



**Irish Heart
Foundation**

The National Stroke & Heart Charity



Primary Prevention of Cardiovascular Disease

Best Practices and Lessons for Ireland

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Irish Heart Foundation
17-19 Rathmines Road Lower,
Dublin 6, D06 C780

 016685001

 info@irishheart.ie

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Primary Prevention of Cardiovascular Disease

Best Practices and Lessons for Ireland

Position paper prepared on behalf of the Irish Heart Foundation
by Professor Ivan Perry and Ms Kerrie Gallagher, School of
Public Health, University College Cork.



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Foreword

Cardiovascular disease (CVD) causes over 1.8 million deaths in the European Union (EU) each year, accounting for 37% of all deaths at an estimated cost of €210 billion. CVD is one of the leading causes of premature death and disability in Ireland, accounting for 8,753 deaths (26.5% of all deaths) in 2021, of which 1,423 were due to stroke.

Mortality rates from CVD (both ischaemic heart disease and stroke) have declined significantly in Ireland as in other high-income countries since the 1980s. This decline in one of the major causes of death has been the major driver of improvements in overall life expectancy during this period. These favourable trends in CVD mortality in all age groups reflect improvement in both underlying risk factors driving incidence (mainly smoking and diet) and the impact of evidence-based medical and surgical treatments.

However, despite these welcome declines in mortality, the absolute number of cases of CVD has increased in Ireland with our rising and ageing population and improved survival. It is also noteworthy that a significant slowdown in CVD-mortality decline is now apparent across high-income countries (including Ireland). This is linked to high and increasing obesity levels, diminishing, albeit still critically important, returns from tobacco control policies and persistent social inequalities in exposure to CVD risk factors and access to care. Recent trends in CVD mortality from the US are of particular concern in this regard. There is emerging evidence that the slowdown in the CVD-mortality decline was the major factor contributing to the stalling and subsequent reversal in life expectancy at birth observed in the US between 2010 and 2017, outpacing and overshadowing the effects of all other causes of death.

In Ireland, the discourse on health is dominated by intervention strategies in high-risk individuals. The rhetoric on prevention inevitably falls short of the reality in terms of national policy priorities and resource allocation. In particular, the scope and potential of population-based prevention strategies to address the distribution of CVD risk across the entire population, thereby reducing the incidence of CVD, have not been adequately addressed.

In this policy paper we highlight the extent to which 'upstream' policy-based CVD prevention strategies are more effective, equitable and cost efficient than 'downstream' preventive activities targeting individuals. We outline a series of recommendations for implementing effective CVD primary prevention strategies and programmes in Ireland, drawing on international experience and best practice. Insofar as possible, the recommendations are set within the context of the Healthy Ireland Framework, Sláintecare, other relevant policies, including the Climate Action and Low Carbon Development Act, 2021, and ongoing prevention programmes and initiatives.

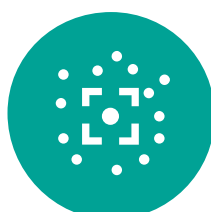
EXECUTIVE SUMMARY

Introduction



Aim

The overall aim of this paper is to support the Irish Heart Foundation's advocacy for effective primary prevention policies to reduce the burden of CVD, reduce inequalities in health and wellbeing linked to cardiovascular disease and improve population health.



Objective

The core objective of the paper is to make recommendations for implementing effective CVD primary prevention policies and programmes in Ireland, drawing on national and international evidence on relevant policies, programmes and interventions, set within the current Irish policy and programme context. Thus, the primary focus of the paper is on potential societal level and non-pharmacological interventions in the primary prevention of CVD.



Section 1: Background and context

The term **primary prevention** encompasses measures taken to **prevent** the onset of disease.

It includes strategies to address the social, economic and environmental conditions that give rise to the risk of CVD, such as tobacco taxes and restrictions on the marketing of unhealthy food to children (often described as primordial prevention) **and** measures to limit the incidence of disease by controlling specific causes and risk factors such as smoking and high blood pressure. Thus, primary prevention efforts can be directed at the whole population with the aim of reducing average risk (the population or “mass” strategy) or at people at high risk as a result of particular exposures (the high-risk-individual strategy).



Section 2: Cardiovascular disease in Ireland

We review the burden of cardiovascular disease in Ireland, including secular trends in morbidity and mortality, the contribution of major risk factors to the aetiology (causes) of CVD and recent trends in its distribution in the population, drawing on recent Healthy Ireland Survey data.

In the Republic of Ireland, the decline in mortality from coronary heart disease has been modelled from 1985 to 2006 and from 2000 to 2015. In the period up to 2006 approximately half the mortality decline was attributable to improvements in population level risk factors, mainly systolic blood pressure and cholesterol levels and a further was 40% attributable to the increased uptake of cardiology interventions. By contrast, from 2000 to 2015, two thirds of the decline in CHD mortality was attributable to increased uptake in cardiology treatments and only one third to improvements in population risk factors, partly reflecting adverse trends in obesity, diabetes and physical inactivity.

In Ireland, the average annual decline in age-standardised CVD mortality between 2000 and 2010 was approximately 7% in men and women aged 35-74 years, falling to 4% in both sexes from 2010 to 2015. Based on 2014-2015 data, the rate of the four major clinically diagnosed CVD conditions (coronary heart disease, stroke and TIA (transient ischaemic attack), atrial fibrillation and heart failure) is estimated at 7.3% in adults aged over 18 and about 30% in adults aged 75 years and older. In recent Global Burden of Disease estimates, CVD is responsible for the loss of 163,335 DALYs¹ in Ireland (13.8% of all DALYs lost). Based on extrapolation from UK data, it is estimated that CVD costs the Irish state €1.7 billion a year, of which 46% are direct health care costs.

The prevalence of smoking has declined in Ireland in recent years as a result of successful tobacco control policies and legislation. Data from the Healthy Ireland Survey 2022 indicates that 18% of the population are current smokers (14% smoke daily and 4% smoke occasionally), a 5% decrease in current smokers since 2015. However, there was a 4-point increase (to 24%) in the proportion of 25-34-year-olds who smoke, with smoking prevalence in this age group returning to the level reported in the 2019 survey. There is also evidence of an upward trend in e-cigarette use, with 25% of young adults aged 25 to 34 having tried e-cigarettes and 6% current users.

The prevalence of overweight and obesity remains high but stable in Ireland, currently estimated at 60% for adults (based on the most recent survey with measured weight and height data) and 20% for children and young people. In the 2021 Healthy Ireland Survey, only 34% of participants reported that they eat the recommended five or more pieces of fruit and vegetables per day. Approximately 35% reported consuming two or more unhealthy snack foods per day, with this behaviour remaining unchanged since 2016.

¹ Disability-adjusted life years

Based on the 2019 Healthy Ireland Survey, the most recent with data on physical activity, less than half of the population (46% overall, 54% of men and 38% of women) are meeting current physical activity guidelines, and there is evidence of a steady decline in physical activity levels with age. In the 2022 Healthy Ireland Survey, 67% of Irish respondents over the age of 15 reported they had consumed alcohol in the previous 6 months. This ranged from 71% of those aged 15 to 24 years to 47% of those aged 75 years and above. An estimated 32% of drinkers consumed alcohol on multiple days per week and 32% of those who consumed alcohol in the previous 6 months met the criteria for binge drinking.

The contribution of major CVD risk factors to the burden of disease, including both behavioural risks and the wider societal and environmental determinants, are considered in detail. A conceptual framework for the social determinants of health, including risk of CVD, is presented with a summary of findings on the origins of cardiovascular disease in childhood that highlights the need for population-based primary prevention measures targeting relevant causal factors for CVD in childhood and adolescence.

It is difficult to overstate the role of **five core risk factors**:



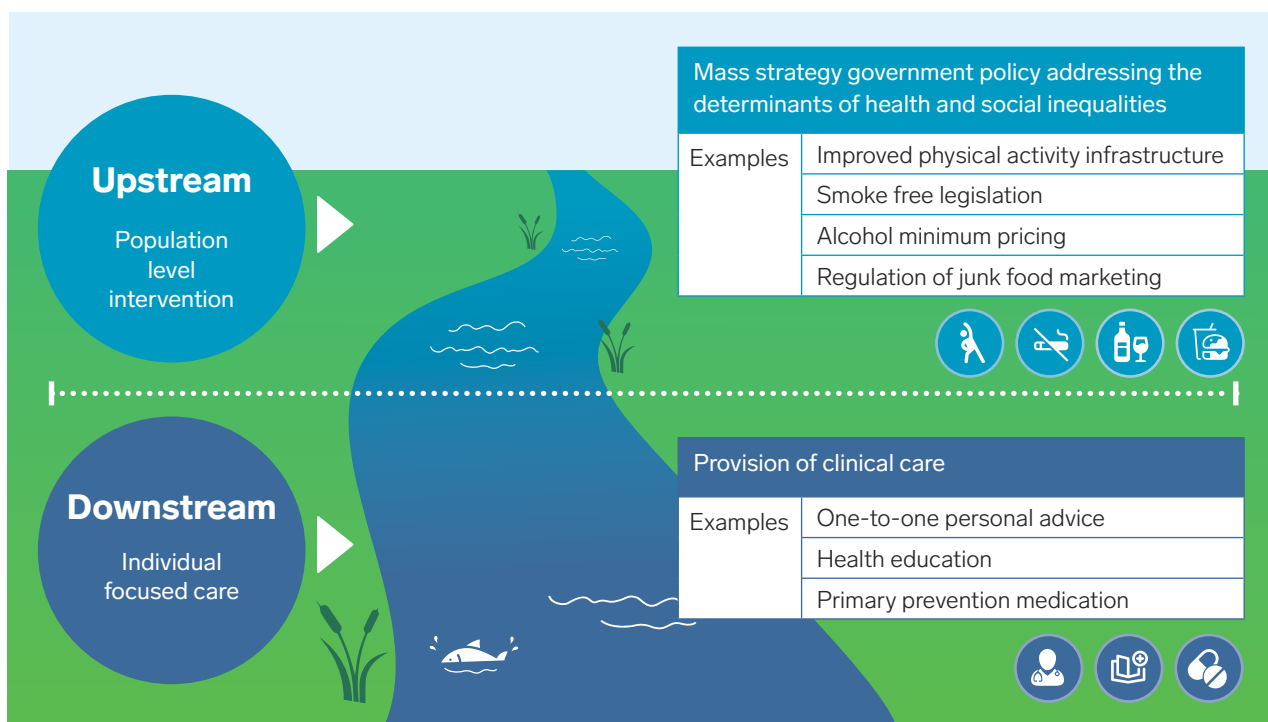
both individually and in combination on a wide range of adverse health outcomes, including the incidence of CVD and diabetes, death from CVD, death from cancer, risk of cognitive decline and dementia, overall life expectancy, healthy life expectancy and death from all causes. While the effects of these factors in isolation have been well documented since the 1960s, in recent decades research has focused on the combined effects of these risk factors. This section also considers detailed findings from this research, including relevant data from Ireland.



Section 3: Population-wide versus targeted strategies in primary prevention of cardiovascular disease

We address the optimal balance between population-wide and high-risk targeted strategies in the primary prevention of cardiovascular disease. Based on a detailed review of the relevant international literature, it is argued that while population based and high-risk approaches to prevention are both clearly necessary and complementary, policy makers should prioritise population-based strategies for primary CVD prevention on the grounds of health and wellbeing, economics and social justice. Evidence is presented in support of both an effectiveness hierarchy and a cost-effectiveness hierarchy of preventive interventions targeting major risk factors for CVD, including poor diet, tobacco, alcohol consumption and physical inactivity.

‘Downstream’ preventive activities targeting individuals (such as 1:1 personal advice, health education, ‘nudge’ or primary prevention medications) consistently achieve smaller population health impacts than interventions aimed further ‘upstream’, such as smoke-free legislation, alcohol minimum pricing or regulations addressing dietary salt intake. For example, in a study that evaluated the optimal mix of individual lifestyle, pharmaceutical and population-wide interventions in the primary prevention of cardiovascular disease from an Australian health sector perspective, best value for money (by a considerable margin) was achieved for a population level intervention addressing dietary salt intake. Mandating more moderate use of salt in breads, margarines and cereals was easily the most effective and cost-effective strategy for primary prevention of CVD; it was associated with the largest improvements in population health and was estimated to be cost saving for the health sector.



There is also increasing evidence that addressing CVD risk factors using “structural” whole population approaches tends to reduce social inequalities in health whereas high-risk approaches typically widen socioeconomic inequalities. However, over the past two decades, the advent of new and more accurate CVD risk scoring systems has shifted the focus from population-wide primary prevention strategies to more medicalized “high-risk” strategies. Despite the lack of robust evidence for effectiveness or cost effectiveness of the “high risk” approach to reducing stroke and CVD incidence on a population level, virtually all guidelines on CVD prevention stress the importance of a total CVD risk-based screening approach. Section 3 presents the core arguments in support of prioritising population wide over targeted high-risk strategies , with a particular focus on concerns about the effectiveness, cost effectiveness and equity of CVD risk factor screening programmes in general and the NHS Health Check programme in particular.

Section 3 also addresses wider issues in relation to CVD screening programmes and initiatives, including targeted CVD risk factor screening in primary care (intuitively appealing but of uncertain effectiveness with high costs per QALY²), opportunistic screening in healthcare settings (recommended on pragmatic grounds but of uncertain impact) and workplace screening (no reliable evidence of effectiveness). By contrast, a strong case can be made for CVD risk factor screening and management in the pharmacy setting based on evidence from well-designed intervention studies and a meta-analysis of randomised controlled trials. Recent findings on the effectiveness and cost-effectiveness of multifaceted screening for asymptomatic CVD, specifically for abdominal aortic aneurysm, peripheral artery disease, hypertension and dyslipidaemia in older men are briefly considered.

Irish data on the hypertension control cascade, which includes hypertension awareness, treatment, and control are presented. While there may be a place for mass media campaigns to increase blood pressure awareness and detection, the available evidence suggests variable and often short-term impacts. The findings from a 2010 Cochrane review, led by Irish researchers, that examined the effectiveness of interventions to improve control of blood pressure in patients with hypertension are summarised. Antihypertensive drug therapy should be implemented by means of a vigorous stepped care approach when patients do not reach target blood pressure levels. There was evidence that self-monitoring of blood pressure and appointment reminders may be useful and some evidence that nurse or pharmacist led care may be effective.

2 Quality-adjusted life year



Section 4: Policy Context

In this section, we outline the current policy context for disease prevention and health promotion in Ireland, including the overarching policy environment, the Healthy Ireland framework and CVD-relevant HSE prevention programmes, including the HSE Chronic Disease Management Programme. We highlight the need for greater alignment between Healthy Ireland and national policy in response to the climate emergency to ensure as far as possible that the health co-benefits of climate action are fully realised. We summarise the findings and recommendations from the Report of the Commission on Taxation and Welfare (which includes a chapter on the role of taxation in “promoting good public health”), the Irish Healthy Food Environment Policy Index (Food-EPI), the Obesity Policy and Action Plan (OPAP) mid-point evaluation report, the Roadmap for Food Production Reformulation in Ireland and the Physical Activity Environment Policy Index (PA-EPI).

The Healthy Ireland framework represents a broad, comprehensive and inspiring vision for the promotion of health and wellbeing and the prevention of disease and premature mortality in Ireland. It is clear also that there is significant commitment to the programme within the Department of Health. However, significant gaps remain between the vision and aspirations of Healthy Ireland and both the level of implementation of core actions and progress on key outcome measures. In this context, we discuss the need for greater investment in Ireland’s public health infrastructure to support the implementation and evaluation of the broad and ambitious Healthy Ireland framework and related public health programmes and initiatives.

Throughout the paper we address the core social, economic, political and commercial determinants of health.

It is clear that the challenges of preventing cardiovascular and other disease and the promotion of health and wellbeing are ultimately political, revolving around how we organise ourselves as a society at local and national level.

Thus, this section also includes a discussion of the Healthy Cities movement, which strives to translate global and national aspirations for health and wellbeing into action at the local level, together with brief reflections on the impact of the broader political environment on CVD prevention.



Section 5: Recommendations

Drawing on national and international evidence on relevant policies, programmes, including intervention, observational and modelling studies, we offer a series of recommendations for the implementation of effective CVD primary prevention policies and programmes in Ireland, set within the current Irish policy and programme context. The recommendations are framed within the overarching context of the need to:



prioritise population-based strategies for primary CVD prevention over high-risk primary prevention strategies on the grounds of health and wellbeing, economics and social justice as addressed in Section 3 of this paper.



acknowledge current detailed and comprehensive preventive strategies and programmes addressing major NCDs including cardiovascular disease linked to *Healthy Ireland*, and relevant HSE prevention programmes, as addressed in Section 4.

The **recommendations** address potential actions, interventions and issues for consideration at the level of:



government policy and wider society, with recommendations addressing (i) the fundamental social, economic, commercial and political determinants of health and wellbeing, with a focus on social justice, (ii) the need for greater policy alignment on climate action and public health, (iii) the promotion of health and wellbeing through food taxes and subsidies and (iv) the need for greater investment in Ireland's public health infrastructure.



the Department of Health, the HSE and other agencies, with recommendations addressing (v) CVD prevention targets and population health monitoring, (vi) mandatory limits on the salt content of bread and processed meat, (vii) the need to implement the detailed recommendations from the 2020 Irish healthy Food Environment Policy Index (Food-EPI), the Obesity Policy and Action Plan (OPAP) mid-point evaluation report and the Physical Activity Environment Policy Index (PA-EPI); (viii) the need for Ireland to re-establish its global leadership role in tobacco control policy; (ix) critical measures on air quality addressing health and climate change related priorities.



the clinical arena, with recommendations on (x) hypertension awareness, detection and control, (xi) CVD risk factor screening in primary care and (xii) CVD risk factor screening and management in the pharmacy setting.

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01

Background and
context

1.0 BACKGROUND AND CONTEXT

1.1 Introduction and overview

Cardiovascular disease (CVD) is the umbrella term for a broad spectrum of conditions that affect the heart and blood vessels throughout the body. The major burden of suffering and premature death from CVD arises from conditions associated with hardening, narrowing, blockage and/or dilation of blood vessels in the heart, brain, other organs and throughout the body. These conditions present with a range of familiar clinical signs and symptoms including (but not confined to) chest pain, heart attack, heart failure, stroke, vascular dementia, abnormal heart rhythms such as atrial fibrillation and sudden cardiac death.



Cardiovascular disease (CVD) is a leading cause of morbidity and mortality in Ireland and around the world ⁽¹⁾.

While mortality from CVD has declined over the last two decades, it remains Ireland's second leading cause of death after cancer ⁽²⁾.

As the causes and pathophysiological mechanisms of cardiovascular disease are well understood there is enormous scope for both prevention and treatment.

Major risk markers or risk factors³ for cardiovascular disease include:

✓ age	✓ poor diet
✓ male sex	✓ physical inactivity
✓ family history and ethnic background	✓ excessive alcohol consumption
✓ various markers of socioeconomic status and educational attainment	✓ overweight and obesity, diabetes
✓ psychosocial stress and mental illness	✓ high blood cholesterol levels
✓ smoking	✓ high blood pressure

In women, those with a history of a hypertensive disorder during pregnancy are at significantly increased risk of cardiovascular disease in later life ^{(3) (4)}.

³ As discussed below in Section 1.5, "risk factor" is an umbrella term for a range of factors operating at different levels in the causal pathway.

The underlying rates of cardiovascular disease in the population are also driven by the broad range of social, political, commercial and environmental determinants of health, which may be regarded as “the causes of the causes” of cardiovascular disease. These include the inequitable distribution of power, status, income and resources in society, the relentless promotion and marketing of unhealthy diets and sedentary behaviours and air pollution linked to vehicle emissions and the burning of fossil fuels in other settings ⁽⁵⁾.



Despite the complex interplay of individual and societal determinants of risk and the relatively long list of risk factors, adherence to five low-risk states:

- ✓ never smoking
- ✓ a healthy weight
- ✓ regular physical activity
- ✓ a healthy diet
- ✓ and moderate alcohol consumption

is associated with an extremely low risk of cardiovascular disease and markedly increased life expectancy. It is clear however that the level of adherence to these low-risk states in the population depends primarily on the wider social, economic, commercial and physical environment as opposed to personal responsibility and individual lifestyle choices. While the latter issues linked to personal agency should be addressed, the current evidence on CVD prevention (reviewed in this paper) suggests limited effectiveness for strategies that are over-reliant on promoting individual level behaviour change through media campaigns and educational interventions without regard to the wider societal context.

Links with broader NCD prevention agenda

CVD prevention initiatives cut across organisational boundaries and cannot be considered in isolation from other noncommunicable diseases (NCDs) that are impacted by the same risk factors. The core risk factors for CVD are also risk factors for other major non-communicable diseases such as cancer, chronic obstructive pulmonary disease (COPD), diabetes and dementia.

It is also clear that prevention of CVD and the promotion of health and wellbeing cannot be separated from wider government and societal policy agendas, in particular the requirement under the Climate Action and Low Carbon Development Act 2021 ⁽⁶⁾ to achieve net zero greenhouse gas (GHG) emissions no later than 2050 and a 51% reduction in emissions by the end of this decade.

Changing Cardiovascular Health: Cardiovascular Health Policy 2010-2019⁽⁷⁾ undoubtedly set out a comprehensive vision for preventing of CVD in the population, including measures drawing on all of government and cross-society intersectoral approaches, a vision reiterated in *Healthy Ireland: A Framework for Improved Health and Wellbeing 2013-2025*, and in related strategies, including *A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016-2025* and *Get Ireland Active: National Physical Activity Plan for Ireland*^{(8) (9)}.

Unfortunately, however, the discourse on health is dominated by intervention strategies in high-risk individuals and the rhetoric on prevention inevitably falls short of the reality in terms of national policy priorities and resource allocation.

Thus, significant gaps remain in Ireland's CVD prevention efforts and there is a need to consider current evidence and best practice in this area, with a particular focus on primary prevention, defined in the broadest sense, as set out below. This paper is intended to inform and potentially reinvigorate policy and practice on the primary prevention of CVD and thereby contribute to work on an updated national CVD prevention strategy.

1.2 Purpose, aims & objectives of this policy paper

The overall aim of this paper is to support the Irish Heart Foundation's advocacy for effective primary prevention policies to reduce the burden of CVD, reduce inequalities in health and wellbeing linked to cardiovascular disease and improve population health.

Considering the key risk factors for cardiovascular disease, inclusive of both behavioural risks and the wider societal and environmental determinants of risk, the paper aims specifically to:

- review the burden of cardiovascular disease in Ireland, including secular trends in morbidity and mortality, the contribution of major CVD risk factors and recent trends in their distribution in the population;
- consider the best combination of whole population and targeted high-risk strategies in the primary prevention of cardiovascular disease, based on the evidence from the international literature;
- outline the current policy context for disease prevention and health promotion in Ireland, including the overarching policy environment, the Healthy Ireland framework and relevant HSE prevention programmes, with particular reference to CVD prevention;
- drawing on national and international evidence, make recommendations for implementing effective CVD primary prevention policies and programmes in Ireland, set within the current policy and programme context.

For the purpose of this paper, the term primary prevention encompasses measures to:

- prevent the onset of disease, including strategies addressing the social, economic and environmental conditions in which risk of CVD emerges, such as tobacco taxes and restrictions on the marketing of unhealthy food to children (often described as primordial prevention),
- limit the incidence of disease, by controlling specific causes and risk factors such as smoking and high blood pressure.

Thus, primary prevention efforts can be directed at the whole population with the aim of reducing average risk (the population or “mass” strategy) or at people at high risk as a result of particular exposures (the high-risk-individual strategy).

The focus of this paper is on potential societal and non-pharmacological interventions in the primary prevention of CVD. Issues such as the role of lipid lowering therapy with statins and other drugs in the primary prevention of CVD are not addressed in detail. The prevention of CVD in high-risk groups such as patients with diabetes and those with mental illness is not addressed. Similarly, the paper does not address issues related to secondary prevention, which aims to halt the progression of the disease through interventions at an early stage in the disease process, or tertiary prevention, which is concerned with rehabilitation and minimising the impact of complications.

1.3 Methods and evidence review

The paper was drafted from July 2022 to October 2022 and is presented as a narrative review of the literature on the primary prevention of cardiovascular disease. To ensure a systematic search of the literature, search terms were developed with an academic librarian. Three databases were consulted in the search (PubMed, Cochrane Database of Systematic Reviews and Google Scholar). The primary focus of the literature review was on (i) systematic reviews, meta-analyses and policy papers focused on the primordial or primary prevention of cardiovascular disease, and (ii) studies focused on policy level interventions addressing modifiable risk factors for primary prevention, including smoking, diet, obesity, alcohol and physical inactivity. The literature review was focused on the period 2010-2020, following publication in June 2010 of the UK National Institute for Health and Care Excellence (NICE) public health guidelines on cardiovascular disease prevention⁽¹⁰⁾.

1.4 CVD causes, risk factors and the “lazy language of lifestyle”

In discussing the origins of cardiovascular disease, it is helpful to distinguish between causes and risk factors. A cause is a factor such as cigarette smoking that precedes the occurrence of CVD events and without which a proportion of such events would not occur. For example, it is estimated that at least 25% of all cases of CVD in the population can be attributed to smoking. By contrast, risk factor is a much broader term that includes:

- (i) factors that are regarded as primary causes of CVD, such as smoking, dietary saturated fat and trans-fat intake, calorie excess, physical inactivity and specific genetic markers;
- (ii) factors that increase the likelihood of exposure to these causal factors, e.g., poverty, childhood adversity and educational disadvantage;
- (iii) factors that result from exposure to the underlying causal factors, e.g., obesity and abnormal blood lipid concentrations;
- (iv) factors that are essentially early signs and symptoms of the underlying disease process, e.g., high blood pressure and atrial fibrillation.

In the primary prevention of CVD (as in the broader field of public health) the focus is largely on the causes of CVD and on the range of factors that increase the likelihood of exposure to these causes (the “causes of the causes” of CVD), but in secondary and tertiary prevention, the focus in the health sector is largely on clinical markers of the underlying causes and on early manifestations of the underlying disease process. While the clinical issues that arise within the health sector are clearly urgent and command attention and resources, in Ireland (as in other countries) we struggle to achieve an appropriate balance between the immediate short-term imperatives of clinical care and the longer-term opportunities to prevent suffering and premature death and reduce health care costs through prevention.

It is also noteworthy that some of the causes of CVD such as smoking, physical inactivity and poor diet are described as “lifestyle” risk factors. The term lifestyle risk factor is not used in this paper. We suggest that it is time to address the issue of ‘lifestyle drift’ whereby ‘upstream’ social determinants of health are reconfigured ‘downstream’ as a matter of individual behaviour change⁽¹¹⁾. Thus, we need to move beyond what has been described as the “lazy language of lifestyle” that emerged toward the latter end of the 20th century and was adopted uncritically by health professionals, policy makers, the media and the general public⁽¹²⁾. In essence, the term “lifestyle” frames health and wellbeing at an individual level – effectively blaming individuals for making irrational decisions that are detrimental to their health. The language of lifestyle tends to perpetuate a disproportionate focus on the need for individuals to make different choices and change their ‘unhealthy lifestyle’ as opposed to the need for system level change to support healthier choices.



