innovative projects such as helping health centres use their clinical data to identify potentially hypertensive patients, or work to improve numbers of people monitoring their own blood pressure.

Partners join the network because they have a common aim to reduce the risk of CVD and take part in challenges, apply for funding, receive incentives from medical insurers or voluntarily develop services to meet the Million Hearts goals.

Human Resources

The core team comprise:

- An Executive Director is supported by an advisor who oversees partnerships with government.
- A Science Lead focuses on surveillance, evaluation and research translation.
- A team that develops products such as the action guides, often in collaboration with external partners.
- A team supporting partnerships and collaboration

Knowledge and Information

A key strategy is agreement by all partners that the same performance measures should be used if possible and this has largely been achieved in relation to the ABCS as well as the population level assessment of sodium and tobacco prevalence.

Population level surveys are utilised, and though accurate may not be timely for the purposes of Million Hearts. The Million Hearts team tend to 'amass data patches' from health systems and local data in order to build a national picture. There are national surveillance data systems that are pieced together for various intermediate and long term indicators. There is a small set of clinical indicators that Million Hearts have worked to

embed in federal, national and private reporting initiatives and it is these that Million Hearts looks at. Clinicians are reporting to those systems, not necessarily for Million Hearts but because there are financial incentives to submitting the data— some of the impetus is from quality and payment systems. Those systems are looked at and pieced together to build a national picture.

On occasion a clinic or local health system may look at their data and choose to share it with Million Hearts and this is encouraged by, for example, the Champion Program for blood pressure.

Often spontaneous regional public health/health care collaborations arise using the Million Hearts framework. There is confidence in using framework developed by an independent government agency and there is flexibility about what to implement for their particular population.

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