02

Cardiovascular disease in Ireland

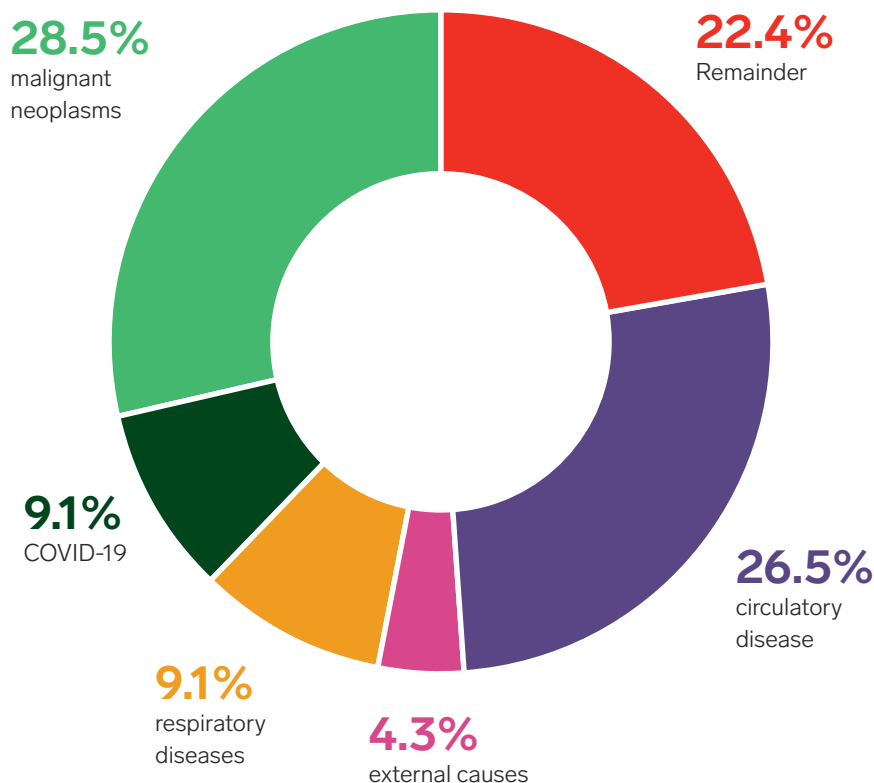
2.0 CARDIOVASCULAR DISEASE IN IRELAND: BURDEN OF DISEASE, UNDERLYING TRENDS AND MAJOR RISK FACTORS

2.1 Burden of cardiovascular disease

The burden of cardiovascular disease should be set within the broader context of the global burden of noncommunicable diseases (NCDs), which includes in addition to CVD, cancer, chronic respiratory diseases, and diabetes. Cardiovascular diseases account for most NCD deaths, or 17.9 million people annually, followed by cancers (9.3 million), chronic respiratory diseases (4.1 million), and diabetes (2.0 million including kidney disease deaths caused by diabetes).

In 2021, approximately 75% of deaths in Ireland were attributed to three major NCDs: malignant neoplasms (28.5%), CVD (26.5%) and diseases of the respiratory system (9%) (see Figure 1)⁽²⁾. Tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets all increase the risk of dying from an NCD. It is estimated that around 40% of all deaths in Ireland are attributable to preventable risk factors, close to the average seen across the EU (39%)⁽¹³⁾.

Figure 1: Principal causes of death in Ireland in 2021



Adapted from the Central Statistic Office. Vital Statistics Yearly Summary

While mortality rates for cardiovascular disease in Ireland have decreased by two thirds over the past 30 years, lower death rates do not necessarily translate into a significant fall in the population disease burden and health sector costs. As of 2021, CVD remains one of the leading causes of premature death and disability in Ireland, accounting for 8,753 deaths (170 deaths per 100,000 population)⁴ or 26.5% of all deaths, of which 4,121 were due to coronary heart disease and 1,423 due to stroke⁽²⁾. Based on the most recent age-standardised data (2019) from Eurostat, the age-standardised death rate from cardiovascular disease in Ireland is 315 per 100,000 in men and 209 per 100,000 in women, lower than the EU average (439 per 100,000 in men and 312 per 100,000 in women) and similar to rates in Northern Ireland (311 per 100,000 in men and 204 per 100,000 in women)⁽¹⁴⁾. Disability-adjusted life years (DALYs) due to CVD have also been falling in most European countries over the last decade. Nonetheless, CVD is responsible for the loss of more than 64 million DALYs in Europe (23% of all DALYs lost) and an estimated 163,335 DALYs in Ireland (13.8% of all DALYs lost)⁽¹⁵⁾.

Despite these welcome declines in mortality and DALYs, the prevalence of CVD, defined as the proportion of the population with a diagnosed CVD condition such as angina or heart failure, has remained largely stable or increased slightly due to population ageing and improved survival. This is evident in primary care data from Northern Ireland, where mortality rates have tracked those in the Republic of Ireland remarkably closely over several decades. In Northern Ireland, the estimated combined prevalence of four major clinically diagnosed CVD conditions was 7.9% in 2006/07 (coronary heart disease (CHD) 4.2%, stroke and transient ischaemic attack (TIA) 1.6%, atrial fibrillation 1.3% and heart failure 0.8%) and 8.5% in 2019/20 (CHD 3.7%, stroke and TIA 1.9%, atrial fibrillation 1.9% and heart failure 1.0%)⁽¹⁴⁾.

CVD prevalence is likely to be underestimated in primary care data, and trends over time are difficult to interpret due to the range of factors that influence self-referral and diagnostic coding. Despite these caveats, the prevalence of the four major clinically diagnosed CVD conditions (CHD, stroke and TIA, atrial fibrillation and heart failure) is broadly similar in the Republic of Ireland, estimated at 7.3% in adults over 18 years in the first wave of Healthy Ireland dataset collected in 2014/15, as shown in Table 1. Note the effects of population ageing in the prevalence of CVD, other non-communicable diseases and multimorbidity in these data; in adults aged 75 years and older, the prevalence of CHD, stroke and TIA, atrial fibrillation and heart failure is estimated at approximately 30%, with 28.7% and 6.6% having at least one or two chronic conditions respectively.

4 Age not standardised

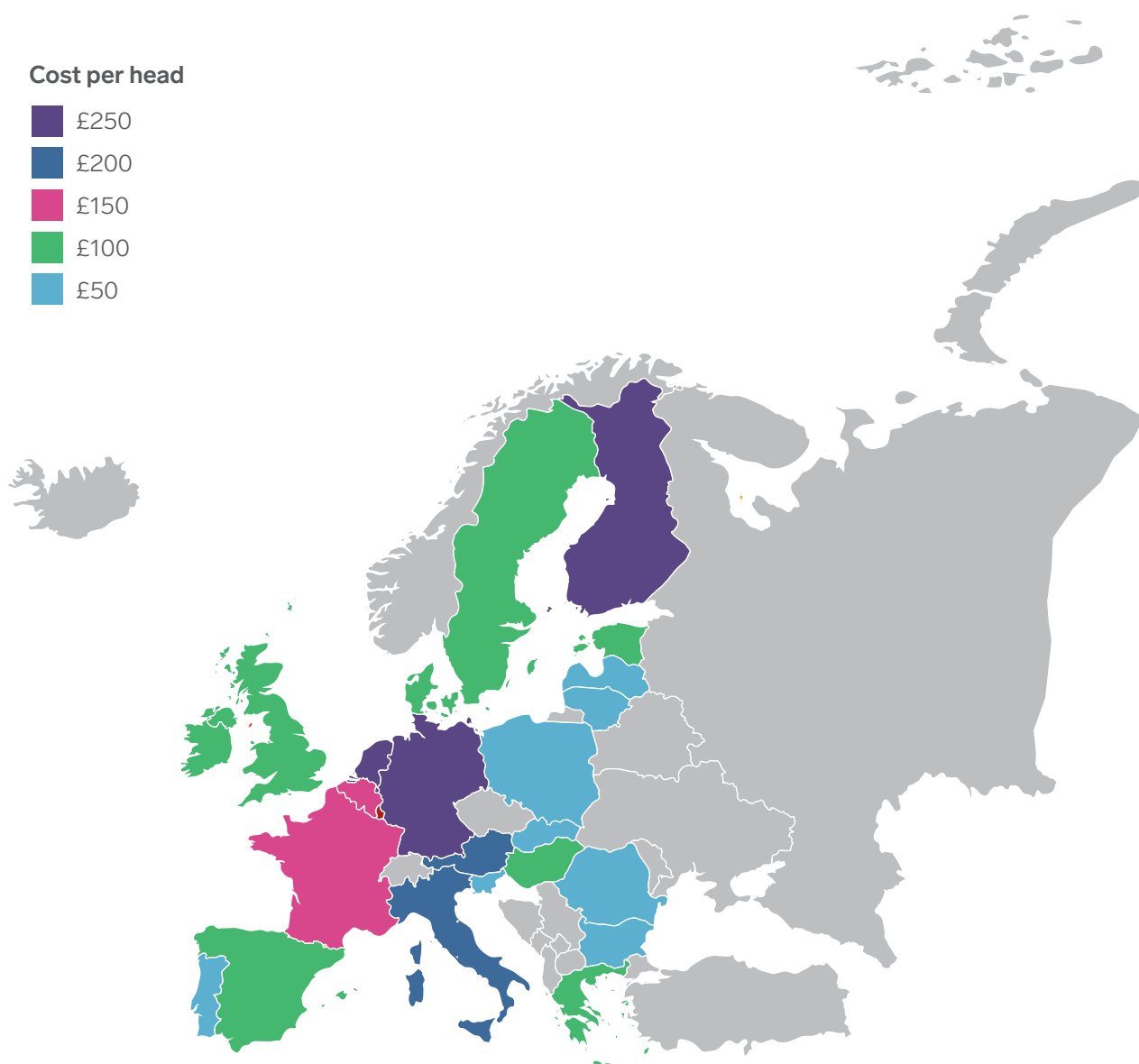
Table 1: % estimates of prevalence (95% confidence interval) of the major clinically diagnosed CVD conditions, diabetes, asthma and COPD in the first wave of Healthy Ireland dataset, 2014-15 ⁽¹⁶⁾

Condition	All adults over 18	18-44 years	45-64 years	65-69 years	70-74 years	75+ years
CHD**	3.7 (3.2, 4.2)	0.7 (0.4, 1.0)	4.2 (3.0, 5.4)	5.7 (3.6, 7.8)	8.9 (6.2, 11.6)	14.5 (11.9, 17.2)
Stroke	0.6 (0.4, 0.8)	0.2 (0.01, 0.4)	0.7 (0.3, 1.0)	1.2 (0.1, 2.2)	1.0 (0.2, 1.8)	2.2 (1.2, 3.2)
Diabetes	4.6 (4.1, 5.2)	0.4 (0.2, 0.7)	6.4 (5.0, 7.7)	11.4 (8.4, 14.4)	13.2 (9.9, 16.6)	12.7 (10.3, 15.2)
Heart Failure	0.4 (0.2, 0.5)	0.04 (0.01, 0.09)	0.2 (0.04, 0.5)	1.1 (0.2, 2.0)	0.4 (0.01, 1.2)	2.1 (0.9, 3.3)
TIA***	0.8 (0.5, 1.0)	0.02 (0.01, 0.05)	0.7 (0.2, 1.2)	1.7 (0.7, 2.8)	2.2 (0.9, 3.5)	3.7 (2.3, 5.1)
Atrial Fibrillation	1.8 (1.4, 2.2)	0.5 (0.2, 0.8)	1.7 (0.9, 2.5)	3.1 (1.4, 4.8)	5.0 (2.7, 7.4)	7.4 (5.1, 9.8)
Asthma	6.9 (6.1, 7.8)	7.9 (6.5, 9.3)	6.0 (4.7, 7.2)	6.4 (4.0, 8.9)	5.6 (3.1, 8.1)	6.3 (4.2, 8.4)
COPD	1.8 (1.4, 2.2)	0.3 (0.04, 0.5)	2.4 (1.5, 3.4)	5.6 (2.8, 8.4)	3.0 (1.3, 4.8)	4.6 (3.0, 6.1)
Multi-morbidity						
At least 1 condition	13.9 (12.9, 14.9)	9.2 (7.8, 10.6)	14.4 (12.5, 16.2)	23.0 (18.8, 27.2)	22.7 (18.4, 26.9)	28.7 (25.0, 32.4)
At least 2 conditions	2.1 (1.7, 2.5)	0.3 (0.06, 0.6)	2.6 (1.6, 3.7)	4.9 (3.0, 6.8)	5.1 (3.2, 7.0)	6.6 (4.9, 8.3)
At least 3 conditions	0.7 (0.5, 0.9)	0.03 (0.01, 0.08)	0.8 (0.2, 1.3)	1.1 (0.01, 2.1)	2.0 (0.5, 3.6)	3.4 (2.1, 4.7)
** CHD = coronary heart disease (heart attack or chronic consequences of heart attack or other heart trouble) *** TIA = transient ischemic attack **** COPD = chronic obstructive pulmonary disease						

With an essentially stable prevalence rate, the absolute number of cases of CVD and associated costs will increase with an increasing population and with health care inflation. In Ireland, hospital discharge rates for inpatients with diseases of the circulatory system were estimated at 1142 per 100,000 in 2019, marginally higher than Portugal and Cyprus, the two lowest ranked countries, less than half the rate in Finland (2425 per 100,000) and well below Bulgaria (4697 per 100,000) the highest ranked country. Clearly these data are difficult to interpret due to differences in health system models, activity and capacity⁽¹⁷⁾.

CVD is not only a human health crisis but also a major economic and societal burden. CVD in Ireland contributes to rising healthcare costs, productivity loss and an increasing familial burden through informal care. Based on extrapolation from UK data, it is estimated that CVD costs the Irish state €1.7 billion a year, of which 46% are direct health care costs (see Figure 2).

Figure 2: Estimated costs of CVD per head of population in GBP by European country⁽¹⁴⁾



Adapted from *Insights from the British Heart Foundation statistical compendium 2022*

2.2 Trends in CVD mortality in Ireland in recent decades projected to 2030/2040

Since 1978, a sharp decline in mortality rates from coronary heart disease and stroke has become unmistakable throughout the industrialised world, with age-adjusted mortality rates having declined to about one third of their 1960s baseline by 2000. Models have shown that this remarkable decline has been fuelled by rapid progress in both prevention and treatment, including steep declines in cigarette smoking, improvements in diet, improvements in hypertension treatment and control, widespread use of statins to lower circulating cholesterol levels and the development and timely use of thrombolysis and stents in acute coronary syndrome to limit or prevent infarction⁽¹⁸⁾.



However, recent evidence suggests this long-term decline may have stagnated, and even reversed in younger populations⁽¹⁹⁾.

2.2.1 CVD mortality and morbidity models in Ireland

In the Republic of Ireland, we have documented and modelled the decline in mortality from coronary heart disease from 1985 to 2006 and from 2000 to 2015 using the well validated IMPACT CHD mortality model^{(20) - (21)}. Between 1985 and 2006, a substantial downward trend in CHD mortality was observed in both men and women. As a result of this decline in CHD mortality rates, there were 6450 fewer CHD deaths in 2006 than would otherwise have occurred if the rates observed in 1985 had persisted⁽²⁰⁾.

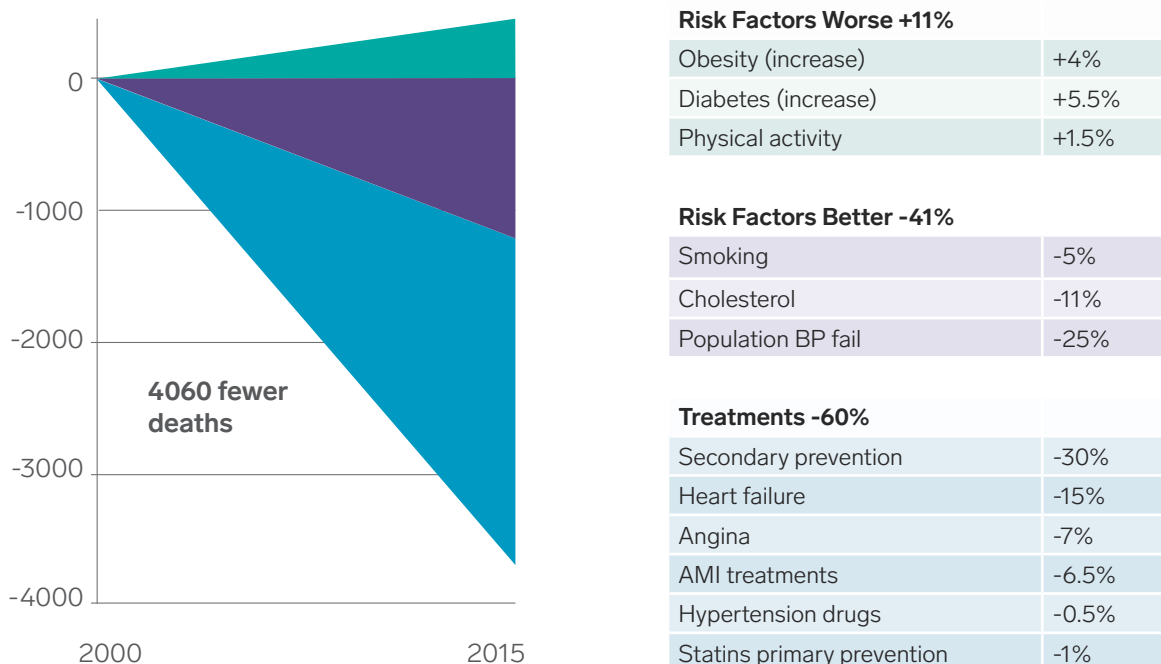


Approximately half of this mortality decline was attributable to improvements in population level risk factors, mainly systolic blood pressure and cholesterol level. A further **40%** was attributable to the increased uptake of cardiology interventions, particularly treatments for secondary prevention, chronic angina and heart failure⁽²⁰⁾.

However, these positive effects were partly negated by the additional CHD mortality attributable to increasing levels of both diabetes and obesity, particularly in women. Interestingly, when the findings on CHD mortality trends from the Republic of Ireland were compared with those from Northern Ireland during the same period, no effects of the major differences in health service organisation and provision between the two jurisdictions were detected.

In the subsequent analyses addressing the period from 2000 to 2015, CHD mortality rates fell by 56% (63% in women vs. men 53%) in those aged 25–84 years, with 4060 fewer deaths than expected in 2015 relative to the 2000 baseline year⁽²¹⁾. By contrast with the earlier period, two thirds of the decline in CHD mortality was attributable to increased uptake in cardiology treatments and only one third to improvements in population risk factors, partly reflecting adverse trends in obesity, diabetes and physical inactivity (Figure 3)⁽²¹⁾.

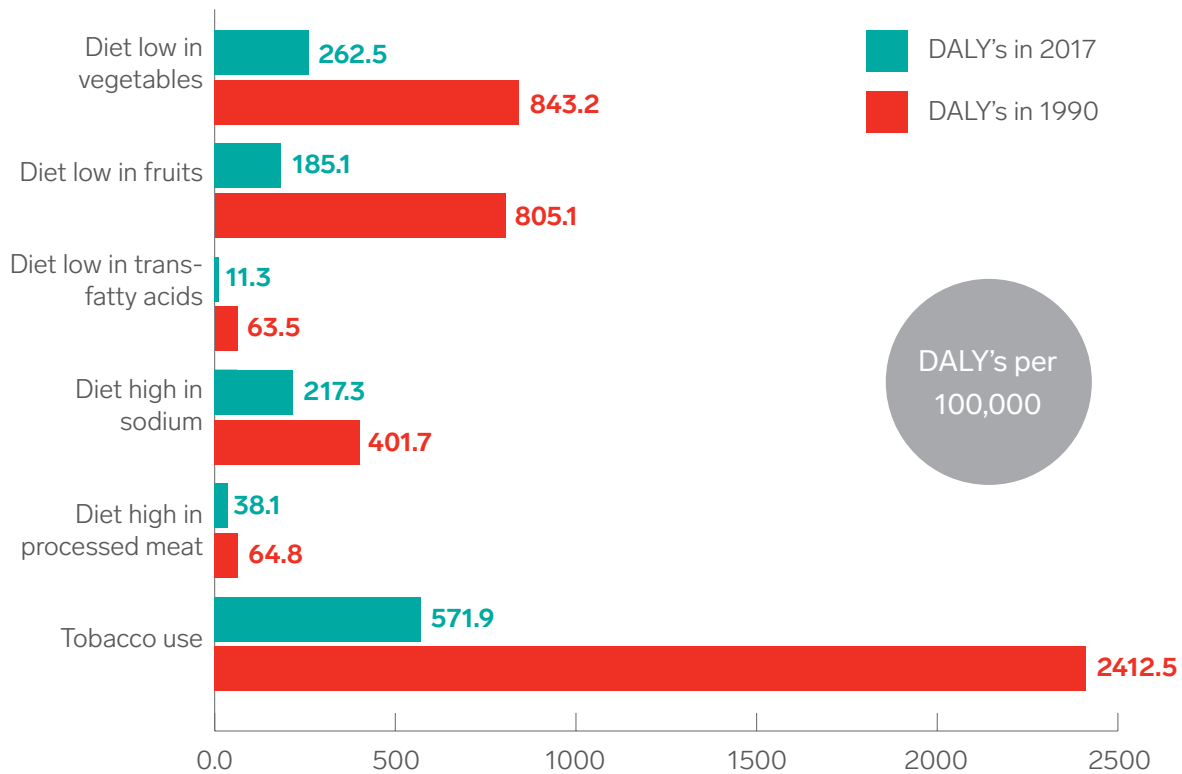
Figure 3: Decline in coronary heart disease mortality 2000-2015 and relative contribution of risk factor changes and clinical interventions⁽²¹⁾



Favourable secular trends in blood pressure have undoubtedly contributed to the declines in mortality from coronary heart disease and stroke observed in Ireland since the mid-1980s. This is evident in the data from two cross-sectional studies of CVD risk factors in men and women aged 47-73 years recruited from general practice lists in the south of Ireland in 1998 (the Cork & Kerry Cohort Study) and 2010 (the Mitchelstown Cohort Study)⁽²²⁾. Adjusted for age, gender and education, mean systolic blood pressure was 5.8 mmHg (-7.3 to -4.5) lower in 2010 than in 1998. While improvement in the clinical management of high blood pressure contributed to this favourable trend, close to one third of the decline in blood pressure was attributable to improved diet quality, including reduced salt intake as defined using the Dietary Approaches to Stopping Hypertension (DASH) diet quality score⁽²³⁾.

The critical role of dietary risks and tobacco use in the favourable trends in both CVD mortality and morbidity since 1990 is evident in analyses from the Global Burden of Disease (GBD) study, based on estimates of disability-adjusted life years (DALYs)⁵ (Figure 4) and years lived with disability (YLDs)(Figure 5).

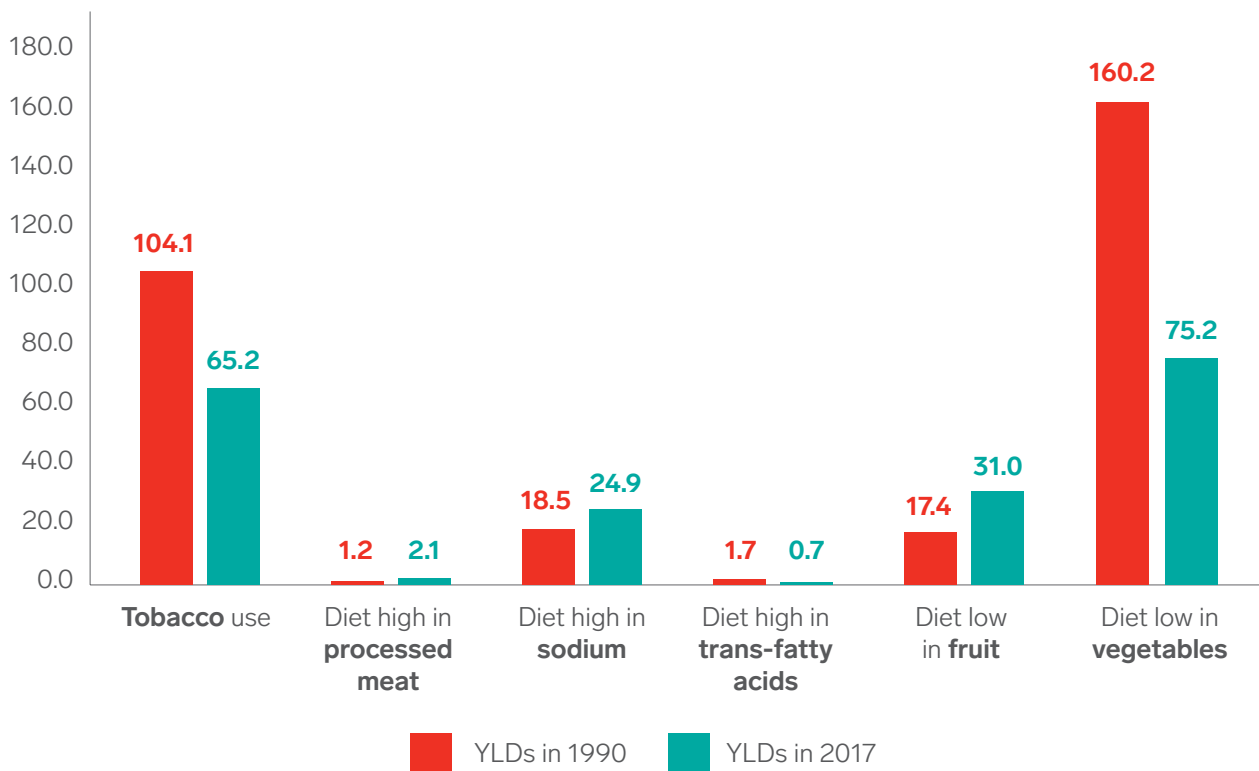
Figure 4: CVD-related DALYs (per 100,000) in Ireland attributable to dietary risk and tobacco use in 1990 and 2017⁽²⁴⁾



While the trends are generally favourable, particularly in relation to tobacco use and vegetable consumption (highlighting the importance and impact of prevention), it is noteworthy that this period saw increases in the estimated years lived with disability associated with unfavourable trends in dietary intakes of processed meat, salt and fruit.

5 The disability-adjusted life year is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

Figure 5: CVD-related YLDs (per 100,000) attributable to dietary risks and tobacco use in Ireland for 1990 and 2017⁽²⁴⁾



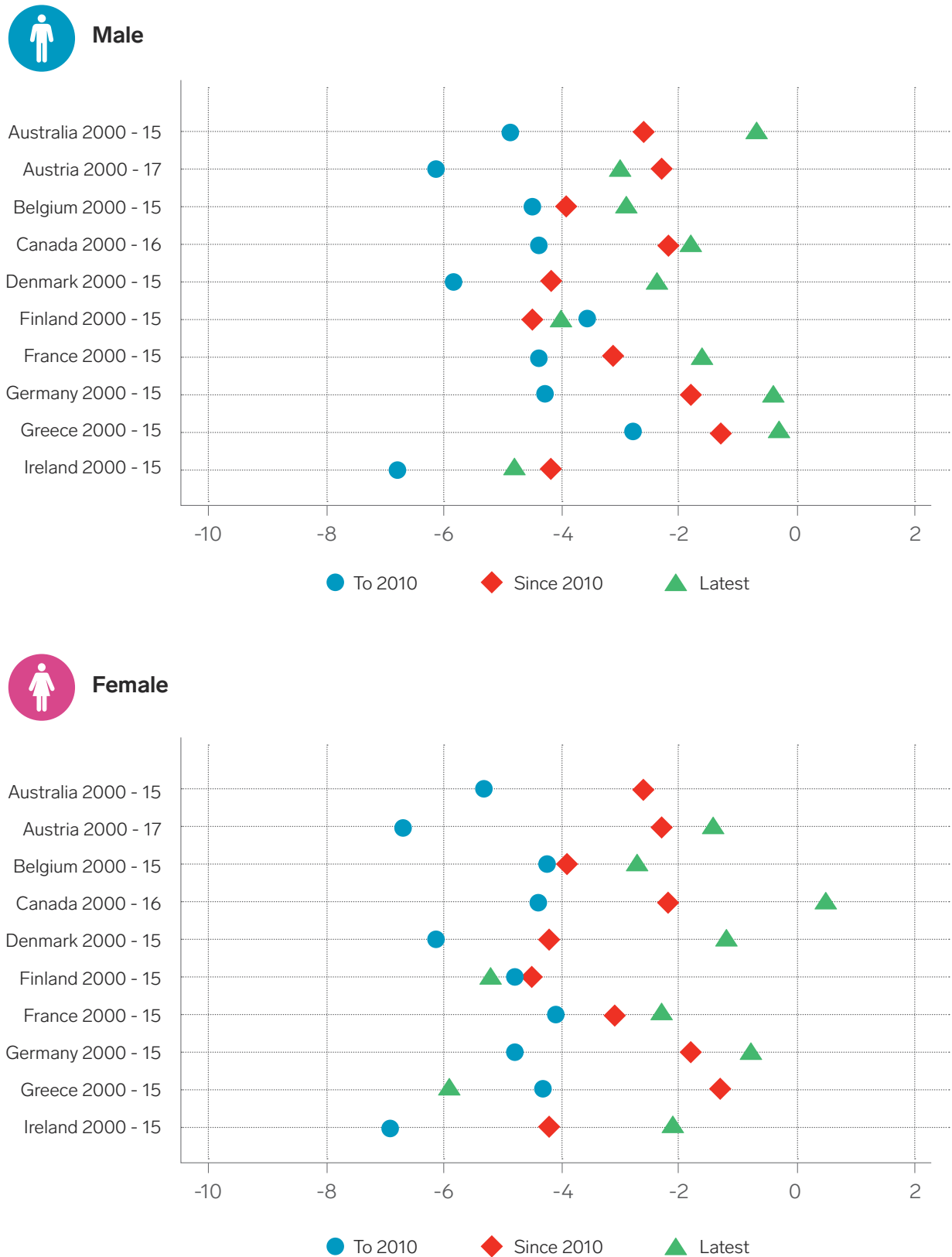
2.2.2 Slowdown in CVD-mortality decline in high-income countries

The decline in mortality rates from CVD (both ischaemic heart disease and stroke) in high-income countries, including Ireland, has been the major driver of improvements in overall life expectancy since the 1980s. As highlighted above, despite these welcome declines in mortality, the absolute number of cases of CVD has increased in Ireland due to population ageing, improved survival and population growth. It is also noteworthy that a significant slowdown in the decline in CVD-related mortality is now apparent across high-income countries, seen in all age groups but most marked in those aged 35-74 years.

In Ireland the average annual decline in age-standardised CVD mortality between 2000 and 2010 was approximately 7% in men and women aged 35-74 years, falling to 4% in both sexes from 2010 to 2015 (Figure 6)⁽¹⁹⁾. This slowdown in the CVD mortality decline is linked to high and increasing obesity levels, diminishing, but still critically important returns, from tobacco control policies and persistent social inequalities in exposure to CVD risk factors and access to care.

Recent trends in CVD mortality from the US are of particular concern for other developed countries such as Ireland. Emerging evidence indicates that the slowdown in the CVD-mortality decline in the US was the major factor in the stalling and subsequent reversal in life expectancy at birth observed there between 2010 and 2017, outpacing and overshadowing the effects of all other causes of death.

Figure 6: Cardiovascular-disease age-standardised death rates (35–74 years), annual % change (average to 2010 and average since 2010 to the latest year in 23 high-income countries)⁽¹⁹⁾



Adapted from Lopez & Adair 2019

2.2.3 Future CVD burden and potential impacts of favourable risk factor trends

In further modelling work, Hughes and colleagues⁽²⁵⁾ estimated potential reductions in CHD mortality from 2010 (baseline year) to 2030 in relation to four specific risk factor scenarios (all regarded as feasible as they have been achieved in other countries):



absolute decreases in smoking prevalence.



absolute decreases in physical inactivity rates of up to 15% by 2030.



relative decreases in dietary salt intake of up to 30% by 2030.



relative decreases in dietary saturated fat of up to 6% by 2030.

The findings from this modelling exercise suggested that a 15% absolute reduction in smoking and physical inactivity could reduce CHD deaths by 5.8–7.2% and 3.1–3.6% respectively. Furthermore, a 30% relative reduction in salt intake could reduce CHD deaths by 5.2–5.6% and a 6% reduction in saturated fat intake could reduce CHD mortality by approximately 7.8–9.0%.

The findings from this study on food policy mirror those from an earlier 2010 study from University College Cork, which modelled the potential effects on CHD and stroke mortality of two food policy scenarios (one conservative and one more ambitious) based on decreasing salt, trans fat and saturated fat consumption, and increasing fruit and vegetable consumption in Irish adults aged 25–84 years⁽²⁶⁾. In the 2010 study it was estimated that 1070 fewer CHD and stroke deaths per year (representing an overall 26% decline in CVD mortality) could occur in Ireland with:



average reductions in current dietary salt intakes of 3 g/day, in trans-fat by 1% of current energy intake and in saturated fat by 3% of current energy intake.



an increase fruit and vegetable intake of 3 portions/day.

In analyses from the Global Burden of Disease study, the expected or projected contribution of core CVD risk factors to overall mortality rates in the Irish population in 2040 will essentially remain the same as in 2017 without major changes in primary prevention strategies (Figure 7). The GBD study has also highlighted the importance and potential return on investment in terms of overall mortality reductions from primary prevention that addresses the core causal risk factors for CVD (smoking, obesity and poor diet) and major risk markers such as undetected and untreated high blood pressure (Figure 8).

Figure 7: Leading risk factor related deaths in 2017 compared to projected leading risk factor related deaths in 2040⁽²⁴⁾

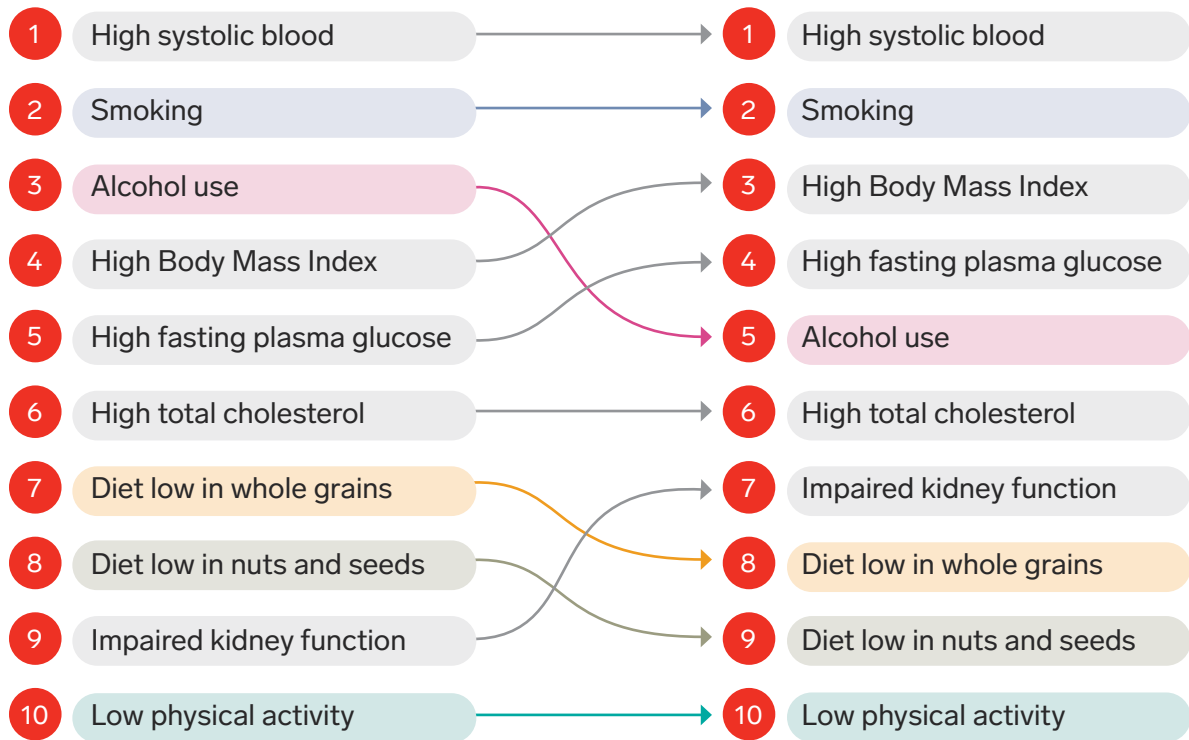
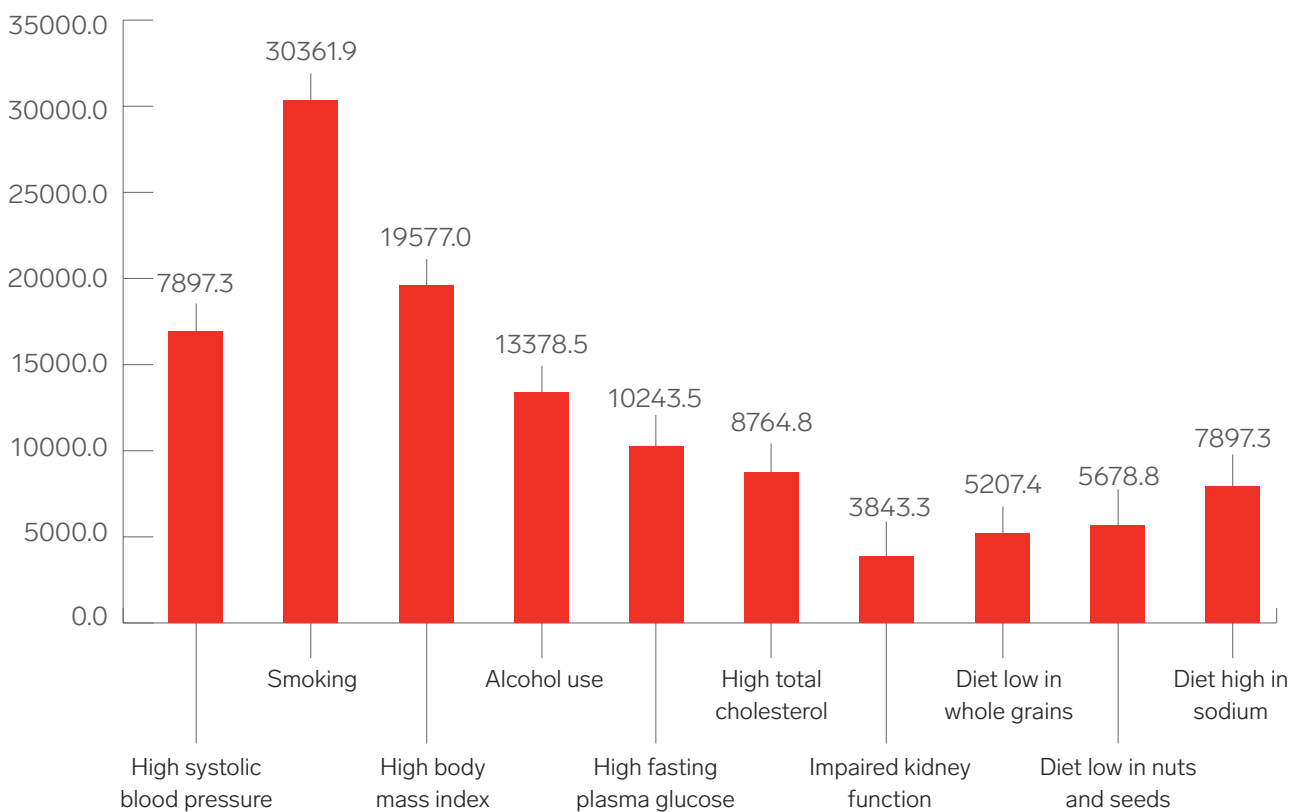


Figure 8: Potential years of lives lost (YLLs) averted in Ireland in 2040 by reducing exposure to key risk factors⁽²⁴⁾

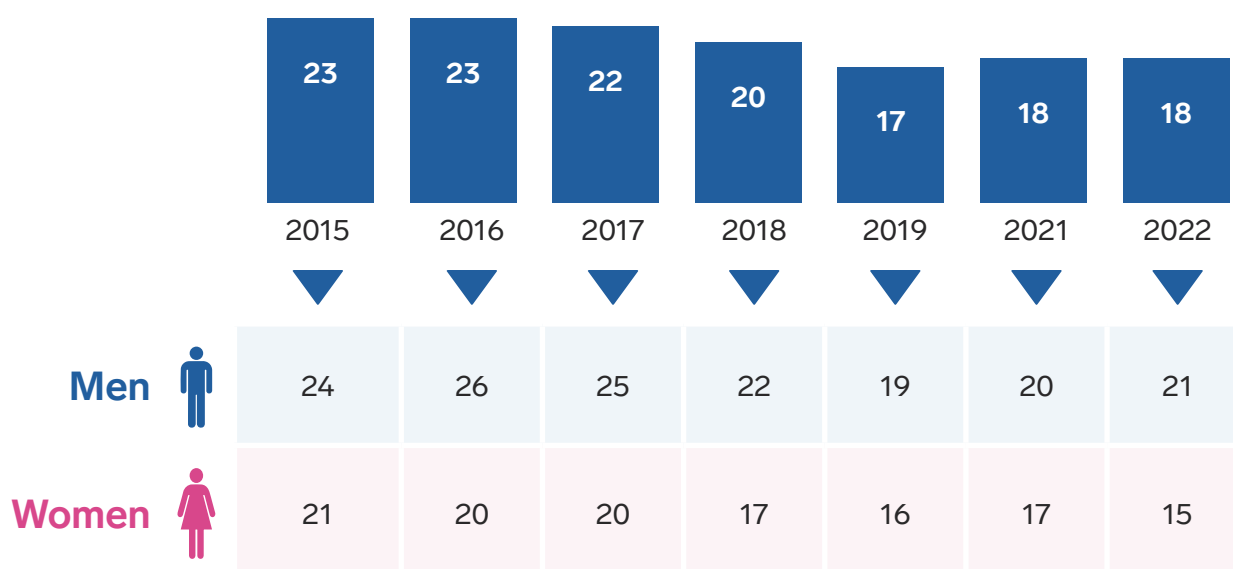


2.3 Recent trends in risk factors from Healthy Ireland surveys

In 2013, the Government launched the Healthy Ireland Framework (2013-2025) to promote the health and wellbeing of the population⁽²⁷⁾. As part of the framework, the Healthy Ireland (HI) Survey, commissioned by the Department of Health since 2015, is an annual interview-administered survey drawing on a representative sample of the Irish population aged 15 and above. The survey is designed to track significant trends in health and wellbeing and evaluate the effects of policy. The topics addressed include general health, the use of health services and the prevalence of important risk factors in the development of chronic disease. In the following section, we summarise major findings on trends in the five major modifiable risk factors for the development of CVD – smoking, obesity, diet, physical inactivity and alcohol intake – using data from the Healthy Ireland Survey 2022⁽²⁸⁾ or the most recent HI survey with relevant data.

Smoking: While the rate of smoking has declined in Ireland in recent years due to successful tobacco control policies and legislation, data from the Healthy Ireland Survey 2022 indicates that 18% of the population are current smokers (14% smoke daily and 4% smoke occasionally), a 5% decrease in current smokers since 2015 (Figure 9).

Figure 9: Prevalence of smoking in Ireland from 2015-2022⁽²⁸⁾



In 2022, the highest prevalence of smoking was in those aged 25 to 34 years (24%). Men continue to have a higher rate of smoking than women: 21% compared with 15% in 2022. Almost a third (32%) of daily smokers reported having a long-term illness or health problem, compared to 27% of never smokers. In the 2022 survey data, smoking rates were higher for those who are unemployed (39%) than those in employment (19%). They also remain higher among those who have not completed the Leaving Certificate (21%) than those with a Leaving Certificate or higher (17%). It is noteworthy that a fifth (20%) of people who smoke report that they now smoke more compared to before the COVID-19 pandemic. However, this has declined from 28% in the 2021 survey and 17% of smokers say they now smoke less. Importantly, now 27% of the population are ex-smokers.

Among those over the age of 35, there are more ex-smokers than current smokers. Approximately 46% of those who have smoked in the past year have attempted to quit smoking, with 73% of this group successfully quitting smoking.



Prevalence of e-cigarette use in Ireland: Although the smoking prevalence has declined in Ireland in recent years, there has been a rise in the prevalence of electronic cigarettes or e-cigarettes. Based on the Healthy Ireland Survey 2022, 3% of the population currently use e-cigarettes. A further 3% report that they have tried them in the past but no longer use them. Use of e-cigarettes is highest among those aged under 25: 6% in this age group currently use them. There is considerable evidence to suggest that the youth use of e-cigarettes can act as a gateway to eventual tobacco cigarette smoking initiation. A systematic review led by the Health Research Board found that adolescents in Europe and North America who had never smoked conventional tobacco cigarettes but had used e-cigarettes, were four times more likely to subsequently start smoking tobacco⁽²⁹⁾. From 1995 to 2015, teen smoking decreased from 41% to 13.1%. A SimSmoke modelling study⁽³⁰⁾ suggested that a 5% smoking prevalence target for this age group was achievable by 2025. However, in 2022, smoking unfortunately remains high (19% in men and 14% in women) in the 15-24 years age group.⁽²⁸⁾



Obesity:

The number of people in Ireland meeting current criteria for overweight and obesity has more than doubled in the last 20 years. Alarming, Ireland has one of the highest levels of obesity in Europe. In the Healthy Ireland Survey 2019 (the most recent wave with measured weight and height data), 60% of Irish adults and 20% of children and young people are living with overweight or obesity. The survey also reported that men are more likely than women to be overweight or obese (66% and 55% respectively), though there has been a slight decline in the proportion of men that are characterised as overweight or obese (from 70% in 2017 to 66% in 2019). Approximately 65% of those living in deprived areas are characterised as overweight or obese compared with 55% of those living in affluent areas. Among those aged under 35 years, 50% of people living in deprived areas meet the criteria for overweight or obesity, compared to 37% of those living in affluent areas. Approximately 17% of those who are overweight or obese also smoke, a finding of particular concern given the interaction between these risk factors in cardiovascular disease. Over a third (34%) of people in Ireland are trying to lose weight, with 49% of those with overweight or obesity currently trying to lose weight. The most common reported actions to lose weight are taking more exercise (56%), eating fewer calories (54%) and eating/drinking fewer sugar sweetened foods/drinks (49%).



Dietary habits: There is considerable evidence that a diet rich in vegetables and fruits is associated with lower blood pressure and reduced risk of coronary heart disease, stroke, type 2 diabetes and specific forms of cancer. Self-reported fruit and vegetable intake is also a good marker of overall diet quality. In the 2021 HI survey, 75% of respondents reported daily consumption of vegetables, and 65% of respondents reported eating fruit every day. However, only 2.9 servings of fruits and vegetables are reportedly consumed on average every day. Approximately 34% of participants reported that they eat the recommended five or more pieces of fruit and vegetables a day, with women (39%) more likely to do so than men (28%), a finding consistent with earlier survey waves.

In terms of unhealthy snacking behaviour, 25% of respondents reported consuming one unhealthy snack food a day and 35% reported consuming two or more, with this behaviour remaining unchanged since 2016. Younger people were significantly more likely to consume two or more unhealthy snack foods per day, with 51% of those aged under 25 reporting doing so compared to 30% of those aged 65-74 (see Figure 10). Approximately 29% of respondents reported drinking sugar-sweetened drinks at least once a week. This includes 8% who reported drinking them every day – this behaviour was reported by 12% of those aged under 25, compared to 4% of those aged 65 and older (Figure 11). Across all age categories, males are more likely than females to report drinking sugar-sweetened beverages every day.

Figure 10: Daily consumption of unhealthy snack foods by age (Healthy Ireland Survey 2021)

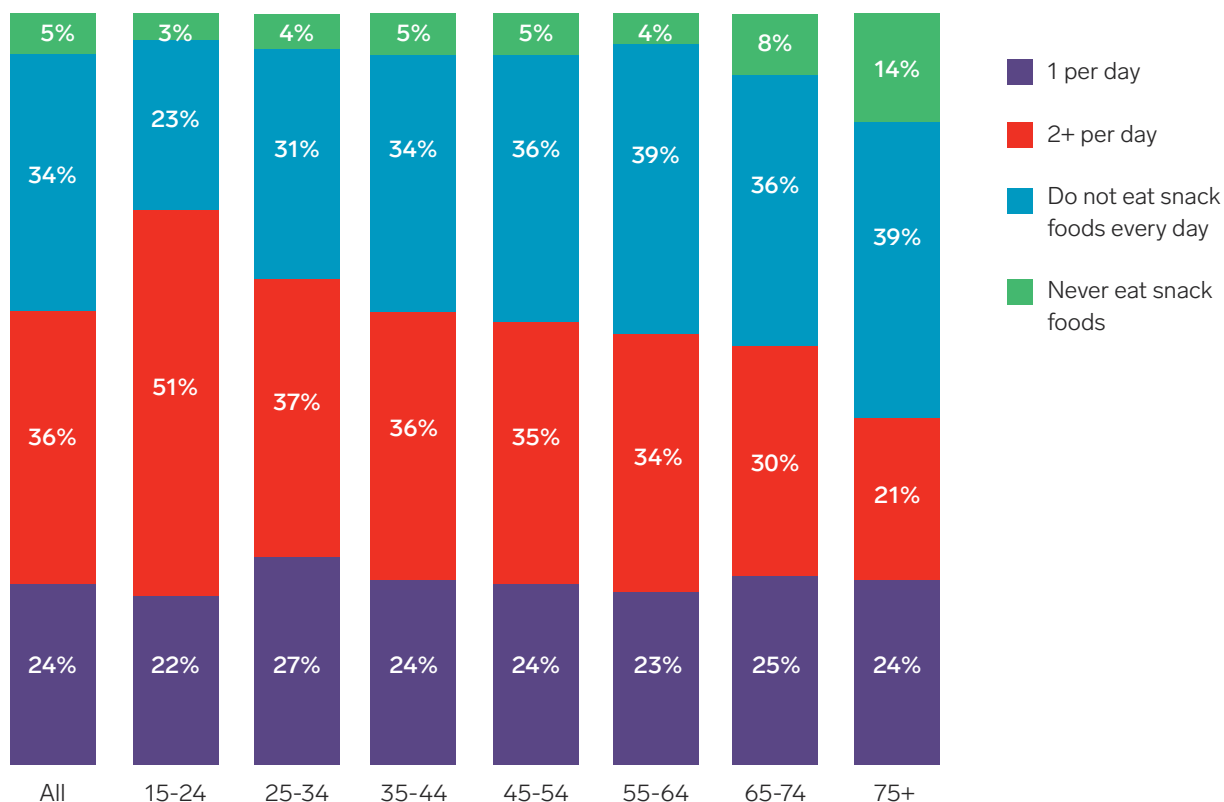
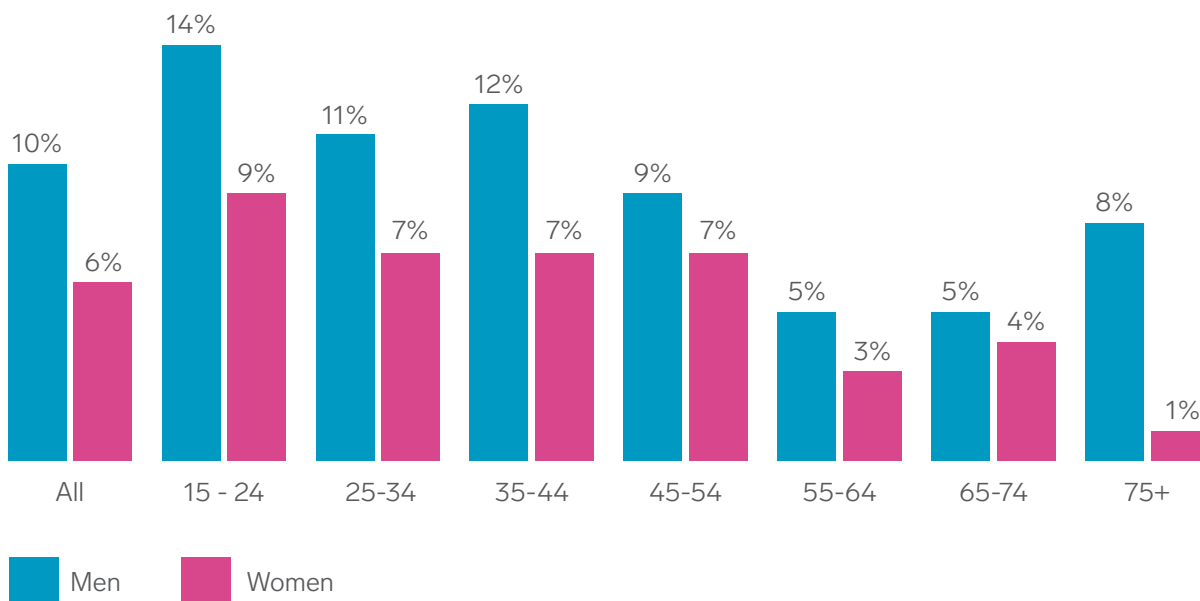
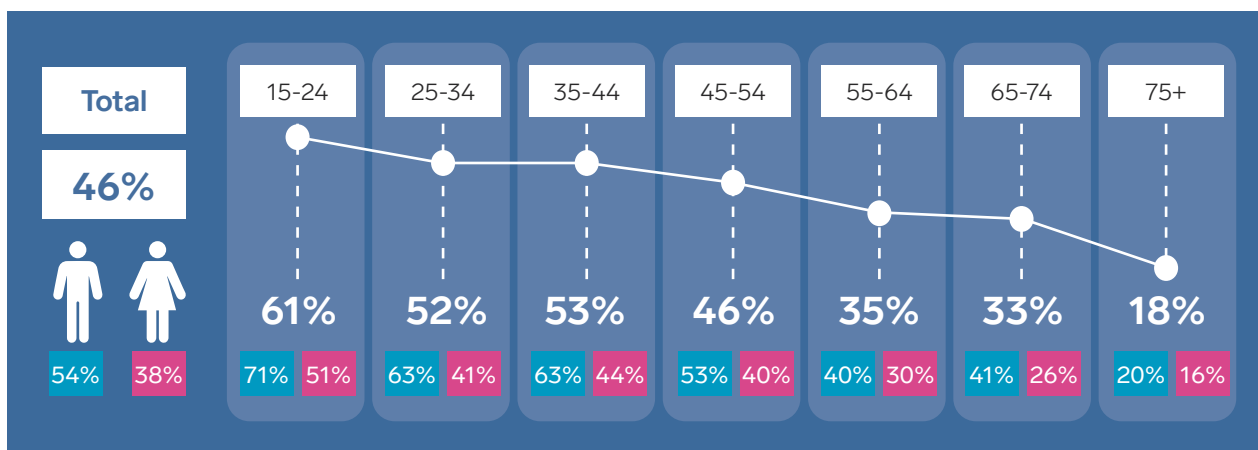


Figure 11: Daily consumption of sugar-sweetened beverages by age and gender (Healthy Ireland Survey 2021)



Physical activity: The World Health Organization recommends that all adults aged 18 to 64 should achieve at least 150-300 minutes of moderate intensity aerobic activity each week, i.e., at least 30 minutes a day of moderate activity on 5 days a week. Based on the most recent HI survey with data on physical activity (2019), the Irish population is not currently meeting these targets. Less than half (46% overall, 54% of men and 38% of women) report the minimum level of activity (150 mins) recommended by the National Physical Activity Guidelines for Ireland and there is evidence of a steady decline in physical activity levels with age. The estimated proportion of the population following national physical activity guidelines falls from 61% in those aged 15 to 24 years to 18% among those who are 75 or older (Figure 12).

Figure 12: Physical activity levels by age and gender in Irish adults (Healthy Ireland Survey 2019)

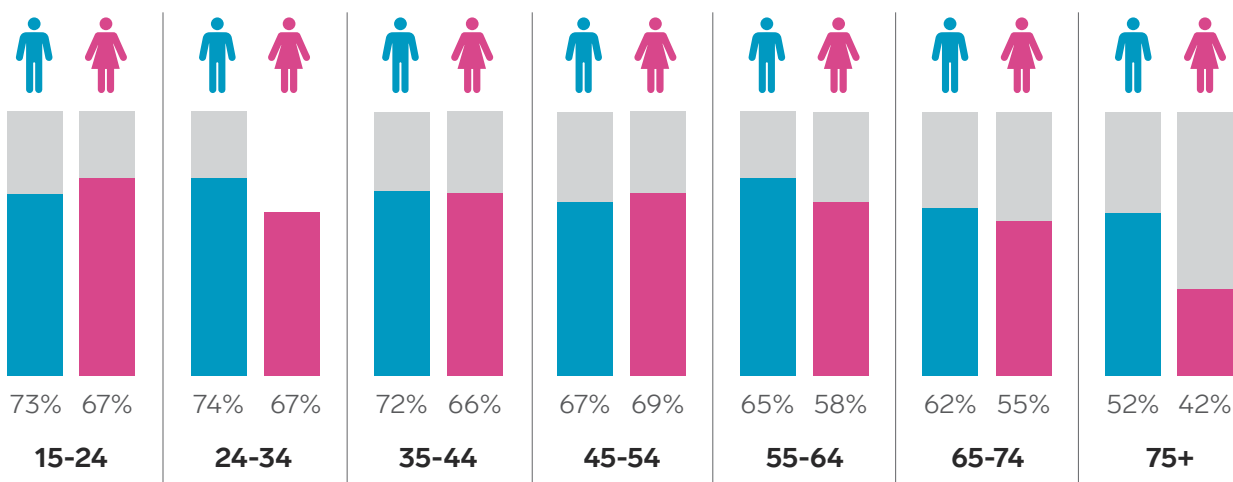


Approximately 8% of respondents reported that they participated in no physical activity during the previous seven days. Those living in more affluent areas are more likely than those in deprived areas to achieve the recommended minimum level of activity (49% compared with 43%).

Nearly two thirds (64%) of people who do not currently meet the National Physical Activity Guidelines for Ireland indicated they want to be more physically active than they are, with women (66%) and those in the 35–44 age group (73%) expressing the greatest desire to increase their activity levels. As discussed below, sedentariness is increasingly recognised as an important independent predictor of CVD risk. In the HI 2019 survey data, time spent sitting is estimated at 5.1 hours on average during weekdays, falling to 4.4 hours on weekends. For a variety of methodological reasons, these figures are likely to be underestimated.

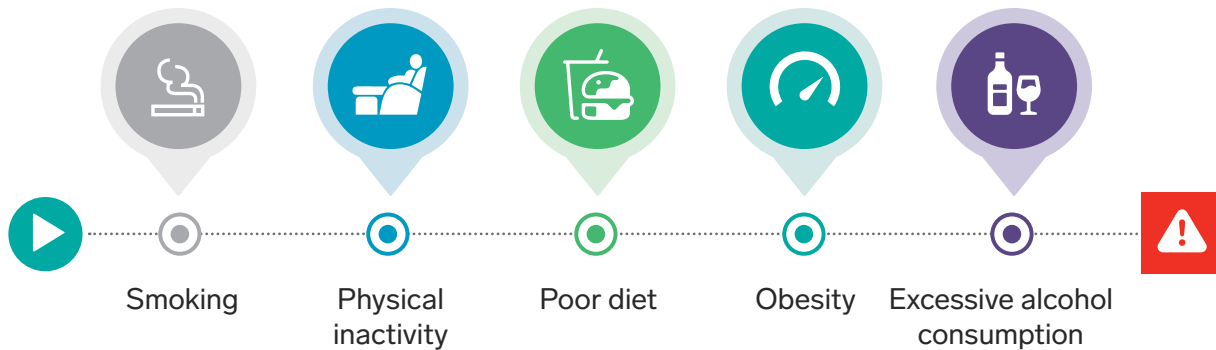
Alcohol consumption: In the Healthy Ireland Survey 2022, 67% of Irish respondents over age 15 reported they had consumed alcohol in the previous 6 months. This ranged from 71% of those aged 15 to 24 years to 47% of those aged 75 years and above (Figure 13) with an estimated 32% of drinkers consuming alcohol on multiple days a week and 32% of those who consumed alcohol in the previous six months meeting the criteria for binge drinking, defined as drinking six or more standard drinks on a drinking occasion.

Figure 13: Alcohol consumption status and weekly alcohol consumption among drinkers in the previous 6 months by age, 2022⁽²⁸⁾



2.4 The big five risk factors for CVD, poor health and premature mortality

It is difficult to overstate the role of **five core risk factors**:



both individually and in combination on a wide range of adverse health outcomes, including the occurrence of CVD and diabetes, death from CVD, death from cancer, risk of cognitive decline and dementia, overall life expectancy, healthy life expectancy and death from all causes. While the effects of these factors in isolation have been well documented since the 1960s, research in recent decades has focused on the combined effects of these risk factors.

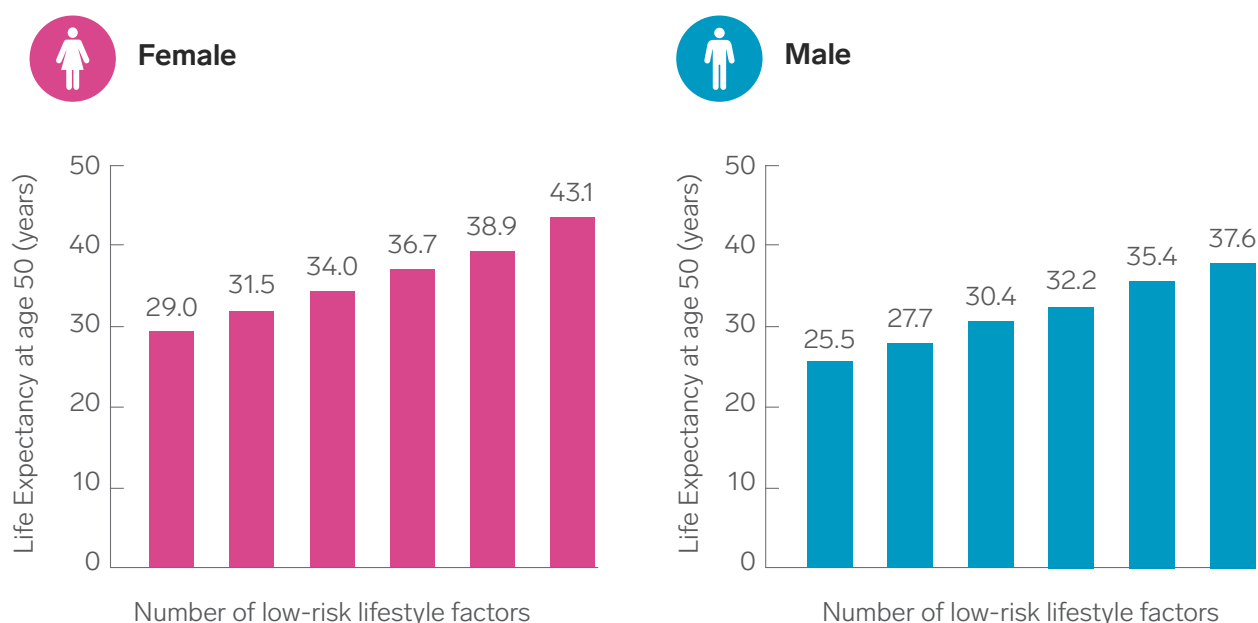
Studies that focus on overall life expectancy and CVD risk in those at low levels of exposure to the five core risk factors (those who have never smoked and have maintained regular physical activity, a healthy diet, a healthy weight and moderate alcohol consumption) have been particularly illuminating. Although the latter studies have profound implications for public policy on the primary prevention of cardiovascular disease, it is not clear that the findings and implications have been processed by policy makers at government and health system level.

In work from the Harvard School of Public Health published in 2018 and based on two large cohort studies, the Nurses' Health Study and the Health Professionals Follow-up Study with over 120,000 participants followed for up to 34 years, five low-risk factors were defined as follows:

- never smoking
- body mass index of 18.5 to 24.9 kg/m²
- ≥30 minutes per day of moderate to vigorous physical activity
- moderate alcohol intake
- a high diet quality score (upper 40% of a diet quality score weighted on alignment with national US dietary guidelines)⁽³¹⁾.

In this study it was estimated that adherence to the five low-risk factors (which is largely determined at the societal rather than individual level) could prolong life expectancy at age 50 by 14.0 years for female and 12.2 years for male US adults compared with individuals who adopted zero low-risk lifestyle factors. Thus, life expectancy at age 50 years was estimated at a further 29.0 years for women and further 25.5 years for men who adopted zero low-risk factors. In contrast, for those who adopted all five low-risk factors, the projected life expectancy at age 50 was a further 43.1 years for women and further 37.6 years for men (see Figure 14)⁽³¹⁾.

Figure 14: Estimated life expectancy at age 50 years by number of protective factors in US adults⁽³¹⁾



In this study, the proportion of cases of CVD in the population that can be statistically attributed to non-adherence⁶ to the five low-risk states was estimated at 72%, with the proportion of cancer deaths estimated at 52% and deaths from any cause estimated at 61%.

In a further study from this group of investigators, highlighting profound impacts on morbidity and health care costs, it was estimated that at age 50, life expectancy free of diabetes, cardiovascular diseases and cancer was approximately 24 years among men and women who adopted none of the five low risk factors and 34 years in men and 31 years in women who adopted four or five low risk factors. These protective health behaviours are also associated with reduced risk of cognitive decline and a substantially lower risk of Alzheimer's dementia⁽³²⁾. These findings have been consistently replicated in studies from the UK, other European countries, Japan and Canada^{(33) (34) (35) (36) (37)}, despite some variation in the criteria used to define low-risk status.

6 The disability-adjusted life year is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

2.4.1 Irish data on protective factors for CVD, poor health and premature mortality

Cross-sectional analyses of over 2,045 middle-aged to older adults in the Mitchelstown Cohort Study have examined associations between the five core protective behaviours (never smoking, moderate alcohol intake, moderate to vigorous physical activity, a high-quality diet (upper 40% Dietary Approaches to Stop Hypertension score) and a normal body mass index) and markers of both CVD risk and cognitive decline. Clear and independent inverse associations were observed between a five-component protective behaviour score and markers of both chronic inflammation linked to CVD risk and an adverse, pro-atherogenic blood lipid profile^{(38) (39)}. In further unpublished analyses, the protective behaviour score was also positively associated with cognitive function in this group of Irish middle-aged men and women.

In earlier work based on the Survey of Lifestyle Attitudes and Nutrition (SLÁN) 2007 study, Janas Harrington and colleagues in UCC examined the combined effect of four protective behaviours (being physically active, a non-smoker, a moderate alcohol consumer and having adequate fruit and vegetable intake) on self-rated health, overweight/obesity and depression⁽⁴⁰⁾. It is noteworthy that in this nationally representative sample of 10,364 men and women aged over 18, one-fifth of respondents (20%) had managed to adopt four protective behaviours, 35% adopted three, 29% two, 13% one and 2% adopted none. Compared to those with zero protective behaviours, those with four protective behaviours were seven times more likely to rate their general health as excellent/very good and four times more likely to have better mental health. Those with four protective behaviours were also more likely to report a healthy body weight.

It can of course be argued that people with better than average self-rated health and better mental health are more likely to engage in health seeking behaviour. The issue of reverse causation cannot be resolved in this cross-sectional study. Indeed, it is likely that the causal effects of these health seeking behaviours flow in both directions and are mutually beneficial: better mental health and better self-rated health lead to increased health-seeking behaviours and vice versa.

However, the key issue in this area is to better understand and influence the individual and societal determinants of health-seeking behaviour.

In this paper based on the SLAN 2007 dataset, it was proposed that the distribution of the four protective behaviours in the general population (being physically active, a non-smoker, a moderate alcohol consumer and having adequate fruit and vegetable intake) which can be assessed by questionnaire, should be used as an outcome measure to assess the impact of public policy on the determinants of health and wellbeing. In this context, it would be interesting and of value to compare the distribution of these factors in the most recent Healthy Ireland survey dataset with the findings from SLAN 2007.

The individual effects of the five core risk factors (smoking, physical inactivity, poor diet, obesity and excessive alcohol consumption) cannot be considered in detail in this relatively short document. However, a number of brief observations will be made.

2.4.2 Smoking and cardiovascular disease

Smoking increases mortality from all causes and has a crucial role in atherosclerotic cardiovascular disease with significant and substantial effects on incidence and mortality from CHD, stroke and other CVD endpoints such as abdominal aortic aneurysm and peripheral vascular disease. The effects of tobacco use and second-hand smoke exposure on cardiovascular health include inflammation, vasoconstriction, clot formation and reduced oxygen availability, as well as direct damage to coronary arteries. Smoking also plays a role in developing type 2 diabetes and has adverse effects on the risk of blood clotting, lipid profiles and cerebral blood flow, all of which are major risk factors for CVD. Smoking is a particularly important cause of CVD in women⁽⁴¹⁾. Together, tobacco use and second-hand smoke exposure contribute to approximately 20% of all cardiovascular deaths globally and around 8 million deaths a year^{(42) (43)}.



In Ireland, smoking is the leading cause of preventable death. Each year in Ireland, over 4,500 people die because of smoking; this amounts to approximately one in seven of all deaths.

In addition, smoking-related illnesses affect a large number of people, and people who smoke lose, on average, at least 10 quality life years compared to those who never smoke⁽⁴⁴⁾. While smoking cessation is associated with a rapid fall in risk of CVD, there is a residual risk of CVD and cancer in ex-smokers compared to never smokers for up to 30 years following cessation. This highlights the importance of measures to prevent people from taking up smoking to begin with.

2.4.3 Physical activity and cardiovascular disease

The importance of physical activity (PA) in the context of CVD risk reduction was first highlighted in a seminal study by Morris and colleagues in 1953⁽⁴⁵⁾. They observed that bus drivers experienced more than double the amount of CVD incidence than bus conductors and speculated that the additional PA undertaken by the bus conductors reduced the risk for future development of CVD.



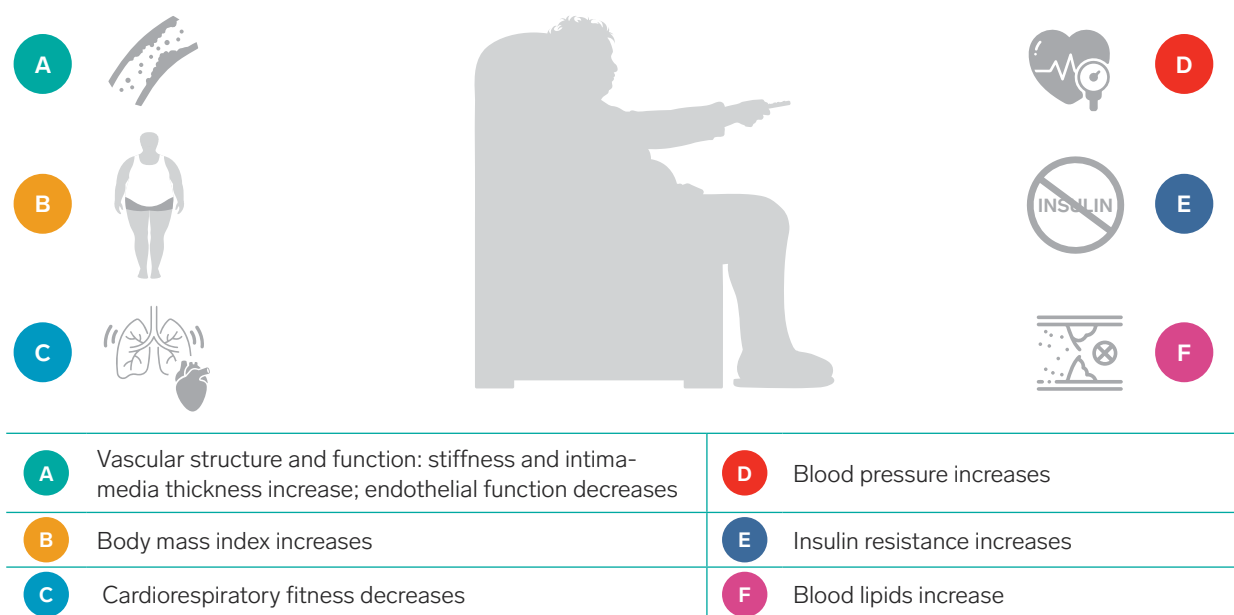
In the intervening decades, the profound benefits associated with physical activity on both physical and mental health and wellbeing have been well documented.

They include substantial, independent, “dose related” effects on risk of obesity, blood pressure levels, concentrations of high-density lipoprotein cholesterol (“good cholesterol”), type 2 diabetes, major cardiovascular disease events including heart attacks and stroke, and sudden cardiac death. The beneficial effects of physical activity on risk of CVD mortality are of particular importance. In a recent systematic review and meta-analysis based on 44 cohort studies with 1,584,181 participants, there was clear evidence of an independent, linear negative correlation of leisure-time physical activity with cardiovascular mortality, regardless of age, gender and the presence of underlying cardiovascular disease⁽⁴⁶⁾.

Sedentary behaviour and CVD risk: Studies over the past decade have highlighted significant adverse effects of sedentary behaviour (i.e., sitting, lying) on health and wellbeing. More specifically, we now have clear evidence of an association between prolonged periods of sedentary behaviour and all-cause morbidity and mortality, which cannot be simply explained by differences in engagement in low-, moderate- or vigorous-intensity PA⁽⁴⁷⁾. In a meta-analysis of 14 prospective cohort studies addressing the effects of sedentary behaviour, significant associations were found with all-cause mortality, cardiovascular disease mortality, cardiovascular disease incidence, cancer mortality, cancer incidence and type 2 diabetes incidence. Although these effects were independent of physical activity levels, the hazard ratios associated with sedentary time and outcomes were generally more pronounced at lower levels of physical activity than at higher levels⁽⁴⁷⁾.

There is increasing evidence that sedentary behaviour modifies key hemodynamic, inflammatory and metabolic processes, resulting in impaired arterial health with adverse effects on body mass index, waist circumference, risk of type 2 diabetes, blood pressure and high-density lipoprotein [HDL] cholesterol (see Figure 15).

Figure 15: Schematic depicting the effect of sedentary behaviour (SB) on cardiovascular disease (CVD) risk factors⁽⁴⁸⁾



Adapted from Carter et al, 2017

Thus, sedentary behaviour has emerged as a critical mediator of health and wellbeing in its own right. As a result of advances in entertainment and transport technologies, as well as the increased reliance on workplace technology, office and home working, sedentary behaviour is a major issue for a significant proportion of the population and a critical issue in the primary prevention of cardiovascular disease.

2.4.4 Diet and cardiovascular disease



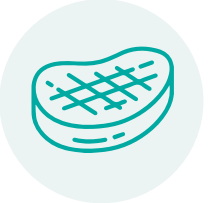

Suboptimal diet is responsible for an enormous burden of suffering and premature deaths globally. In Ireland, as in other developed countries, the impact of poor diet on the development of non-communicable disease (NCDs) is immense. Poor diet is the single biggest risk factor for NCDs, exceeding the combined effects of tobacco, alcohol and physical inactivity⁽⁴⁹⁾.

Dietary habits exert profound effects on CVD risk via indirect effects on risk factors such as body weight, diabetes and blood pressure and direct effects through diverse biological mechanisms such as insulin resistance, inflammation and oxidative stress^{(50) (51)}. Thus, dietary interventions together with measures addressing smoking, physical activity and alcohol consumption are of critical importance in the primary prevention of cardiovascular disease.

In recent decades, the findings both from well-designed, large-scale population cohort studies and randomised controlled trials have greatly enhanced our understanding of the relationship between diet and cardiovascular disease. We now have an overwhelming scientific consensus on the core elements of a healthy diet – a diet associated with reduced risk of CVD, dementia, diabetes and other non-communicable diseases. Unfortunately, however, divergent results from outlying studies of diet and CVD (often of poor quality) receive disproportionate media coverage, thereby creating confusion and a spurious sense of uncertainty and controversy in the popular and policy discourse on diet and health.

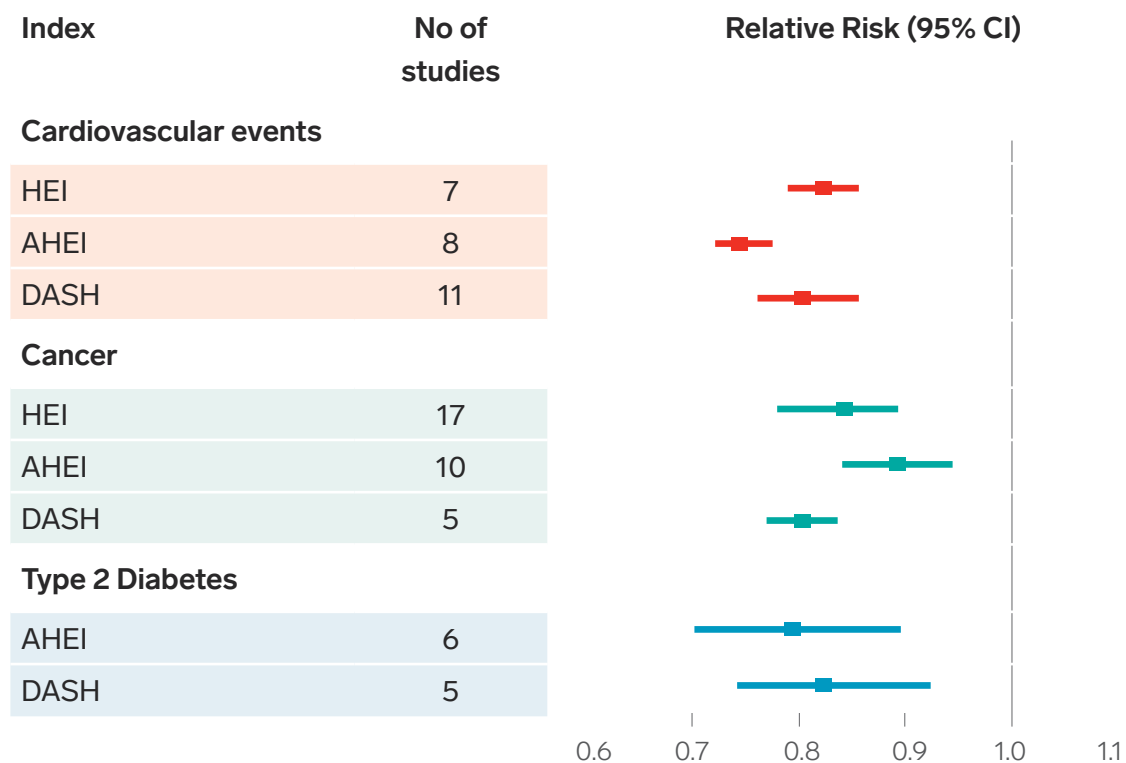
In this short overview we focus primarily on the issue of dietary patterns and cardiovascular disease, including brief reference to relevant work from Ireland. One of the major developments in recent decades that has enhanced our understanding of diet and CVD risk is the extent to which research has evolved from examining individual nutrients and foods towards using dietary patterns to represent the combined effects of foods and beverages in different diets. Dietary pattern analysis considers the complex interactions among nutrients and foods as well as the cumulative effect of an overall diet, which may be more powerful than the sum of the effects of each dietary component.

We now have considerable data on the profoundly beneficial effects on CVD risk and related health outcomes of a number of healthy dietary patterns, including the Mediterranean diet, the Dietary Approaches to Stop Hypertension (DASH)⁽⁵²⁾ and Alternative Healthy Eating Index (AHEI)⁽⁵³⁾ dietary patterns. While these patterns differ in their specific components, there are significant elements common to all. A healthy dietary pattern is generally:

			
high in vegetables, fruits, whole grains, seafood and fatty fish, legumes, and nuts	moderate in low-fat and non-fat dairy products	lower in red meat, minimal or no processed meat	low in refined grains and foods and beverages containing added sugars.

We now have extensive evidence from prospective cohort studies to demonstrate that following a healthy diet defined by any of these dietary patterns is associated with substantially reduced risk of CVD, type 2 diabetes and cancer^{(54) (55)} (Figure 16).

Figure 16: Dietary patterns and risk of cardiovascular events, cancer and type 2 diabetes in meta-analyses of prospective cohort studies of HEI (Healthy Eating Index), AHEI (Alternative Healthy Eating Index) and DASH (Dietary Approaches to Stop Hypertension)⁽⁵⁵⁾



Note: In all studies, the relative risk point estimate and the associated 95% confidence intervals are less than 1.0, consistent with protective effects.

From analyses of repeated dietary measurements every four years in the US Nurses' Health Study and Health Professionals Follow-up Study, there is evidence that consistently high and improving diet quality is associated with a lower CVD risk in both the short term (subsequent 8 years) and long-term (subsequent 16 years) follow up. In this study, the authors found consistent associations between improved diet quality over 12 years as assessed by the Alternate Healthy Eating Index, Alternate Mediterranean Diet, and DASH scores and a reduced risk of death in the subsequent 12 years. A 20-percentile increase in diet-quality scores was associated with an 8-17% reduction in mortality.

In contrast, worsening diet quality over 12 years was associated with an increase in mortality of 6-12%. The risk of death from any cause was significantly lower (by 9-14%) among participants who maintained a high-quality diet than among those who had consistently low diet scores over time⁽⁵⁶⁾. These studies suggest that individual and population cardiovascular health can be substantially improved with greater adherence to healthy dietary patterns.

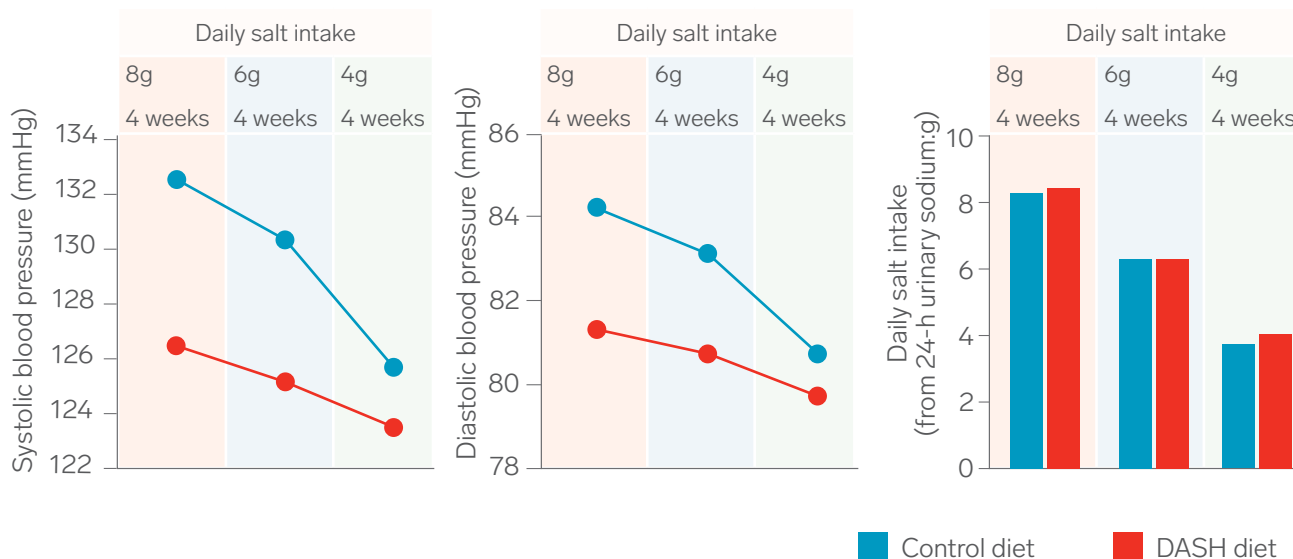
Randomised controlled trials: Randomized clinical trials (RCTs), particularly those that are high quality and double blind, are the gold standard for determining causation between an exposure such as diet and an outcome. Therefore, it is noteworthy that we now have RCT evidence both supports the extensive observational evidence on healthy dietary patterns and CVD risk and provides additional insights on potentially important differences between dietary patterns. For example, the DASH (Dietary Approaches to Stop Hypertension) trial, published in 1997, provided strong evidence to support the role of a healthy dietary pattern in lowering blood pressure and LDL cholesterol levels⁽⁵⁷⁾. The DASH study was based on a carbohydrate-rich diet that emphasizes fruits, vegetables and low-fat dairy products, with reduced saturated fat, total fat and cholesterol.



In a subsequent study published in 2001, the DASH-Sodium trial, the effect of different levels of dietary salt, in conjunction with the DASH diet, was studied in a randomised cross-over trial in a group of 412 adults, with and without hypertension⁽⁵⁸⁾.

Participants were randomly assigned to eat either a control diet typical of intake in the United States or the DASH diet. Within the assigned diet, participants ate foods with high, intermediate and low levels of sodium for 30 consecutive days each, in random order. Two clear findings emerged from this landmark study. Blood pressure was lower on the DASH diet at high, intermediate and low salt intakes and on both diets (control and DASH), the transition from high to intermediate to a low sodium intake was associated with a progressive fall in blood pressure (Figure 17). As compared with the combination of the control diet (typical US diet) and a high level of sodium, the combination of the DASH diet and a low level of sodium lowered systolic blood pressure by 11.5 mm Hg in participants with hypertension (169 participants) and by 7.1 mm Hg in participants without hypertension (243 participants), an effect equal to or greater than that of single-drug antihypertensive therapy.

Figure 17: Dietary Approaches to Stop Hypertension (DASH)-sodium study of changes in blood pressure and daily salt intake on a normal American (control) diet or the DASH diet⁽⁵⁸⁾



In a further study published in 2005, the OmniHeart Trial, a randomised, three-period, crossover feeding study, the DASH diet (rich in carbohydrates) was compared with two alternative diets - a diet with partial substitution of carbohydrates with protein, about half from plant sources, and a diet with partial replacement of carbohydrate with unsaturated fat, predominantly monounsaturated fat⁽⁵⁹⁾. In this study, involving 164 adults with prehypertension, the risk of high blood pressure, low-density lipoprotein cholesterol and estimated coronary heart disease was lower on each of the three diets compared with baseline. However, compared with the carbohydrate-rich diet, the protein diet not only lowered blood pressure, LDL cholesterol levels and triglyceride levels but also lowered “healthy” HDL cholesterol levels. The unsaturated fat diet lowered blood pressure and triglyceride levels and increased HDL cholesterol levels but had no significant effect on LDL cholesterol levels. Estimated CHD risk was similar on the protein and unsaturated fat diets and lower than estimated on the carbohydrate diet.

The findings from the DASH, the DASH-Sodium and the OmniHeart trials highlight the importance of salt intake and macronutrients as determinants of CVD risk and, in the case of macronutrients, the substantial flexibility that we have in our efforts to promote and consume a heart-healthy diet.

Based on the totality of currently available evidence on diet and CVD risk, the 2021 European Society of Cardiology (ESC) Guidelines on cardiovascular disease prevention in clinical practice recommend the adoption a Mediterranean or similar dietary pattern to lower risk of CVD⁽⁶⁰⁾. Additional details on the current European Society of Cardiology dietary guidelines are provided in Table 2.

Table 2: Overview of healthy diet characteristics from the ESC Guidelines on cardiovascular disease prevention in clinical practice⁽⁶⁰⁾

	Adopt a more plant and less animal-based food pattern. More specifically it is recommended to adopt a Mediterranean or similar diet to lower risk of CVD.
	Saturated fatty acids should account for <10% of total energy intake, through replacement by polyunsaturated fatty acid (PUFAs), monounsaturated fatty acid (MUFAs), and carbohydrates from whole grains.
	Trans unsaturated fatty acids should be minimized as far as possible, with none from processed foods.
	Total salt intake should be less than 5g per day.
	Consumption of between 30 and 45 g of fibre of per day, preferably from wholegrains is recommended.
	Consumption of more than 200 g of fruit per day (at least 2 to 3 servings) is recommended.
	Consumption of more than 200 g of vegetables per day (more than 2 to 3 servings) is recommended.
	Red meat should be reduced to a maximum of 350 - 500 g a week, and in particular processed meat should be minimized.
	Fish is recommended 1 to 2 times per week, in particular fatty fish.
	Consumption of 30 g unsalted nuts per day is recommended.
	Consumption of alcohol should be limited to a maximum of 100 g per week.
	Sugar-sweetened beverages, such as soft drinks and fruit juices, must be discouraged.

Irish data on diet quality based on the DASH score: A diet quality score based on the DASH dietary pattern has been extensively used in Ireland to study both the determinants of dietary quality in the population and the effects of diet quality on clinical and laboratory markers of CVD risk⁽⁶¹⁾. Using data from the Food Frequency Questionnaire used in the 2007 SLAN National Health and wellbeing survey, Janas Harrington and colleagues have shown adverse effects of a wide range of sociodemographic factors on diet quality, including lower educational attainment and occupational status, non-cohabiting marital status, smoking, self-perceived poor health, food poverty and living in a deprived area, defined using an area level deprivation index⁽⁶²⁾. In further work based on the SLAN 2007 dataset and the Irish Geodirectory, these authors examined the effect of distance to and density of food outlets within local areas on individual dietary quality, controlling for the socioeconomic characteristics of individuals and their households⁽⁶³⁾. In this study, it was found that individuals who live closer to a larger food outlet or who live in an area with a higher density of larger food outlets have a significantly better diet in terms of cardiovascular risk, in analyses controlling for individual and household socioeconomic status and demographic characteristics. These findings highlight the wider social and environmental determinants of diet quality. We also have data from Ireland that better diet quality, determined by the DASH score is associated with lower blood pressure⁽⁶⁴⁾, and more favourable lipoprotein particle subclass profiles⁽⁶⁵⁾ in middle-to older-aged adults.

Importance of dietary salt intake as a cause of high blood pressure and cardiovascular disease: The risk of cardiovascular disease increases progressively throughout the range of blood pressure, starting at 115/75 mmHg⁽⁶⁶⁾. Most CVD events occur in individuals with high-normal blood pressure (BP) of approximately 130/80 mmHg because of the large number of individuals with BP at this level in the general population. Given that clinical guidelines do not recommend treating these individuals with blood pressure lowering drugs, population level interventions focused on the underlying causes of high blood pressure, including suboptimal diet, physical activity levels and alcohol intake, are of critical importance.

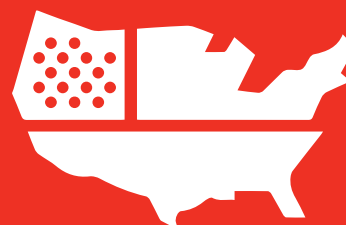
The findings from the DASH-Sodium trial are consistent with data accumulated over several decades from animal experiments, human genetics, physiological studies, migration studies, population-based intervention studies and clinical trials, all showing that high dietary salt intake is the major cause of raised blood pressure and that a reduction in salt intake lowers blood pressure and reduces CVD risk⁽⁶⁷⁾. We also have evidence of a direct association between salt intake and CVD risk from meta-analysis of cohort studies⁽⁶⁸⁾.

The most compelling data on a direct association between salt intake and CVD risk comes from a study published in 2022 involving 10,709 adults whose data were pooled from six prospective cohort studies across the United States and Europe, with a median follow up of 8.8 years⁽⁶⁹⁾. The study found that higher sodium intake, measured through multiple 24-hour urine samples (the gold standard method), was significantly associated with higher cardiovascular risk in a dose-response manner with a daily sodium intake of approximately 2000 mg to 6000 mg (equivalent to a salt intake between 5g and 15g). Lower potassium intake and higher sodium-to-potassium ratio were also associated with higher cardiovascular risks⁽⁶⁹⁾.

The findings from this study have resolved the controversy over the past decade surrounding the publication of several cohort studies suggesting that both low and high sodium intakes were associated with higher risk of cardiovascular disease – a so-called J-shaped association⁽⁷⁰⁾⁽⁷¹⁾. A key limitation of the latter studies is the assessment of salt intake by methods that are prone to measurement errors, such as spot (single specimen) urine samples and the inclusion of participants with existing chronic diseases, such as heart failure, which may have led to reverse-causation bias, i.e., low salt intake in these studies may have been a consequence as opposed to a cause of cardiovascular disease.

The overall body of evidence on salt intake, blood pressure and CVD risk has informed modelling studies on the impact of population-wide reductions in salt intake on incidence and mortality from cardiovascular disease, including coronary heart disease and stroke.

For example, in a US modelling study, it has been estimated that reducing dietary salt by 3g per day would reduce the annual number of:



New cases of coronary heart disease by

60,000 to 120,000



Stroke by

32,000 to 66,000



Myocardial infarction by

54,000 to 99,000



Deaths from any cause



44,000 to 92,000

In these analyses, the cardiovascular benefits of reduced salt intake are on par with the benefits of population-wide reductions in tobacco use, obesity and cholesterol levels. A regulatory intervention designed to achieve a reduction in salt intake of 3 g per day would save 194,000 to 392,000 quality-adjusted life years and USD10 billion to USD24 billion in health care costs each year. It was estimated that such an intervention would still save costs even if only a modest reduction of 1 g per day were achieved gradually over 10 years and would be more cost-effective than using medications to lower blood pressure in all people with hypertension ⁽⁷²⁾.

The WHO has set a global target of reducing the population salt intake from the current level of approximately **10g daily** in most countries to less than **5g daily**.



There is evidence that a further reduction to 3 g daily will have an even greater effect on blood pressure. In Ireland there is a dearth of contemporary data on salt intake in the population. In work completed in 2007, based on a spot (single specimen) urine sample obtained from 1207 adults aged over 45 years (participants in the SLÁN-07 health and lifestyle survey), the estimated (mean (sd), median) for salt intake per day were as follows:

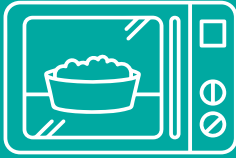
		mean	standard deviation	median
	men	10.3 grams	5.0 grams	9.7 grams
	women	7.4 grams	4.2 grams	7.1 grams

The findings in a separate 2008-2009 study of 599 adults who provided 24-hour urine collections were virtually identical ⁽⁷³⁾.

Ultra-processed foods and CVD risk:

Over recent decades, the volume of industrially processed products in global food supplies has increased. This trend has coincided with a transition towards diets linked to a rising prevalence of obesity and non-communicable diseases in many countries.

Among food processing classification systems investigating this phenomenon, the most prominent is the NOVA classification system, which groups foods into four categories according to the extent and purpose of industrial processing involved: (1) unprocessed and minimally processed foods (2) processed culinary ingredients (3) processed foods (4) ultra-processed foods ⁽⁷⁴⁾.



Ultra-processed foods are defined as “formulations of food substances often modified by chemical processes and then assembled into ready-to-consume hyper-palatable food and drink products using flavours, colours, emulsifiers and . . . other cosmetic additives.”

These foods include soft drinks, savoury snacks, commercial breads, cakes, and biscuits, sweetened breakfast cereals, sugared milk-based and “fruit” drinks, margarine, reconstituted meat products and pre-processed ready-to-eat products such as burgers, pastas and pizzas. Most ultra-processed foods are made, sold and promoted by corporations, typically transnational, that formulate them to be convenient (ready to consume), affordable (due to low-cost ingredients), and hyper-palatable. Thus, they are liable both to displace other foods and be over-consumed.

In the period since Brazilian researchers coined the term ultra-processed foods in 2009⁽⁷⁵⁾, there has been a growing body of evidence associating consumption of such foods with poor diet quality, increased cardiovascular risk factors (e.g., dyslipidaemia, hypertension), and adverse health outcomes such as obesity and metabolic syndrome. Two large and well-designed European cohort studies, published in 2019, reported positive associations between consumption of ultra-processed foods and cardiovascular disease⁽⁷⁶⁾ and all-cause mortality⁽⁷⁷⁾ in analyses adjusted for sociodemographic and anthropometric risk factors and for established markers of dietary quality.

Critics of the ultra-processed food concept have argued that the definition has varied over time, that in modern societies it is unrealistic to advise people to avoid ultra-processed foods and that reformulating the nutrient composition of processed foods is a more effective way to reduce exposure to “risk” nutrients such as saturated fat⁽⁷⁸⁾. Although adjustments to the definition have occurred, these were often a necessary response to an evolving evidence base on food and health and a changing food supply.

The view that it is better to reformulate ultra-processed foods than avoid them altogether underplays the extent to which these foods displace nutritious foods from the diet and the concern that, as the products of industrial processing, they may have peculiar physical structures or chemical compositions that are also risk factors for adverse health outcomes⁽⁷⁹⁾.

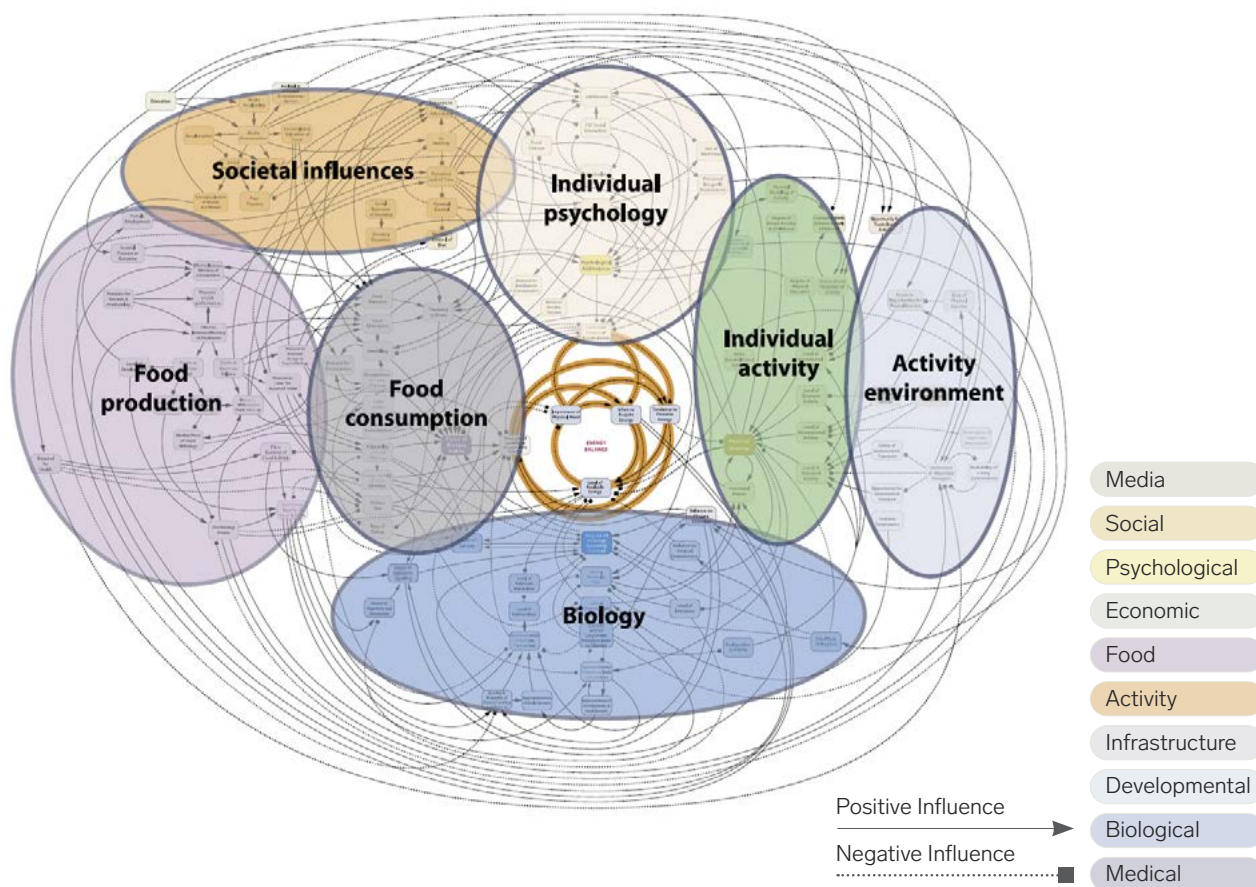
A recent randomised controlled trial comparing diets controlled for energy and nutrient composition showed it was the proportion of ultra-processed food rather than the amount of risk nutrients in the diets that caused weight gain⁽⁸⁰⁾. Evidence is also accumulating from mechanistic studies of plausible causal pathways by which the physical and chemical characteristics of these foods might cause harm, for example by changing the gut microbiome in ways that could disturb energy balance⁽⁸¹⁾. These findings add to growing evidence of an association between ultra-processed food and adverse health outcomes that has important implications for dietary advice and food policies. The findings also have particular implications for policy actions such as front-of-pack labelling, food taxation and restrictions on food marketing, which require an evidence-informed metric to determine the “healthiness” of individual food products.

Current metrics do not capture the extent to which food products are ultra-processed. It is also suggested that policy makers should shift their priorities from food reformulation—which risks positioning ultra-processed food as a solution to dietary problems—towards a greater emphasis on promoting the availability, affordability and accessibility of unprocessed or minimally processed foods⁽⁷⁹⁾.

2.4.5 Overweight and obesity

Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. Globally, both conditions have increased dramatically over the past four decades, posing a serious threat to cardiovascular health and overall disease burden throughout the life course. Overweight and obesity are complex, systemic, multi-causal problems, rooted in the sedentary nature of modern post-industrial life, more widely available and more affordable food (including ultra-processed food), a change in the nature and mix of diets, infant nutrition, psychological stimuli such as stress and (potentially) physiological disruption to the gut microbiome. With regard to infant nutrition, a recent updated systematic review and meta-analysis commissioned by the WHO has provided evidence of significant protective effects of breast feeding on risk of overweight and obesity in both children and adults⁽⁸²⁾.

The challenges of understanding the interplay of biological, behavioural and societal factors in the origins of obesity and devising appropriate interventions at both the individual and societal levels to this complex “wicked” problem were starkly highlighted in the UK 2007 Foresight Tackling Obesities: Future Choices report⁽⁸³⁾ and in the Foresight obesity systems map (Figure 18).

Figure 18: UK 2007 Foresight obesity systems map⁽⁸³⁾

A wealth of clinical and epidemiological evidence has linked excess body weight, both general obesity (body mass index, BMI) and central abdominal obesity, to a broad spectrum of cardiovascular diseases (CVD) including coronary heart disease, heart failure, hypertension, stroke, atrial fibrillation and sudden cardiac death. Overweight and obesity increase CVD morbidity and mortality directly and indirectly.

- Direct effects are mediated by obesity-induced structural and functional adaptations of the cardiovascular system to accommodate excess body weight and by adverse effects on a wide range of inflammatory and pro-thrombotic (clotting) markers linked to CVD.
- Indirect effects are mediated by co-existing CVD risk factors such as insulin resistance and type 2 diabetes, hypertension and abnormal blood lipids.

In work led by the School of Public Health at UCC in 2012, the costs of overweight and obesity in the Republic of Ireland in 2009 were estimated at €1.13 billion, with approximately 35% of the costs assigned to direct healthcare costs (heavily weighted on cardiovascular disease and diabetes) and 65% to indirect costs linked to productivity losses associated with work absenteeism and premature mortality⁽⁸⁴⁾. The direct health care costs represent 2.7% of the total healthcare costs for 2009, a finding that is consistent with similar studies internationally.

Childhood overweight and obesity:

Childhood overweight and obesity have emerged as a major public health issue over the past two decades, with current estimates suggesting that approximately

1 in 5



Irish children have overweight or obesity.

In addition to important effects on physical, mental and social health and wellbeing during childhood, excess weight in childhood is also a strong predictor of adult obesity. In pooled results from 15 high-quality cohort studies, it has been shown that children who have obesity at the ages of 7-11 years were five times more likely to have obesity as adults compared children without obesity⁽⁸⁵⁾.

There is also consistent evidence that childhood overweight and obesity is positively associated with the development of type 2 diabetes and hypertension in adulthood. Indeed, the effects of excess weight on blood pressure are already evident in childhood. In a study of 58,899 children and adolescents aged 6–17 years from seven national cross-sectional surveys, a BMI within the currently accepted normal weight range (25th–84th percentiles of BMI) was associated with an increased risk of elevated and high BP among children and adolescents. Notably, the risk of elevated and high BP started from the 25th–49th percentiles of BMI and persisted into ≥99th percentile of BMI⁽⁸⁶⁾.

In further work on the cost of overweight and obesity from the School of Public Health UCC, the projected lifetime costs attributable to overweight and obesity for the Republic of Ireland in 2015 (including health care and indirect costs, discounted) were estimated at €4.6 billion. In these analyses, it was estimated that a 1% and 5% reduction in population mean childhood BMI would be associated with a €270 million and €1.1 billion reduction in projected lifetime costs, respectively⁽⁸⁷⁾.

2.4.6 Alcohol and CVD

The health, social and broader societal impacts of alcohol consumption are well documented. In the most recent estimates from the global burden of disease study, alcohol use is ranked 7th among major modifiable risk factors as a cause of death and disability worldwide and is the leading risk factor globally among people aged 15-49 years⁽⁸⁸⁾. In Ireland, based on the most recent Global Burden of Disease estimates, 1543 deaths (4.8% of all deaths) were attributable to alcohol from all causes in 2019⁽⁸⁹⁾.



Alcohol is an important contributor to the burden of cardiovascular disease due to its adverse effects on blood pressure and risk of coronary heart disease, stroke, peripheral arterial disease and heart failure.

Heavy alcohol consumption in a binge pattern is linked to the development of acute cardiac arrhythmia, even in people with normal heart function. Atrial fibrillation is the most common arrhythmia associated with chronic high-volume alcohol intake. Above 14 g alcohol per day, the relative risk increases 10% for every extra standard drink (14 g ethanol).

Cardioprotective effects of moderate alcohol consumption: Observational studies over several decades have consistently shown a lower risk of cardiovascular and all-cause mortality in people with low levels of alcohol consumption when compared to abstainers (the 'J'-shaped curve). This has informed discussion on safe alcohol consumption levels for men and women. However, it has long been suspected that the cardioprotective effects of light to moderate alcohol consumption may be the product of confounding behavioural factors, i.e. light to moderate alcohol consumers tend to have healthier behaviours than abstainers and it is difficult to fully capture or measure these effects and fully account for them in statistical analyses.

In recent analyses from the UK Biobank study involving 371,463 participants with extensive data on potentially confounding behavioural factors, the benefits of modest alcohol intake were substantially reduced in standard multivariate analyses⁽⁹⁰⁾. In further complex genetic analyses (Mendelian randomization), alcohol consumption at all levels was associated with increased cardiovascular risk. In the latter analyses, it was found that light alcohol consumption was associated with minimal cardiovascular risk, but the risk of cardiovascular disease increased exponentially at higher levels of intake⁽⁹⁰⁾.



These results from a large contemporary UK cohort study substantiate claims that no amount of alcohol is protective against cardiovascular disease.

Further research from the UK Biobank study examined the effect of moderate alcohol consumption on brain health (defined by structural and functional MRI brain measures). No safe dose of alcohol for the brain was found. Moderate consumption was associated with more widespread adverse effects on the brain than previously recognised⁽⁹¹⁾. The findings also suggest that individuals who binge drink or those high with high blood pressure and BMI may be more susceptible to adverse effects on the brain. The authors of this paper recommend that current 'low risk' drinking guidelines should be revisited to take account of brain effects. Thus, at the societal level, it is clear that the detrimental effects of alcohol on mental, physical and social health and wellbeing, together with the economic costs, far outweigh the beneficial effects.

2.4.7 Atmospheric pollution and CVD risk



Fossil fuel combustion, the major source of climate-warming greenhouse gases, also produces harmful air pollution, now considered to be among the leading risk factors for premature mortality worldwide.

Epidemiological studies have established a consistent link between increased risk of cardiovascular events and long-term and short-term exposure to air pollutants. For example, in the US Multi-Ethnic Study of Atherosclerosis and Air Pollution (MESA) study, increased long-term exposure to particulate matter (PM_{2.5}), nitrogen dioxide and ozone was associated with the progression of coronary artery calcification, consistent with the advancement of atherosclerosis⁽⁹²⁾. Higher levels of particulate matter and gaseous air pollutants have been associated with elevations in both systolic and diastolic blood pressure⁽⁹³⁾ and there is evidence from work reported in 2004 that individuals with greater long-term exposure to PM_{2.5} have an increased risk of cardiovascular mortality from ischemic heart disease, arrhythmias and heart failure⁽⁹⁴⁾.

Numerous studies worldwide have corroborated these findings since that time. Even short-term changes in air pollution can affect cardiovascular mortality. Increased heart failure hospitalisations and mortality were associated with same-day rises in nitrogen dioxide, sulphur dioxide and particulate matter⁽⁹⁵⁾. In a meta-analysis of the effects of air pollutants on myocardial infarction, it was shown that a 10 mg/m³ increase in PM_{2.5} levels was associated with a 2.5% increase in the relative risk of myocardial infarction on the same day as or day after the elevation⁽⁹⁶⁾. More modest but significant increases in myocardial infarction risk were also found for elevations in nitrogen dioxide, sulphur dioxide and particulate matter.

2.4.8 COVID-19 infection and CVD risk



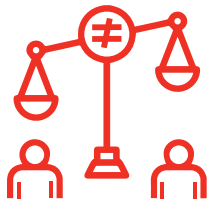
The effects of the ongoing COVID-19 pandemic continue to reverberate through our health system and wider society.

Our ongoing efforts to minimise the incidence of infection with the SARS-CoV-2 virus in the population through vaccination, ventilation the use of masks of appropriate quality in relevant settings and other measures will have significant implications for the burden of CVD, other conditions and overall mortality. Older age, pre-existing cardiovascular disease, obesity and diabetes are associated with increased risk of hospitalisation and death from COVID-19 infection. Among hospitalised patients with COVID-19, evidence of acute cardiac compromise is extremely common. It includes acute heart failure, myocardial ischemia or infarction, ventricular dysfunction, cardiomyopathy, arrhythmias, venous thromboembolism and arterial thrombosis secondary to viral-mediated coagulopathy⁽⁹⁷⁾.

We now also have high quality data on the post-acute cardiovascular signs and symptoms of COVID-19. Xie and colleagues used the US Department of Veterans Affairs national healthcare databases to build a cohort of 153,760 individuals with COVID-19, as well as two sets of control cohorts with 5,637,647 (contemporary controls) and 5,859,411 (historical controls) individuals, to estimate risks and 1-year burdens of a set of pre-specified incident cardiovascular outcomes⁽⁹⁸⁾. They found that beyond the first 30 days after infection, individuals with COVID-19 are at increased risk of incident cardiovascular disease spanning several categories, including cerebrovascular disorders, dysrhythmias, ischemic and non-ischemic heart disease, pericarditis, myocarditis, heart failure and thromboembolic disease. These risks and burdens were evident even among individuals who were not hospitalised during the acute phase of the infection and increased in a graded fashion according to the care setting during the acute phase (non-hospitalised, hospitalised and admitted to intensive care). This study provides clear evidence that the risk and 1-year burden of cardiovascular disease in survivors of acute COVID-19 are substantial. Care pathways of those surviving the acute episode of COVID-19 should include attention to cardiovascular health and disease.

2.5 Social inequalities in CVD risk

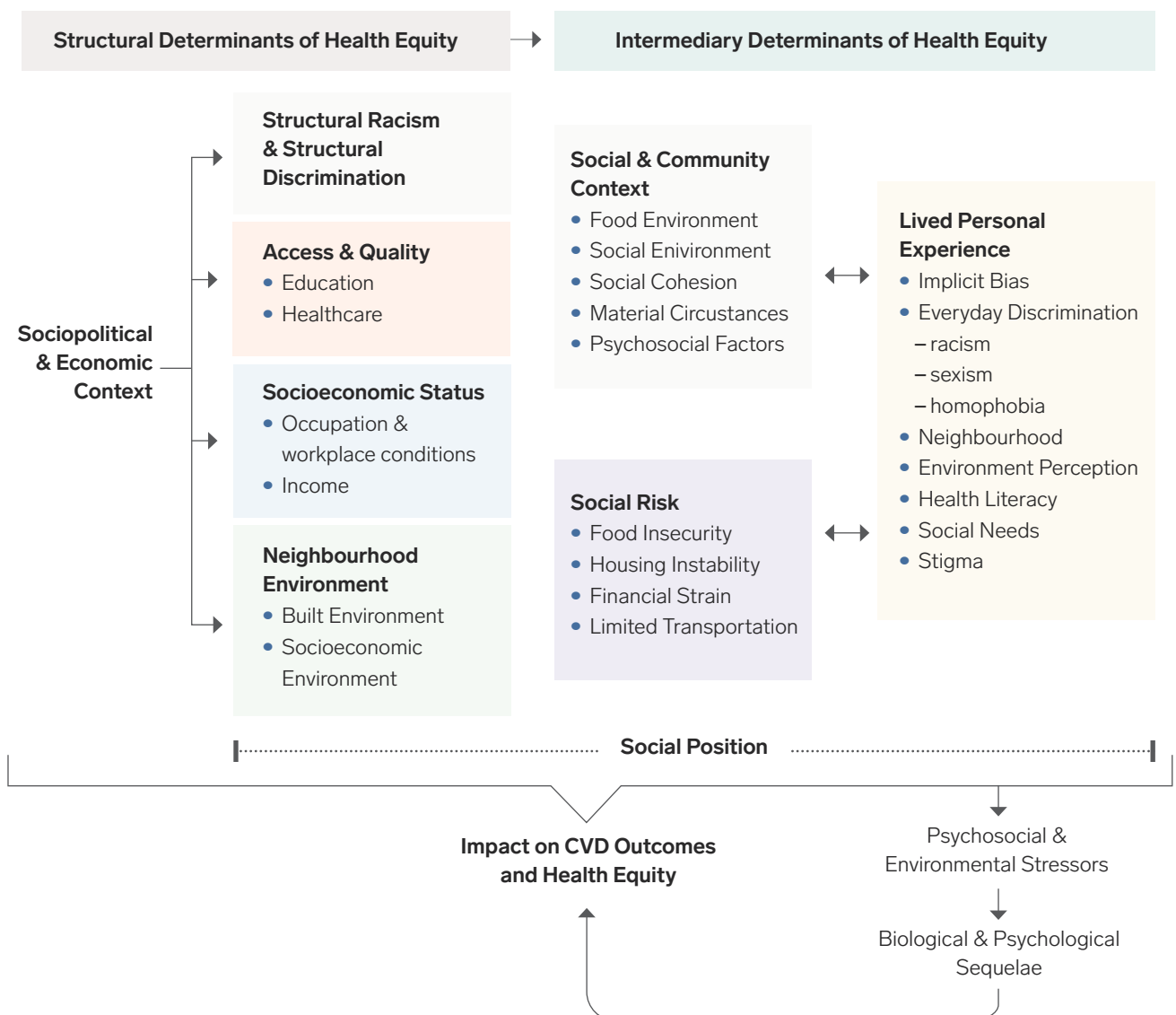
As discussed in earlier sections, the social determinants of health, which encompass the broad range of economic, social, environmental and psychosocial factors that influence health, play a significant role in the development of cardiovascular disease risk factors as well as CVD morbidity and mortality.



Social inequalities in health refer to the systemic differences in health that exist between socioeconomic positions, social classes, genders, ethnicities, sexual orientations or other social groups with differentiated access to the material and non-material resources that determine health and wellbeing.

Social inequalities are best conceptualised within a broad health equity framework (see Figure 19) anchored in social, economic, political and power structures that are woven into the fabric of society⁽⁹⁹⁾. In essence, inequalities in health are deeply interconnected with inequalities in education, income, power and status. Ultimately, they reflect core aspects of the organisation of society with regard to the distribution of political and economic power and influence. Differences in mortality and morbidity from cardiovascular disease, cancer and virtually all the major causes of disability and premature mortality are just the most dramatic examples of the injustices that arise, even in societies committed to social democracy and a strong welfare state.

Figure 19: A conceptual framework of the social determinants of health⁽⁹⁹⁾



As shown in the graphic, the trickle-down effects of the socio-political and economic context influence the social position and subsequent lived experiences of marginalised groups through the application of laws and policies within the social and community context. The chronic effects of these experiences influence human biology and subsequent cardiovascular disease (CVD) outcomes through psychosocial and environmental stressors⁽⁹⁹⁾.

Social inequalities in health in Ireland: Data on social inequalities in health in general and in cardiovascular disease in particular are relatively sparse in Ireland. In earlier sections we have briefly presented recent findings on social inequalities in the distribution of CVD risk factors. There is consistent evidence that social inequalities in mortality have been increasing in Ireland and other European countries in recent decades⁽¹⁰⁰⁾ ⁽¹⁰¹⁾. For example, an examination of variations in standardised mortality rates (SMRs) between occupational groups in Ireland from 1984 to 2008 revealed that, despite declining SMRs, the absolute and relative differences in SMRs between the professional and manual occupational categories increased with time; some of this increase was attributed to a greater decline in cardiovascular mortality among more socioeconomically advantaged populations⁽¹⁰²⁾.

In a September 2022 update on inequalities in mortality in Ireland, standardised mortality rates in adults from 2014 to 2018 were twice as high among the “manual skilled to agricultural workers” than in those classified as “employers and managers”⁽¹⁰³⁾. More recently, the Evidence for Policies to Prevent Chronic Conditions (EPICC) research group⁽¹⁶⁾ examined the prevalence of chronic conditions by level of deprivation using data from the Healthy Ireland Survey 2018.

×2

They found that prevalence of coronary heart disease among those categorised as disadvantaged, very disadvantaged or extremely disadvantaged was **more than twice** as high than that among affluent individuals.

Among the starkest inequalities in health in Ireland are those related to ethnicity. Representing just over 1% of the population, Travellers in Ireland experience persistent racism and discrimination resulting in poorer outcomes in terms of education, employment, accommodation and health. In the All-Ireland Traveller Health Study (2010), it was found that:



Traveller women and men live on average 11.5 years and 15 years less respectively than women and men in the general population.



The leading causes of death in Travellers was identified as heart disease, external causes respiratory diseases and cancer.



Mortality rates among Traveller infants was estimated at 14.1 for every 1,000 live births compared to 3.9 per 1,000 live births among the general population⁽¹⁰⁴⁾.

While there is social gradient in the distribution of cardiovascular disease risk factors, the higher levels of cardiovascular disease observed in socially disadvantaged groups cannot be explained in terms of differences in traditional CVD risk factors. Rather, the higher rates of morbidity and mortality from CVD observed in these groups reflect the cumulative lifetime burden of social disadvantage operating at multiple levels – individual, family, neighbourhood community and societal – from childhood to old age (see Figure 20)⁽⁹⁹⁾. The mechanisms whereby the social and economic structures of society are embodied in suffering and premature death from CVD and other conditions have been extensively studied in recent decades and have produced findings with important implications for the primary prevention of CVD (Figure 20). In broad terms, the core social determinants of health, including poverty, unemployment, the built environment, education and healthcare access, are linked to an interrelated set of chronic psychosocial and environmental stressors such as low social status, discrimination, poor housing, food insecurity, social isolation and early childhood adversity. All of these are linked to CVD development and progression through a plethora of biological mechanisms, including chronic activation of physiological stress responses and systemic inflammation and epigenetic changes (Figure. 20).

Psychosocial stress forms a critical component in our current understanding of social inequalities in CVD. It is well established that psychosocial factors are significantly associated with cardiovascular disease both directly through the biological mechanisms summarised in Figure 20 and indirectly through increased frequency of behaviours with potentially negative effects on cardiovascular health. Longitudinal studies have demonstrated numerous psychosocial determinants of cardiovascular health, including chronic psychological stress, subjective social status, job strain, adverse childhood experiences, depression, perceived discrimination and loneliness/social isolation.

Childhood origins of CVD risk: Work on the social determinants of health and on social inequalities in CVD highlight the early origins of CVD and the need for population-based primary prevention measures targeting relevant causal factors in childhood and adolescence.

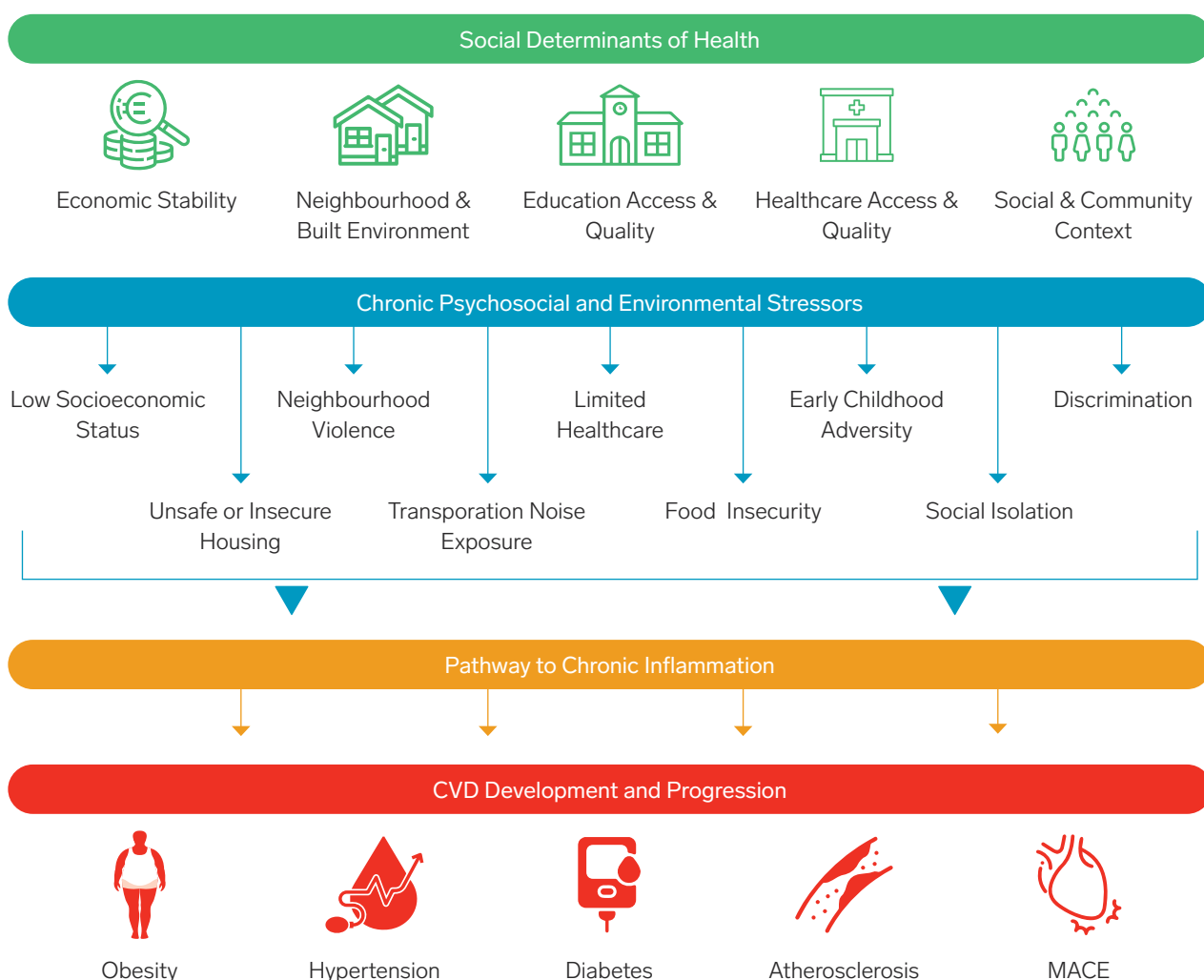


There is substantial evidence that the origins of cardiovascular disease are in childhood⁽¹⁰⁵⁾.

In a study published in 2000, McGill and colleagues⁽¹⁰⁶⁾ examined arteries and tissue from 3000 autopsied persons aged 15-34 who died of accidental injury, homicide or suicide. The extent of both fatty streaks and raised lesions (fibrous plaques and other advanced lesions) in the right coronary artery and in the abdominal aorta was linked with established CVD risk factors in adults, including non-HDL cholesterol concentration, hypertension, impaired glucose tolerance and obesity, and associated negatively with HDL-cholesterol concentration. Atherosclerosis of the abdominal aorta also was associated positively with smoking. These observations indicate that the long-range prevention of atherosclerosis and its sequelae by control of the risk factors for adult coronary artery disease should begin in adolescence and young adulthood.

In further work in this area, prospective studies beginning in childhood report associations of childhood obesity, abnormal blood pressure (BP), dyslipidaemia, diabetes and tobacco use with intermediate CVD markers, including ventricular hypertrophy and vascular stiffness in young adulthood. In a recent 2021 study, O’Keefe and colleagues⁽¹⁰⁷⁾ examined sex specific trajectories of 148 metabolic trait concentrations including various lipoprotein subclasses at age 7 years, 15 years, 18 years and 25 years in 3909 females and 3717 males - offspring of the Avon Longitudinal Study of Parents and Children birth cohort study. These analyses have shown that substantial changes in the levels of causal risk factors and novel predictive biomarkers for cardiometabolic diseases occur from childhood to early adulthood. Moreover, the magnitude of change for many atherogenic markers was more adverse among males than females. Overall, the findings from this study suggest that childhood and adolescence are important life stages for developing sex differences in atherogenic lipids and predictive biomarkers for cardiometabolic disease, mostly to the detriment of males.

Figure 20: Social determinants of health and the biology of adversity⁽⁹⁹⁾



Adapted from Powell-Wiley et al. 2022

2.6 Commercial determinants of CVD risk

Within the broad framework of societal level determinants of health, there is increasing understanding of the commercial determinants of health. These are defined as the strategies, practices and approaches adopted by private sector actors to promote products and choices that impact directly and indirectly on health ⁽¹⁰⁸⁾.

While there is clearly potential for private sector actors/corporations to provide benefits to society, the malign effects of corporate power and influence on health and wellbeing are evident across a wide range of issues, including the role of global tobacco and fossil fuel companies in the ongoing pandemics of non-communicable disease and climate change and the role of multinational food and beverage companies in the pandemic of obesity and diet-related disease in children and adults.

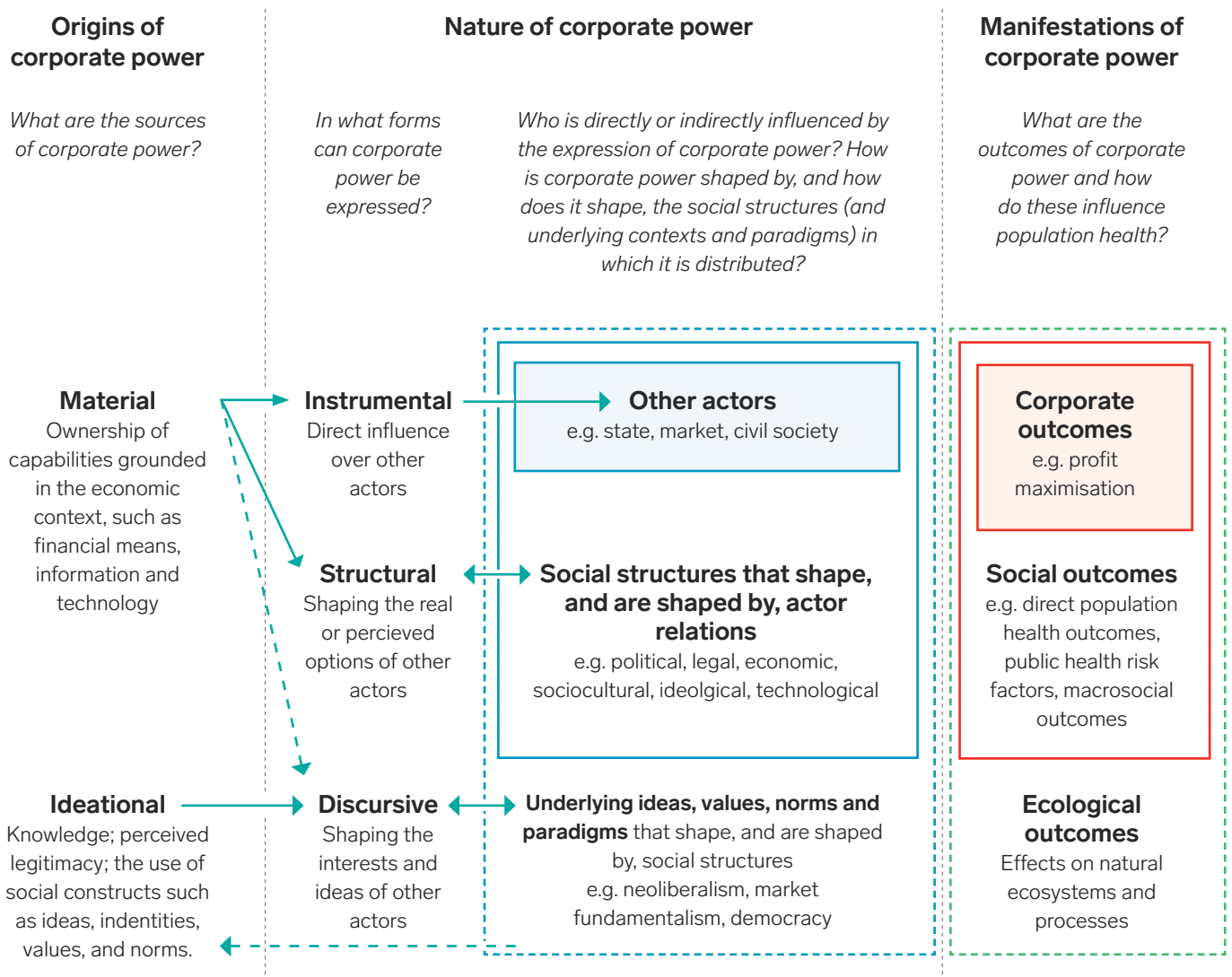


Thus, in addressing the prevention of CVD and related NCDs there is a need to explicitly acknowledge the power of corporations and the largely unseen means by which corporate power is exerted in society. McKee and Stuckler have identified four ways that corporations influence health, all of which are relevant to the prevention of CVD in general and the role of diet in particular:

- ✓ defining the dominant narrative
- ✓ setting the rules by which society, especially trade, operates
- ✓ commodifying knowledge
- ✓ undermining political, social, and economic rights ⁽¹⁰⁹⁾.

Figure 21 provides a schematic overview of this important conceptual framework. In the context of a wealthy developed country such as Ireland, the power of corporations to define the dominant narrative, to frame the “window of discourse” (the range of policies deemed worthy of consideration) is of particular importance in areas such the contribution of the agri-food sector to greenhouse gas emissions and food reformulation. This is illustrated, for example, by the use of the term “nanny state” as a rhetorical device by corporations and media to frame public health policies such as sugar taxes or warning labels on alcohol products as manifestations of an overreaching state seeking to limit individual choice and freedom.

Figure 21: Schematic overview of the commercial determinants of health ⁽¹¹⁰⁾





03

Population-wide versus targeted strategies in primary prevention of cardiovascular disease



3.0 POPULATION-WIDE VERSUS TARGETED STRATEGIES IN PRIMARY PREVENTION OF CARDIOVASCULAR DISEASE

3.1 Outline

While population-based and high-risk approaches to primary CVD prevention are both clearly necessary and complementary, population-based strategies are more effective and cost effective than high-risk targeted strategies and are less likely to widen social inequalities in health. Thus, policy makers should prioritise population-based strategies for primary CVD prevention on the grounds of health and wellbeing, economics and social justice.

3.2 Sick individuals and sick populations

The concept of “sick individuals and sick populations” as set out in Geoffrey Rose’s classic paper, published in 1985, remains highly relevant to the primary prevention of cardiovascular disease⁽¹¹⁾. Rose highlighted the critical distinction between the causes of illness at the individual level (causes of cases) and the causes of illness at the population level (causes of incidence) and the equally critical distinction between the corresponding “high-risk” and “population” prevention strategies.

 High Risk Strategies	 Population-wide Strategies
<p>Briefly, high-risk strategies target individuals identified (e.g., thorough screening) as having elevated risk for some adverse health outcome such as blood pressure above a specific threshold. Those exceeding the risk threshold are then given lifestyle advice and/or medication to reduce their blood pressure.</p>	<p>By contrast, Rose’s population or “mass” strategy of prevention refers to prevention activities that target a whole population regardless of variation in individuals’ risk status, such as measures taken to reduce average blood pressure levels in the entire population by legislation on the salt content of processed food to reduce the population’s exposure to dietary salt.</p>

Rose argued that more cases of disease arise from the mass of the population at slightly or moderately increased risk than from the minority of the population at high risk, therefore measures taken to reduce the level of a risk factor by a small amount in the whole population will prevent more cases of disease than measures taken to reduce that risk factor by a large magnitude in those identified as having elevated risk.

In essence, even though high-risk individuals such as those with multiple risk factors (e.g., smoking, high blood pressure and high cholesterol levels) gain most from preventive measures, the greatest number of deaths from CVD occurs in low- or medium-risk individuals, simply because there are many more of them. This is well illustrated in Figure 22, which shows that, even with the application of a CVD risk scoring system based on several core risk factors, most deaths over 10 years occur in the segment of the population characterised as having a low 10-year risk of CVD mortality. Furthermore, high-risk approaches are, by definition, temporary and palliative and high risk states are, at best, managed but not prevented.

While high-risk prevention strategies are clearly essential to reduce the risk of major events such as heart attack, stroke and death in those already at high risk, **population strategies are essential** if we wish to reduce the underlying incidence of heart disease and stroke in the population and reduce the number of individuals falling into high-risk categories and requiring lifelong interventions with drug therapy and monitoring of risk factors.

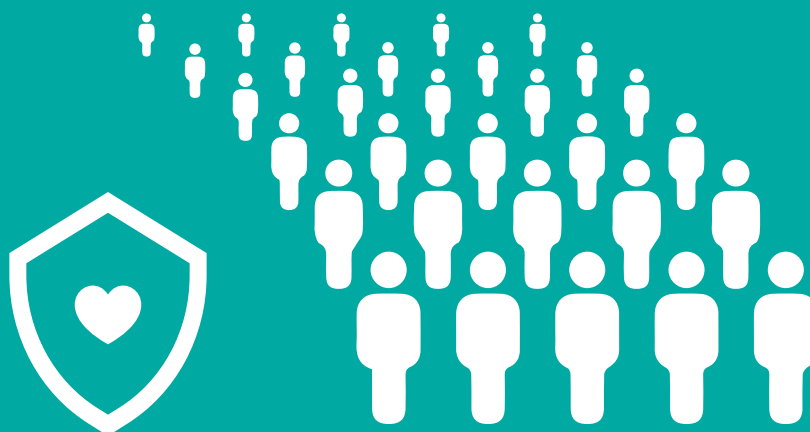
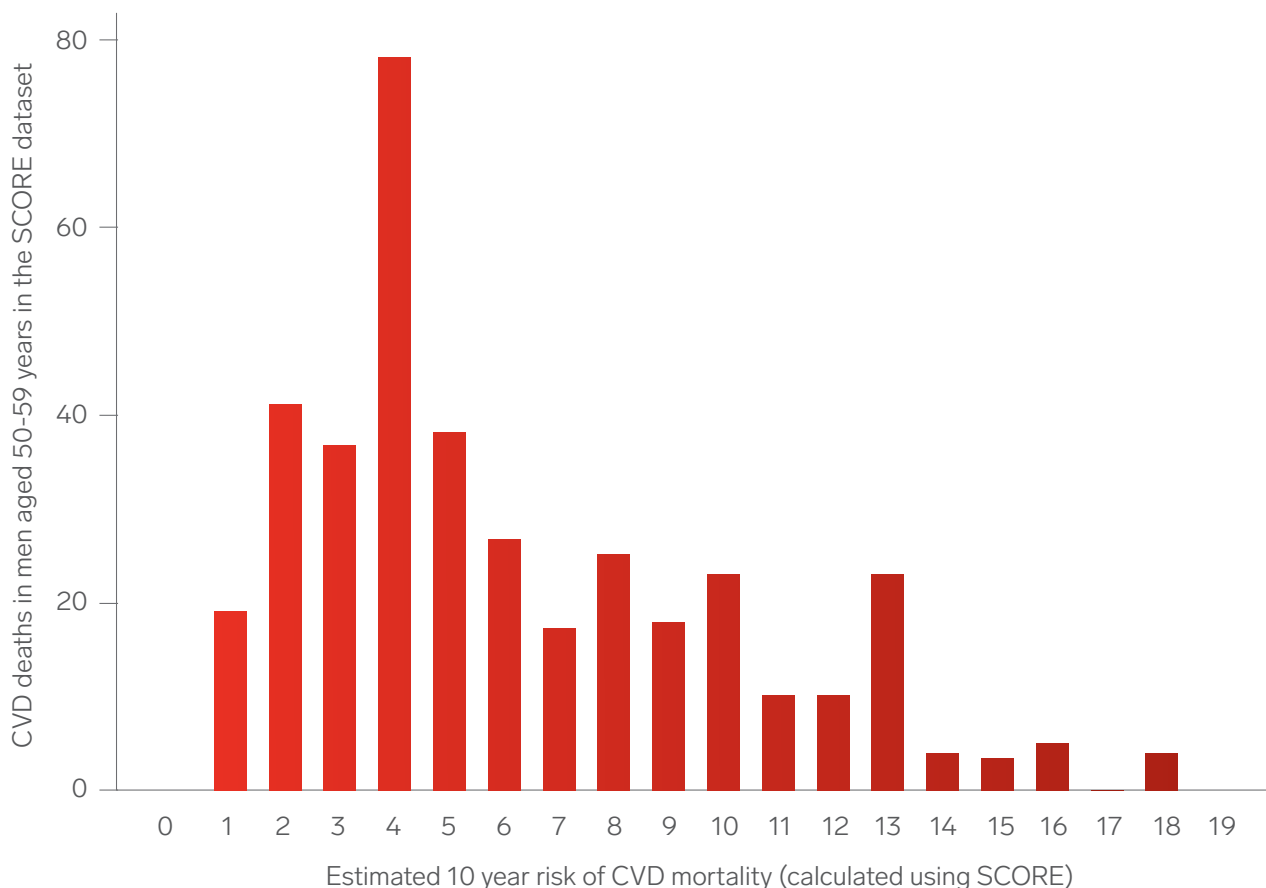


Figure 22: Observed number of CVD deaths over 10 years of follow up at each level of predicted risk in men aged 50-59 years⁽¹¹²⁾



Note: n=206,091 for the entire dataset spanning ages 19 to 80 years

Empirical and modelling studies: Although high-risk and population strategies are clearly complementary, Rose’s core argument on the greater impact of population strategies on the burden of disease is well supported by empirical data and modelling studies. Small reductions in population cholesterol concentrations, blood pressure or smoking translate into substantial reductions in cardiovascular events and deaths^{(112) (113) (114)}. For example, Cooney and colleagues⁽¹¹²⁾ compared the estimated effects on CVD mortality of population strategies at varying levels of population-wide risk factor reduction with targeted high-risk strategies at varying rates of screening uptake using data from 109,954 participants pooled from six European general population cohort studies.

At the population level, they estimated that a:

↓10% +
↓10% +
↓10%
→
would save
9125 ♥
lives per million over 10 years⁽¹¹²⁾.

reduction of **blood cholesterol level** over 10 years
blood pressure reduction
reduction in the prevalence of **smoking**

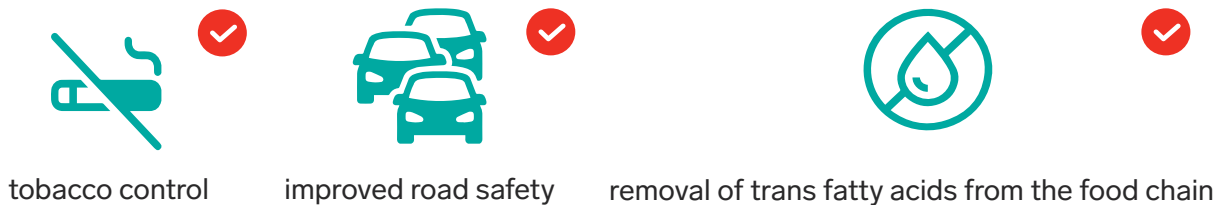
By contrast, an approach that treats all high-risk individuals with a “polypill” containing a statin, three antihypertensives drugs at half-dose and aspirin, with a 20–80% uptake, would save 1861-7452 lives per million⁽¹¹²⁾. While the limitations of observational data and modelling studies on the comparative benefits of population versus high-risk approaches to prevention should be acknowledged, there is virtual unanimity in the literature on the greater impact of population-based strategies^{(112) (113) (114) (115)}.

To take a further example, Mackenbach and colleagues⁽¹¹⁵⁾ examined the impact of 22 new preventive interventions in the Netherlands between 1970 and 2010. They estimated that approximately three quarters of the health gain from prevention in this period was achieved by primary prevention but only a small fraction of this gain was achieved with a high-risk approach.

The population approach to prevention accounted for:



Important contributors to prevention included:

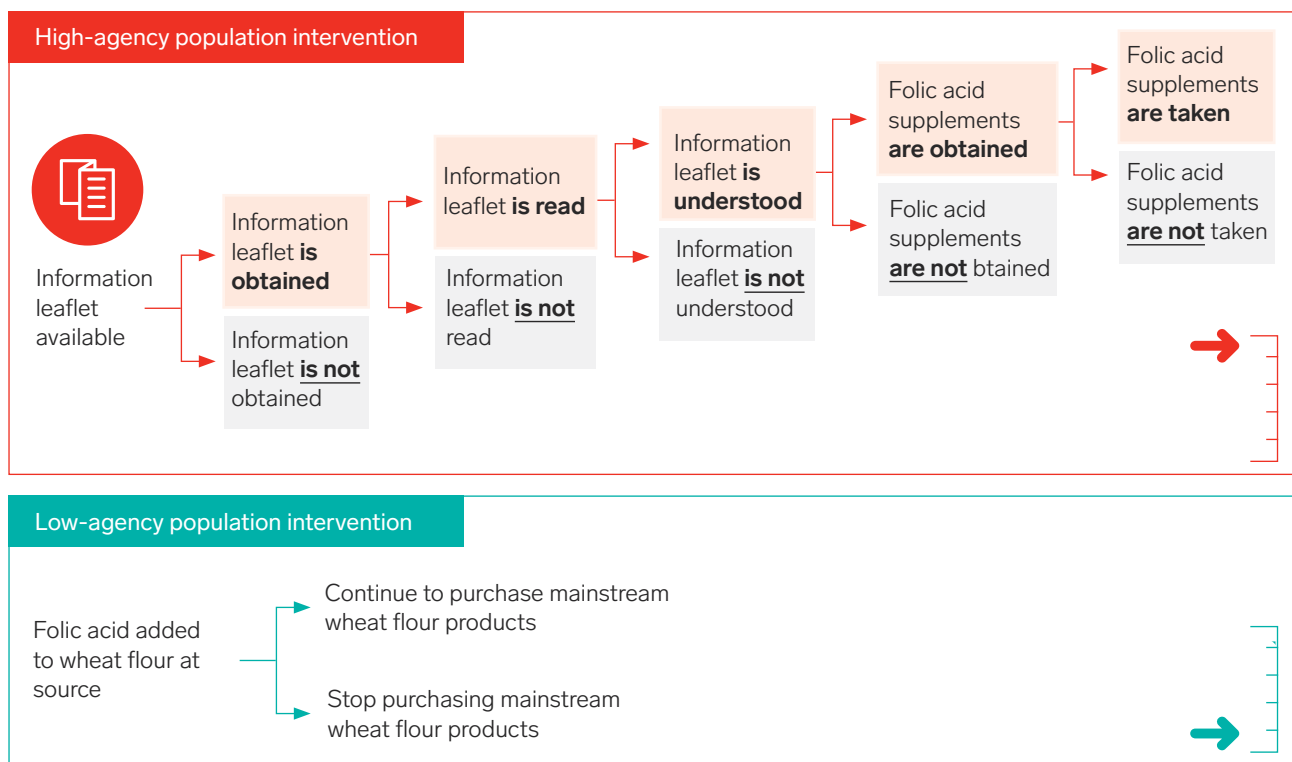


These were all based on a population approach, in which disease risks were reduced without targeting interventions at those at high risk.

3.3 Individual agency and an effectiveness hierarchy of preventive interventions

While population-based strategies are more effective than high-risk prevention strategies, unfortunately not all population approaches are the same. Population approaches that rely on individuals engaging with information (high agency interventions) are unlikely to be as effective and equitable as those that require less agency (Figure. 23).

Figure 23: Illustration of the intervention pathway in high-agency (top) and low-agency (bottom) population interventions ⁽¹¹⁶⁾



Adapted from Adams et al, 2016

Both examples illustrate population interventions to increase folate in women trying to conceive. The top panel illustrates an information leaflet encouraging women to take folic acid supplements (a high-agency population intervention). The bottom panel illustrates the universal addition of folic acid to mainstream wheat flour (a low-agency intervention). Numbers are illustrative and the steps shown in both cases are illustrative and not necessarily exhaustive.

All public health interventions can be placed on a continuum that describes the amount of agency individuals must use to benefit from them. Similarly, there is a spectrum or continuum from high-risk to population-level interventions. For example, local planning arrangements restricting proliferation of hot food takeaways near schools are intended to target 'vulnerable populations' (i.e. children), thereby placing such interventions somewhere between high-risk interventions targeted at those known to be at high baseline risk and population interventions available to all. When

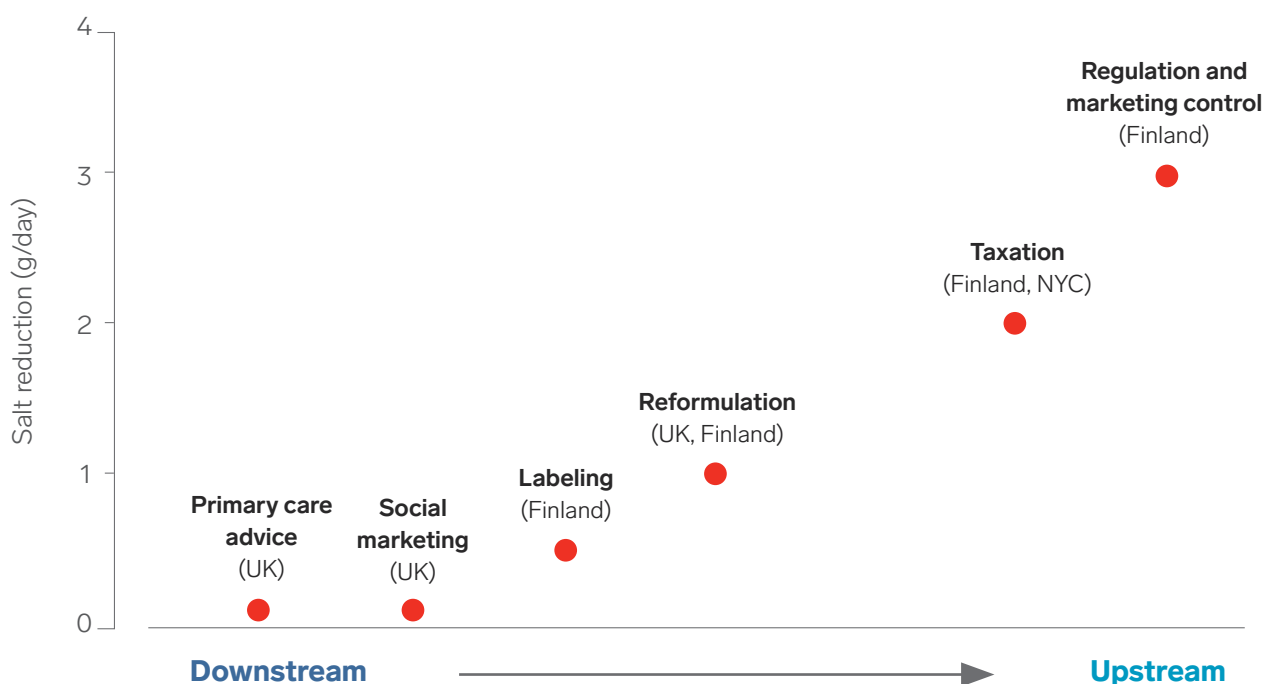
combined, these two continuums provide a framework for describing the whole range of public health interventions. Figure 24 illustrates this framework with examples largely drawn from work on diet and obesity.

Figure 24: Two continuums describe all public health interventions, with examples related to diet and obesity⁽¹¹⁶⁾



In further elaboration of these points, Simon and Ann Capewell highlight the increasing evidence in support of an effectiveness hierarchy of preventive interventions, targeting the four major risk factors for non-communicable diseases (NCDs) of poor diet, tobacco, alcohol consumption and physical inactivity⁽¹¹⁷⁾. It is increasingly clear that 'downstream' preventive activities targeting individuals (such as 1:1 personal advice, health education, 'nudge' or primary prevention medications) consistently achieve a smaller population health impact than interventions aimed further 'upstream' (for instance smoke-free legislation, alcohol minimum pricing or regulations eliminating dietary trans fats).

Figure 25 shows the estimated effects of different policy options addressing the issue of dietary salt reduction. It highlights the minimal impact of downstream primary care advice and social marketing approaches on population intakes versus upstream approaches such as regulation and marketing control⁽¹¹⁸⁾. Comprehensive, upstream, policy-based interventions reach all parts of the population and do not depend on a sustained 'agentic' individual response. They thus tend to be more effective, rapid and equitable and save more costs. While this effectiveness hierarchy is evident to many professionals working in public health, it is not widely acknowledged by clinicians or policy makers.

Figure 25: Dietary salt reduction: estimated effects of different policy options⁽¹¹⁸⁾

3.4 Cost-effectiveness hierarchy of preventive interventions

Estimating the cost effectiveness of public health or preventive interventions poses several challenges. Often there is a lack of data, or the data relates to intermediate or short-term outcomes (e.g. knowledge, attitudes, behaviour change within 1 year of the intervention) rather than long-term outcomes that are more relevant. Interventions are rarely well described and often differ in crucial details from those that have been modelled.

Despite these and other technical issues that arise in relation to economic evaluation studies, there is increasing evidence of a similar hierarchy in both the effectiveness and the cost-effectiveness of preventive interventions⁽¹¹⁷⁾. In 2011, Owen and colleagues⁽¹¹⁹⁾ reviewed the cost-effectiveness estimates for some 200 public health interventions recommended by the UK National Institute for Clinical Effectiveness (NICE), most of which were 'downstream', individual interventions. They found that most public health interventions assessed by NICE were estimated to be cost effective and a significant minority (15%) were cost saving. However, a clear cost-effectiveness hierarchy was evident. For example, high-risk preventive interventions in individuals requiring statin medication often cost many thousands of pounds per QALY, while individual advice on behaviour changes (for instance, exercise on prescription or mass media campaigns promoting healthy eating) usually only cost a few hundred pounds per QALY.



By contrast, ‘upstream’ population-wide policy interventions, such as regulations to control tobacco or alcohol consumption, reduce levels of dietary salt or trans fats in the food supply or subsidies to promote fresh fruit consumption are generally cost-saving.

These findings have been replicated in analyses from diverse countries worldwide. For example, in 2012 Cobiac et al. evaluated the optimal mix of individual lifestyle, pharmaceutical and population-wide interventions in the primary prevention of cardiovascular disease from an Australian health sector perspective⁽¹²⁰⁾. In a discrete time Markov model, they simulated the ischaemic heart disease and stroke outcomes and cost impacts of interventions over the lifetime of all Australian men and women aged 35–84 years who have never experienced a heart disease or stroke event. They found that a population-level intervention addressing dietary salt intake achieved the best value for money (by a considerable margin). Mandating more moderate use of salt in breads, margarines and cereals was easily the most effective and cost-effective strategy for primary prevention of CVD; it was associated with the largest improvements in population health and was estimated to be cost saving for the health sector. Cobiac et al. also found that a combination of diuretic, calcium channel blocker, ACE inhibitor and low-cost statin for everyone with at least 5% five-year risk of cardiovascular disease was also cost-effective, but “lifestyle” interventions aiming to change risky dietary and exercise behaviours were extremely poor value for money and had little population health benefit.

In a more recent systematic review, Masters et al. observed a similar effectiveness hierarchy in over 50 diverse public health interventions. ‘Upstream’ nationwide public health interventions had an estimated median return on investment of £27 for each pound invested⁽¹²¹⁾.

3.5 Effects of population and high-risk strategies on social inequalities in health

There is increasing evidence that “structural” whole population approaches to address CVD risk factors tend to reduce social inequalities in health whereas high-risk approaches typically widen socioeconomic inequalities. Disadvantaged groups experience a greater CVD burden. They are thus likely to gain extra benefit if a risk factor is uniformly reduced across the entire population, with a consequent reduction in absolute (but not necessarily relative) inequalities. Kivimaki et al. quantified the 15-year benefits of decreasing risk factors uniformly across a male population (reductions of 10 mmHg in blood pressure, 2 mmol/l in total cholesterol, and 1 mmol/l in glucose). In this modelling study, it was estimated that such interventions might reduce the absolute mortality gap between rich and poor by approximately 70%⁽¹²²⁾.

Similar observations have been made in relation to smoking. Smoking rates and exposure to environmental tobacco smoke are higher in poorer groups. There is evidence that strong regulatory policies, particularly those including increases in cigarette price, are associated with declines in tobacco use of a similar magnitude across socioeconomic groups⁽¹²³⁾. This suggests that, in the many countries where smoking rates are higher in poorer groups, the absolute benefit will be greater than in affluent groups.

By contrast, there is considerable evidence that high-risk interventions targeting individual-level changes in knowledge, motivation and behaviour (for example, national health promotion campaigns and behavioural change programmes) can widen inequalities in health. These high-agency interventions, which typically require mobilisation of an individual's resources, whether material or psychological, generally favour those with more resources, thus tending to increase social inequalities. This reflects what the British GP Julian Tudor Hart memorably described as the “inverse care law”—the availability of good medical care tends to vary inversely with the need for it in the population served⁽¹²⁴⁾. Such inequalities have been reported in screening, healthy diet advice, smoking cessation, statin and anti-hypertensive prescribing and adherence⁽¹²⁵⁾. Disadvantage can occur at every stage in the process, from the person's beliefs about health and disease and health-related behaviour, to presentation, screening, risk assessment, negotiation, participation, programme persistence and treatment adherence. Tugwell et al. usefully described this cumulative inequality as the “staircase effect”⁽¹²⁶⁾.

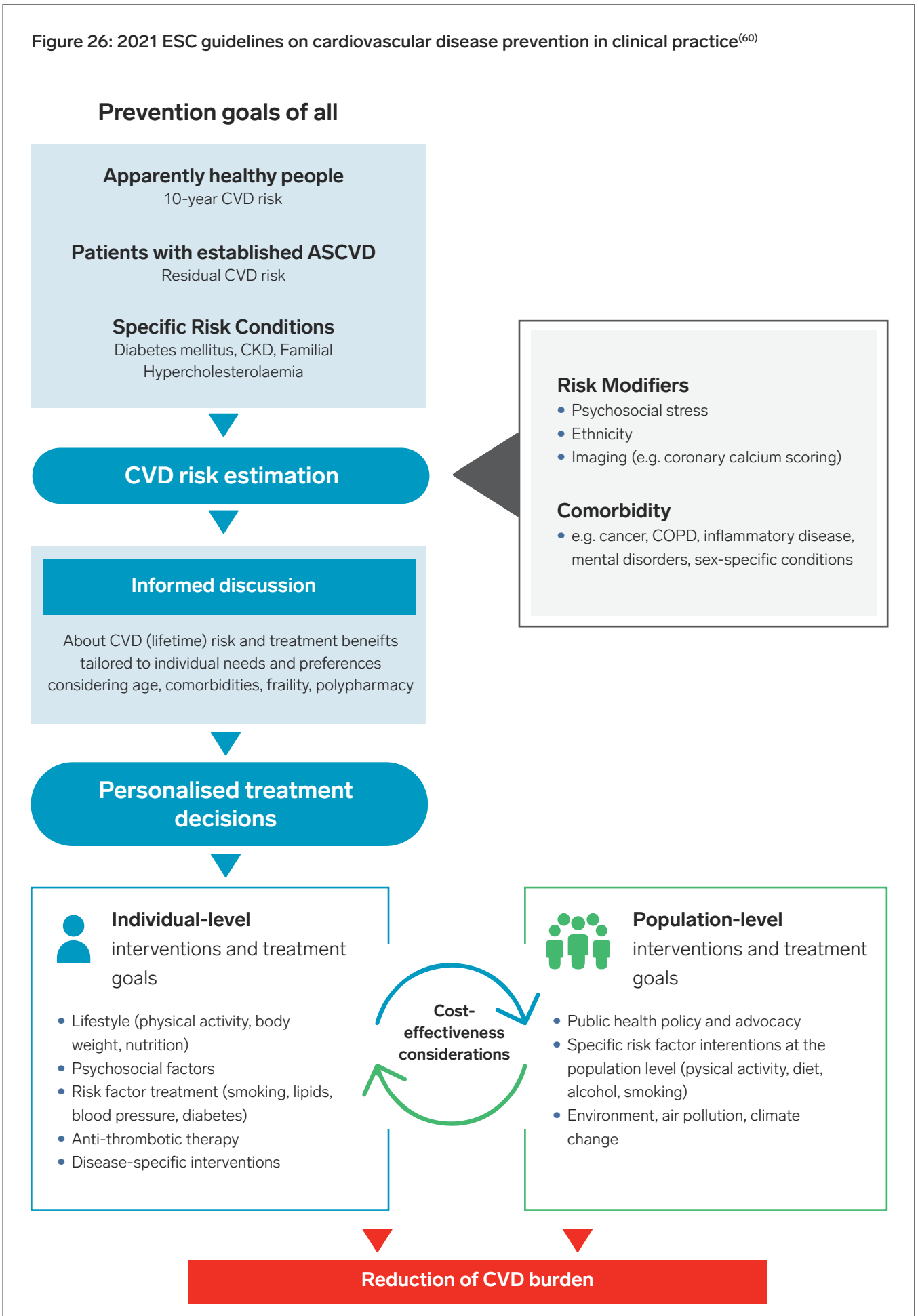
3.6 Current trends in primary prevention strategies: an overview of debate on high-risk versus population-based strategies

The UK 2010 NICE Guidelines on cardiovascular disease prevention made detailed recommendations on population-based strategies with a major focus on diet, including population level measures to reduce consumption of salt, saturated fats and trans fats, product labelling, public sector catering guidelines, the promotion and marketing of unhealthy food to children, the regulation of take-aways and other food outlets and the need for increased transparency in dealings between government, government agencies and the food and drink industry⁽¹⁰⁾. However, over the past two decades, the advent of new and more accurate CVD risk scoring systems has shifted focus from population-wide prevention strategies to more medicalised “high-risk” strategies⁽¹²⁷⁾. Despite the lack of robust evidence for effectiveness or cost effectiveness of the “high risk” approach in terms of the reduction of stroke and CVD incidence on a population level^{(128) (129)}, virtually all guidelines on CVD prevention stress the importance of a total CVD risk-based screening approach.

While the 2021 European Society of Cardiology (ESC) Guidelines on Cardiovascular Disease Prevention in Clinical Practice⁽⁶⁰⁾ discuss population level interventions, the focus (as expected in guidelines for clinical practice) is primarily on identifying and managing those at high 10-year risk of first onset CVD event⁷ and on managing those with established atherosclerotic cardiovascular disease (ASCVD) or a high-risk condition for ASCVD such as diabetes, chronic kidney disease or familial hypercholesterolaemia (Figure. 26).

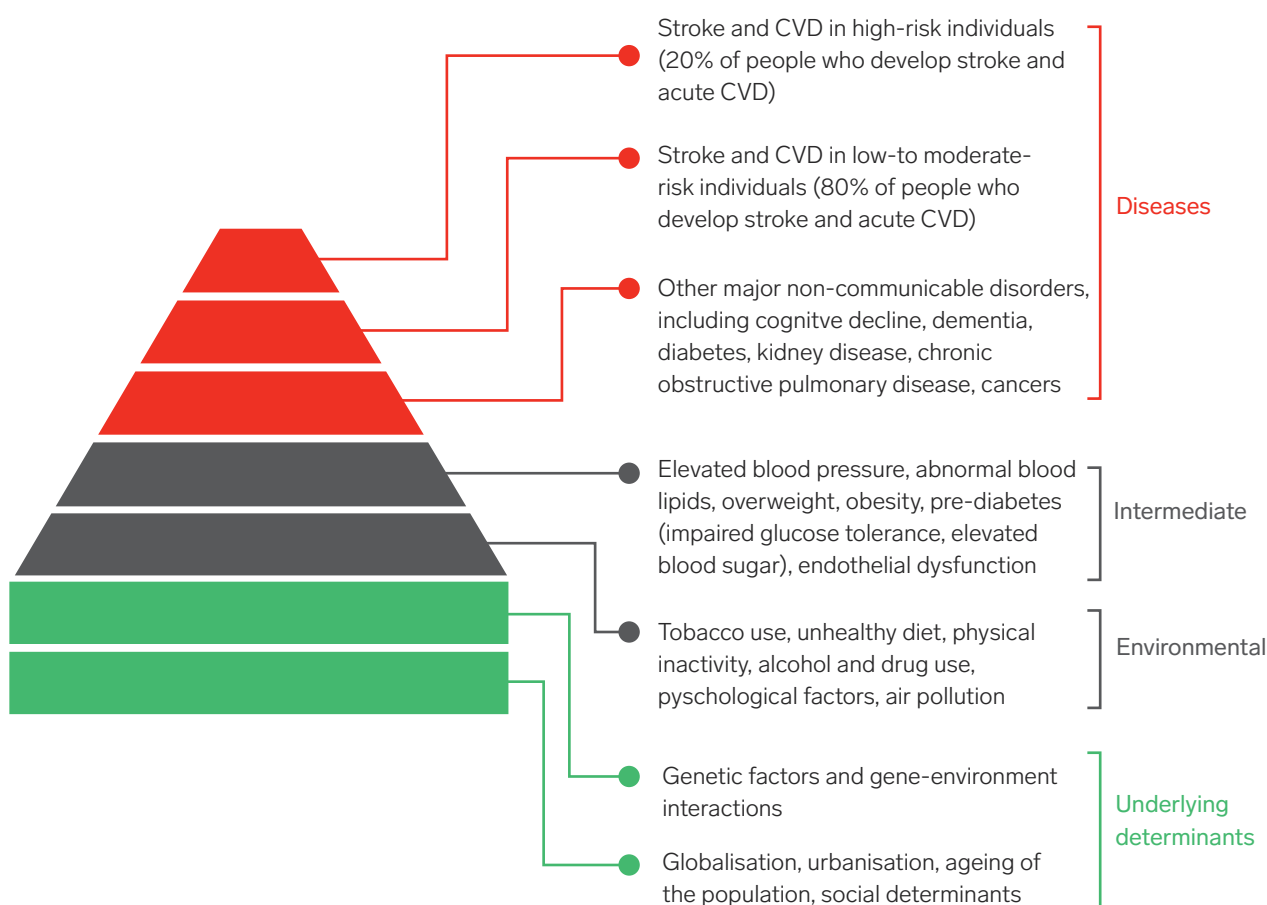
7 Defined as (SCORE2 >7.5% for age under 50; SCORE2 >10% for age 50-69; SCORE2-Older Persons >15% for age >70).

Figure 26: 2021 ESC guidelines on cardiovascular disease prevention in clinical practice⁽⁶⁰⁾



Feigin and colleagues have recently reviewed the optimal balance between population-wide and targeted strategies in the primary prevention of cardiovascular disease⁽¹³⁰⁾. They argue that when developing stroke and CVD primary prevention strategies, priority should be given to reducing exposure to CVD risk factors of the whole population across the life course, regardless of the CVD risk, with a focus on behavioural risk factors including tobacco use, unhealthy diet (excessive salt and sugar intake, lack of fruits and vegetables), physical inactivity, and the harmful use of alcohol. This would allow an integrative approach that also targets other major noncommunicable diseases, such as dementia, diabetes mellitus, cancer and pulmonary diseases. Drawing on a broad and comprehensive noncommunicable disease prevention framework, they argue that focusing on a “high-risk group” alone will be addressing just the tip of the iceberg (see Figure 27). These arguments have been endorsed in a joint position statement from the World Stroke Association (WSO) and the World Heart Federation (WHF)⁽¹³¹⁾.

Figure 27: Theoretical models of causal pathways and benefits of population-wide primary stroke and CVD prevention strategies for preventing other noncommunicable diseases⁽¹³⁰⁾



Adapted from Feigin, Brainin, Norrving et al, 2020

3.6.1 Core arguments for prioritising population-level over high-risk primary prevention strategies

A number of core arguments may be cited in support of prioritising reduction of exposure to CVD risk factors in the whole population across the life course, regardless of individual CVD risk.

Definition of high risk: By definition, the “high-risk” strategy leaves out the people with low and moderate CVD risk who ultimately make up 80% of all stroke and heart attacks. Therefore, the majority of the population, who contribute to most future incident CVD events, are not prioritised for recognition, education and other prevention interventions.

Problems with CVD risk scores: Four of the five core behavioural factors that account for a substantial proportion of CVD events (obesity, unhealthy diet, sedentary lifestyle and excessive alcohol intake), are not included in current major CVD risk scoring systems such as SCORE2. Therefore, the ability of “high risk” CVD screening to detect, control and monitor important behavioural risk factors for CVD prevention is currently limited.

Arbitrary intervention thresholds: Clinicians often seek thresholds to trigger certain interventions. This concept is at odds with the fact that risk is a continuum, particularly for risk factors such as blood pressure and cholesterol, and there is no threshold at which certain interventions are automatically indicated. Therefore, it has been suggested that in communicating absolute CVD risk, categorising people into low, moderate (mild) and high risk should be abandoned ⁽¹³²⁾.

Concerns about implementing targeted high-risk strategies: Patients deemed eligible for high-risk interventions often do not receive adequate or meaningful recommendations from their healthcare systems on risk-reducing lifestyle behaviours and medication regimes, often reflecting ineffective communication between clinicians and patients. There is also reportedly poor use of high-risk prevention protocols among clinicians and often limited uptake of any given lifestyle and/or medication recommendations.

Without changes in the environment in which we live (such as a smoking ban in public settings) sustained health behaviour change is generally difficult for us as individuals. The issue of the most appropriate pharmacological interventions in the primary prevention of CVD is beyond the scope of this paper. The detection and effective treatment of high blood pressure in the primary prevention of cardiovascular disease is clearly of critical importance. However, it should be noted that there is ongoing debate on thresholds for intervention with statin therapy in the primary prevention of cardiovascular disease ⁽¹³³⁾ (reflected in the inconsistencies in international guidelines, with profound implications for the proportion of the population potentially eligible for life-long drug therapy ^{(134) (135)}).

Labelling people as ‘low risk’: The act of labelling people as ‘low risk’ may give them false reassurance that they are protected from stroke and heart disease, which may compromise their motivation to control their risk factors. This issue is of particular concern for young people with high levels of risk factors and a high relative risk of stroke and CVD that require (at minimum) intensive efforts to change their behaviour in relation to smoking, diet, exercise and alcohol but are placed in a low absolute risk category on risk scoring because of their age.

Concerns about the effectiveness of CVD screening programmes: There is, at best, only limited evidence from well-designed randomised controlled trials that screening programs by themselves are effective in preventing CVD events. A Cochrane meta-analysis of 15 randomised controlled trials, comparing the effect of health checks (screening for one or more diseases or risk factors) with no health checks in a total of 251,891 adults, found there were no beneficial effects of general health checks over 1 to 15 years’ follow up for total mortality, CVD mortality, ischaemic heart disease incidence or stroke incidence⁽¹²⁸⁾. These data suggest that health checks with systematic CVD screening and counselling are not, in isolation, effective in practice. It may be argued that most studies in this review were from before 1980, before the introduction of many pharmacological interventions such as well tolerated combination therapy for high blood pressure and statins for hypercholesterolaemia.

However, the findings from more recent studies on CVD risk factor screening, such as the Danish Inter99 study published in 2014, are broadly similar. In the latter study, a randomised control trial examined the effects of screening for CVD risk factors on the incidence of ischaemic heart disease in the general population⁽¹²⁹⁾. The screening intervention included estimation of 10-year risk of fatal and non-fatal ischaemic heart disease combined with lifestyle counselling, and referral to a GP for medical treatment if relevant. In this trial, involving 59,616 people aged 30 to 60 years followed for 10 years, no significant difference was found between the intervention and control groups in the risk of ischaemic heart disease, (hazard ratio, 1.03, 95% CI, 0.94–1.13), stroke (hazard ratio, 0.98; 95% CI, 0.87–1.11), combined ischaemic heart disease and stroke (hazard ratio, 1.01; 95% CI, 0.93–1.09) and total mortality (hazard ratio⁸, 1.0; 95% CI, 0.91–1.09). Thus, the findings from RCTs on the effectiveness of universal screening for CVD risk factors are not encouraging⁽¹²⁹⁾.

While RCTs provide the most rigorous evidence on the effectiveness of screening, we should also consider evidence from pragmatic (albeit less rigorous) intervention studies, given the range and complexity of factors that influence screening for CVD risk factors in primary care, including the impact of local health system and practice-related contextual factors. For example, in a non-randomised intervention study carried out in primary care settings in Canada (cited by Feigin et al.)⁽¹³⁰⁾, a strategy of supplementing risk factor screening with moderately intense behavioural counselling, pharmacological treatment as appropriate and linkage to community programs has been shown to lower CVD risk over the next year by 10% in individuals at moderate baseline risk (defined using the Framingham Risk Score), comprising 32% of study participants, and by 25% in individuals at high baseline risk, comprising 48% of participants⁽¹³⁰⁾.

⁸ A hazard ratio is measure of how often a particular event happens in one group compared to how often it happens in another group, over time. A hazard ratio of 1 (or 1.03 as in this instance) implies equal hazard or risk of ischaemic heart disease in the two groups – the screened group and the control group.

However, these data come with the caveats that attend all non-randomised trials and the intervention described might not be feasible or scalable in the Irish context.

Concerns about the effectiveness and equity of the NHS Health Check programme: The findings from a unique microsimulation study evaluating CVD screening to reduce burden from cardiovascular disease suggest that universal screening is less effective than population-wide approaches in reducing CVD incidence and mortality. This study, from Simon Capewell's group at the University of Liverpool, was based on a synthetic population with similar characteristics to the community dwelling population of England and used data from the NHS Health Check programme and Health Survey for England datasets ⁽¹³⁶⁾.

The authors estimated the potential impact of universal screening for primary prevention of cardiovascular disease (NHS Health Check approach) on disease burden and socioeconomic inequalities in health in England compared with three alternative scenarios: screening concentrated only in the most deprived areas; structural population-wide intervention; and a combination of population-wide intervention and concentrated screening. In England, based on these analyses, it was estimated that structural population-wide interventions targeting unhealthy diet and tobacco would be three times more effective than the existing Health Check universal screening policy. Structural population-wide interventions are also likely to be more equitable than high risk screening in these models. The authors concluded that a comprehensive strategy, combining structural population-wide interventions with screening in the most deprived areas (where CVD risk is concentrated) is most likely to maximise both effectiveness and equity of primary CVD prevention.

Concerns about the cost effectiveness of the NHS Health Check programme: CVD screening programs require considerable efforts and cost from society and individuals. For example, in England the NHS Health Check programme offers a risk assessment at 5-year intervals for those aged 40-74 without a pre-existing condition (including CVD, diabetes mellitus and hypertension). Those identified as high risk are offered appropriate treatment, including pharmacological and behavioural interventions. This national screening programme achieves an uptake of approximately 48%, with lower uptake in relatively deprived areas ⁽¹³⁷⁾. This highlights the effort required and perception of the cost-benefit ratio of screening at the individual level and raises significant concerns in relation to overall cost effectiveness at the health system level.

In a modelling study published in 2018, Capewell's group assessed the cost effectiveness and equity of NHS Health Check in Liverpool, a setting in which the likelihood of programme effectiveness increases due to high levels of deprivation and CVD ⁽¹³⁸⁾. The findings suggested that continued implementation of the Health Check programme in Liverpool was unlikely to be cost effective or equitable, even when modelled two decades into the future. If implementation of the programme met optimal recommendations for uptake and prescribing for the Liverpool population, cost effectiveness might be achieved by 2030 and cost savings achieved by 2040. However, it would not improve relative health inequalities.

These findings add to the results of a systematic review of the evidence for the cost-effectiveness of population-wide CVD screening by Lee and colleagues in 2017⁽¹³⁹⁾, which found a lack of robust evidence to support the implementation of such screening. The latter review was based on 14 economic evaluations: five randomised controlled trials, seven observational studies and two studies using hypothetical modelling synthesising secondary data. Trial-based studies measured CVD risk factor changes over 1 to 3 years, with modelled projections of longer-term events. Programmes were either not cost-effective, or only cost-effective under non-verified assumptions such as sustained risk factor changes.

Need for radical CVD prevention strategy: Since virtually all the underlying causes of CVD, including ischaemic heart disease and stroke, are well established, identifiable and controllable, high-risk strategies for the primary prevention of CVD should be seen as complementary to more powerful population-based strategies.

3.7 Wider issues on CVD screening programmes

The issues to be considered in relation to screening for CVD (as with other conditions) are complex and multifaceted and conclusions are at best tentative. It is not suggested that screening for CVD risk be abandoned but that the 'high risk' approach should not be the prime focus of public health policy for the primary prevention of cardiovascular disease.



Screening should be used as an adjunct to population-wide strategies with a particular focus on detecting undiagnosed hypertension and other established risk factors for which effective interventions are available.



Targeted CVD risk factor screening in primary care:

Although clinical trials do not support widespread, whole population cardiovascular disease (CVD) risk factor assessment in primary care, there is some evidence that targeting people at the highest risk for CVD by estimating their cardiovascular risk score before screening may be a more efficient and cheaper approach to primary prevention than a strategy of health checks for all healthy adults. Crossan and colleagues⁽¹⁴⁰⁾ assessed the potential cost effectiveness of targeted case finding for CVD prevention by modelling data on 10,000 people aged 30-74 without CVD or diabetes from the UK Health Improvement Network, a large primary care database. These analyses combined CVD risk factor data and drug cessation rates from the primary care database with published estimates of uptake of CVD risk assessment, treatment initiation and treatment effects. Findings indicated that the optimum strategy was to invite patients in the top 8% of CVD risk, based on risk factors already recorded in their records (namely, those at >12.8% predicted 10-year CVD risk). Screening these people yielded a total health gain of 17.53 quality

adjusted life years (QALYs) per 10,000 patients, at a cost of £162,280. This compared with 30.32 QALYs at a total cost of £705,732 if all adults aged 30-74 were invited for CVD screening⁽¹⁴⁰⁾. While this may be regarded as encouraging, the costs per QALY compare unfavourably with system level, upstream, population-based strategies for primary CVD prevention.

In a further study conducted in 37 general practices in the Netherlands from 2014 to 2017, and drawing on a broadly similar targeted approach to CVD risk factor screening, Stol and colleagues examined the effectiveness of a stepwise cardio-metabolic disease (CMD) risk assessment followed by individualised treatment if indicated compared to care as usual in a randomised controlled trial⁽¹⁴¹⁾. Individuals (45-70 years) without CMD or CMD risk factors were invited for:

1. Stepwise CMD risk assessment through a risk score
2. Additional risk assessment at the practice in case of high risk
3. and individualised follow-up treatment if indicated.

The risk score was based on seven questions addressing sex, age, smoking status, BMI, waist circumference and a family history of premature CVD (age < 65 years) and/or type 2 diabetes. Participants allocated to the control group were invited to complete a health questionnaire about demographic characteristics, CMD risk factors and lifestyle. These participants did not complete the risk score and received neither a personal CMD risk estimate nor tailored lifestyle advice or treatment. During follow-up, they received care as usual until they were invited for the CMD prevention programme one year later.

At one year follow-up, this stepwise CMD prevention programme led to the detection of two- to threefold more patients with CMD and a significant drop in systolic blood pressure and cholesterol levels in the intervention relative to the control group, reflecting higher prescribing of antihypertensive and lipid lowering drugs. However, apart from a reduction in waist circumference, no significant changes in behavioural risk factors were detected between the intervention and control group and no meaningful change was found between the two groups in EQ 5D-based quality of life.

In a subsequent economic analysis, this research group assessed the long-term cost effectiveness of this stepwise CMD risk assessment followed by individualised treatment, if indicated, compared to care as usual in Dutch primary care⁽¹⁴²⁾. These analyses found that this primary care based CMD prevention program is not cost effective in the long term (Incremental Cost Effectiveness Ratio of €306,000/QALY after 60 years) and additional scenario analyses showed that cost effectiveness cannot be achieved even with better treatment compliance and lower intervention costs⁽¹⁴²⁾.



Opportunistic screening:

Opportunistic screening occurs when individuals, healthcare providers or the healthcare system take initiative to check for health conditions on an ad hoc basis, typically because of suspected risk. It is difficult to argue against incentives to promote opportunistic screening in primary care and potentially other health care settings such as pharmacies. However, unlike systematic, population-based screening, opportunistic screening is often not centrally managed, and thus has the advantage of lower (but not zero) cost. Thus, the benefits and harms of opportunistic screening cannot be evaluated according to the same criteria as those for systematic and centrally-organised screening. Such programmes are unlikely to reduce inequalities in health.



CVD screening and interventions in the pharmacy setting:

Horgan and colleagues evaluated a targeted cardiovascular (CVD) assessment pilot in 23 community pharmacies in Birmingham, UK⁽¹⁴³⁾. The CVD risk assessment service used near-patient testing and the Framingham risk equations administered by pharmacists to screen clients aged 40 to 70 without known CVD. Outcomes assessed included volume of activity, uptake by deprivation and ethnicity and onwards referral. The findings suggested that delivery of a one-stop cardiovascular risk assessment service by community pharmacies is feasible in the setting of a large city in the UK and identifies an appreciable number of individuals—around two-thirds of those screened—for whom intervention for cardiovascular risk or an additional risk factor is indicated. Most clients were men for whom attendance at general practice is low and there was higher than expected uptake among individuals from more deprived areas and from areas with a minority ethnic background⁽¹³²⁾.

Santschi et al. published a systematic review and meta-analysis of 39 randomised controlled trials assessing the effect of pharmacist interventions on blood pressure management in 2014⁽¹⁴⁴⁾. These interventions were largely patient education and counselling, feedback to physicians about management (including drug-related problems, recommendations for changing pharmacotherapy and development of care plans) and medication management (including monitoring with adjustment of change in medication). This review found that, compared with usual care, pharmacist interventions were significantly better at lowering both systolic and diastolic blood pressure, with an average systolic blood pressure reduction of 7.6 mmHg.

In a subsequent patient-level randomised controlled trial, Tsuyuki et al. evaluated the impact of pharmacist prescribing on blood pressure control of community-dwelling patients. The intervention group received from their pharmacist an assessment of blood pressure and CVD risk, education on hypertension, prescribing of antihypertensive medications, laboratory monitoring and monthly visits for 6 months⁽¹⁴⁵⁾. The control group received some educational

material, blood pressure measurements and usual care from their pharmacist and physician. Of the 248 patients enrolled, those randomised to the intervention arm experienced a statistically and clinically significant reduction in systolic blood pressure of 18.3 mmHg⁽¹⁴⁵⁾. In a subsequent economic analysis of the findings from the latter trial, the pharmacist intervention was highly cost effective⁽¹⁴⁶⁾.

In Ireland, the HSE has acknowledged the importance of the detection and management of chronic disease including hypertension with the publication of “*Living Well with a Chronic Condition: Framework for Self-Management Support*”⁽¹⁴⁷⁾ and in a 2015 HIQA Report - *Health Technology Assessment of Chronic Disease Self-Management Support Intervention*, it was suggested that community pharmacy interventions, which include patient education, may lead to improvements in blood pressure control⁽¹⁴⁸⁾

In 2018, the Irish Pharmacy Union carried out a pilot study addressing the detection of hypertension and atrial fibrillation in the community pharmacy setting⁽¹⁴⁹⁾. The aim was to identify those people aged 50 years and over who were at risk of hypertension, atrial fibrillation or both. More than 1,100 people, recruited from 68 community pharmacies, were assessed in a two-month period. All health checks were carried out in the pharmacy’s private consultation room. The pharmacist measured the person’s blood pressure, according to the Irish Heart Foundation SOP, and measured the person’s pulse, using the Kardia Mobile device with the option of also completing a manual pulse check. The outcomes were as follows:

- possible atrial fibrillation was detected in 5.5% of participants
- high blood pressure (possible hypertension) was identified in 27% of participants
- both an irregular pulse and high blood pressure were noted in 2% of participants
- 26% of all participants checked were referred to their GP
- 4% of the total population checked were started on medicines for hypertension, atrial fibrillation or both.

Although the findings from this pilot study are encouraging, further work is needed to assess the feasibility of scaling the intervention at national level, the uptake of screening including variation by age, gender and social class and area deprivation, the scope for involving pharmacists in managing confirmed hypertension and the overall cost effectiveness of both screening and potential management interventions in the pharmacy setting.



CVD screening in the workplace:

While worksite health screenings and health and wellness programmes have the potential to positively impact on employees' health and wellbeing, including CVD risk, the evidence is sparse, of low quality and heavily dependent on the local context and setting⁽¹⁵⁰⁾. In a 2010 systematic review of 86 studies published between 1980 and 2005, Soler et al. evaluated the effectiveness on health outcomes of workplace health screening with and without feedback. In the subset of 37 studies that evaluated health risks and provided feedback, there were favourable changes in health behaviours relevant to CVD, including self-reported increases in fruit and vegetable intake with an accompanying decrease in saturated fat intake, increased physical activity and modest improvements in smoking cessation rates. Overall, the behavioural changes were modest, and most study designs were before–after analyses that did not include a comparison group⁽¹⁵¹⁾.



Screening for asymptomatic CVD disease:

Much of the CVD screening literature has focused on CVD risk factors, which cannot be neatly distinguished from screening for asymptomatic CVD disease such as abdominal aortic aneurysm. There is evidence that multifaceted screening in older men for CVD risk factors and asymptomatic CVD, specifically for abdominal aortic aneurysm, peripheral artery disease, hypertension and dyslipidaemia, may be effective and possibly cost effective. The first trial that testing multifaceted CVD screening was the Danish VIVA trial, which combined screening for AAA (by ultrasound scanning), peripheral artery disease (PAD) and hypertension (by measurement of ankle-brachial index)⁽¹⁵²⁾. More than 50,000 men aged 65–74 years were randomised in a one-to-one intervention: control ratio. After 5 years follow up, overall mortality was significantly reduced by 7%. The impact of screening on quality of life (QoL) was ascertained both overall and for individuals who tested positive, with no significant harm detected. The costs of an additional QALY was well within what is considered acceptable, at approximately one-tenth the cost of many cancer screening programmes⁽¹⁵³⁾.

The most recent and sophisticated proposal for multiple CVD screening is another Danish trial, the DANCAVAS trial, involving 46,611 men, aged 65 to 74 years, living in 15 Danish municipalities⁽¹⁵⁴⁾. The participants were randomly assigned in a 1:2 ratio to undergo screening (invited group) or not to undergo screening (control group) for subclinical cardiovascular disease. Screening included non-contrast electrocardiography-gated computed tomography to determine the coronary-artery calcium score and to detect aneurysms and atrial fibrillation, ankle–brachial blood pressure measurements to detect peripheral artery disease and hypertension and a blood sample to detect diabetes mellitus and hypercholesterolemia. The primary outcome was death from any cause. Approximately 63% of the invited group underwent screening.

In intention-to-treat analyses, after a median follow-up of 5.6 years, 2106 men (12.6%) in the invited group and 3915 men (13.1%) in the control group had died (hazard ratio, 0.95; 95% confidence interval [CI], 0.90 to 1.00; $P = 0.06$). The hazard ratio for stroke in the invited group, as compared with the control group, was 0.93 (95% CI, 0.86 to 0.99); for myocardial infarction, 0.91 (95% CI, 0.81 to 1.03); for aortic dissection, 0.95 (95% CI, 0.61 to 1.49); and for aortic rupture, 0.81 (95% CI, 0.49 to 1.35). Thus, after more than 5 years, the invitation to undergo comprehensive cardiovascular screening did not significantly reduce the incidence of death from any cause among men aged 65 to 74. However, the 95% confidence interval suggests that the plausible results range from no reduction in risk to a 10% reduction, so a clinically important benefit cannot be ruled out and in separate cost effectiveness analyses, there is a high probability that this intervention is cost effective⁽¹⁵⁵⁾. It should also be noted that the trial was powered on the basis of a planned 10 years of follow-up and that long-term follow-up is ongoing.

The findings from subgroup analyses of the data from this trial suggest the possibility of a greater benefit of screening among participants in the younger age group (65 to 69 years of age). Compared with men in the older age group, men in the younger age group had a higher uptake of screening, were less likely to have a known history of cardiovascular disease and may have been more likely to benefit from screening (and from subsequent preventive treatment) owing to their lower baseline use of such treatments, including antiplatelet agents and statins. There was also a higher prevalence of smoking, higher weight and higher diastolic blood pressures in this sub-group of younger participants – additional factors likely to enhance the effectiveness of screening⁽¹⁵⁴⁾. However, as this subgroup was one of multiple subgroups assessed, without adjustment for multiple testing, further study is needed to confirm these findings.

It should also be noted that the findings from this important study are not necessarily generalisable to countries such as Ireland with a different health care system to Denmark. Treatment was provided by the primary physicians of the participants in both groups; all citizens in Denmark have access to such treatment free of charge and the Danish health care system is regarded as relatively efficient in detecting asymptomatic disease in primary care. The benefit of screening would be expected to vary depending on access to care and the extent of use of appropriate preventive treatment in routine primary care. Thus, paradoxically, the benefits of a well organised national screening programme with high uptake (if achievable) might be greater in countries with less efficient primary care systems.

3.8 Hypertension awareness, treatment and control



Untreated high blood pressure is the leading modifiable risk factor for mortality globally in women



and is ranked second to tobacco in men⁽⁸⁸⁾.

The hypertension control cascade, which includes hypertension awareness, treatment and control, has been proposed as a framework for improving blood pressure control in the population⁽¹⁵⁶⁾. Data from Ireland on the hypertension control cascade are relatively sparse and over 10 years old. In a cross-sectional study of a nationally representative sample of community living adults aged 50 years and older, using data collected from 2009 to 2011 for the first wave of the Irish Longitudinal Study on Ageing (TILDA) (N=5857), the prevalence of hypertension (systolic blood pressure (BP) \geq 140 mmHg or diastolic BP \geq 90 mmHg and/or currently taking antihypertensive medications) was approximately 64%⁽¹⁴⁴⁾.

Approximately 45% of those with high blood pressure were unaware of their condition. Lack of awareness was highest in men and in younger age groups. In those already diagnosed with high blood pressure, 59% were taking medication to reduce it. Older adults with no medical card were significantly less likely to be on medication than those who did have a medical card. Almost half (48%) of those who were on medication to control hypertension did not have their blood pressure controlled to normal levels⁽¹⁵⁷⁾. These findings are broadly consistent with those from diverse settings over many decades that

over half of the population aged 50 years and older meet current clinical criteria for hypertension, approximately half are aware of their condition and, of those with diagnosed hypertension, only half have their blood pressure controlled to normal levels.

The findings (unpublished) on this issue from the Mitchelstown Cohort Study are broadly similar. The Mitchelstown Cohort Study is based on a sample of 2047 men and women aged 50 to 69 recruited in 2010/2011 from patients attending a single large primary care centre, the LivingHealth Clinic in Mitchelstown, County Cork, with a 67% response rate⁽²⁰⁾. The LivingHealth Clinic includes eight GPs and serves a catchment area of 20,000, with a mix of urban and rural residents. In the baseline data from this primary care derived sample:

- 46% of participants had high blood pressure
- 38% of those with high blood pressure were unaware of their condition
- 42% of those who were on medication to control hypertension did not have their blood pressure controlled to normal levels.

Improving hypertension detection and control: The challenges of hypertension detection and control have been addressed over many decades. While there is some evidence of progress in some settings⁽¹⁵⁸⁾, there are no panaceas. Shah Ebrahim reported on a systematic review of the detection, adherence and control of hypertension for the prevention of stroke in 1998⁽¹⁵⁹⁾. He found that population screening when compared with usual care or case finding does not appear to increase coverage of the population assessed for hypertension or detection of people with hypertension. Screening programmes in shopping centres or housing blocks do not reach the disadvantaged groups to the extent anticipated. However case finding appears to be effective when linked with professional training, protocols and reminders for both patients and doctors to record blood pressure.

Based on the evidence reviewed, no single approach to improving patient adherence could be recommended apart from the use of simpler drug regimens. With regard to blood pressure control, a comprehensive ‘stepped care’ approach (education, free care, specialist clinics and protocols) achieves the greatest improvements. Self-monitoring of blood pressure at home appears to have a small but significant effect on blood pressure control and may save costs. Patient education alone is unlikely to improve blood pressure control. Professional education may make a small contribution to blood pressure control, but it is probably due to increased use of drug therapy. In this review, Ebrahim found that issuing guidelines does not result in improvements in care. Locally, rather than expert, produced guidelines that are integrated into clinical practice improve both practice and clinical outcomes. The evidence to support nurse-led clinics was sparse.

In a 2010 Cochrane review led by Irish researchers, Liam Glynn and colleagues⁽¹⁶⁰⁾ examined the effectiveness of interventions to improve blood pressure control in patients with hypertension and the effectiveness of reminders in improving the follow-up of these patients. In this comprehensive review the authors reviewed randomised controlled trials of patients with hypertension that evaluated the following interventions:



self-monitoring.



educational interventions directed to the patient.



educational interventions directed to the health professional.



health professional (nurse or pharmacist) led care.



organisational interventions that aimed to improve the delivery of care.



appointment reminder systems.

Outcomes assessed were:

- ✓ mean systolic and diastolic blood pressure.
- ✓ control of blood pressure.
- ✓ proportion of patients followed up at clinic.

A total of 72 RCTs met the inclusion criteria. As one might expect, the findings suggested that family practices and community-based clinics need to have an organised system of regular follow-up and review of their hypertensive patients. Antihypertensive drug therapy should be implemented through a vigorous stepped care approach when patients do not reach target blood pressure levels. There was evidence that self-monitoring and appointment reminders may be useful adjuncts to improve blood pressure control but require further evaluation. There was also an indication that nurse or pharmacist led care may be a promising way forward, with most RCTs being associated with improved blood pressure control and mean SBP and DBP, but it was suggested that these interventions also require further evaluation.

In a 2019 review, Kitt et al. considered how emerging technologies including smartphones and Bluetooth®-enabled tele-monitoring devices might support improved detection and management of hypertension not only in the wider population but also within specific sub groups such as older people, pregnant women and those with atrial fibrillation⁽¹⁶¹⁾. They highlight emerging trends to empower patients to support hypertension screening and diagnosis, with several studies showing the benefit of tele-monitoring, particularly when coupled with co-intervention (such as pharmacist intervention), in improving the management of hypertension. However, there is a pressing need for these new technologies to be properly assessed and clinically validated before widespread implementation in the general population⁽¹⁶¹⁾.

Media campaigns to increase blood pressure awareness: Initiatives such as May Measurement Month, a pragmatic global screening campaign to raise awareness of blood pressure by the International Society of Hypertension, reflect the view that there may be a place for mass media campaigns to increase blood pressure awareness and detection⁽¹⁶²⁾. Unfortunately, the available evidence suggests variable and often short-lived impacts of short-term hypertension awareness campaigns⁽¹⁶³⁾.

3.9 Summary

A strong case can be made for prioritising population-based strategies for primary CVD prevention over high-risk primary prevention strategies on the grounds of health and wellbeing, economics and social justice. Ireland has successfully implemented major population-based prevention strategies in the area of tobacco control. However, given the barriers to system level change due to inertia and opposition from powerful commercial interests, it will be important to focus advocacy efforts on a limited number of population level interventions with a supportive national policy infrastructure and major synergies with other public policy initiatives such as those linked to the climate emergency.



04

Policy Context

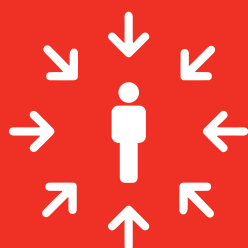
4.0 POLICY CONTEXT

4.1 Current CVD and broader prevention initiatives

The Department of Health's Changing Cardiovascular Health: Cardiovascular Health Policy 2010–2019 established a framework for preventing, detecting and treating cardiovascular diseases to reduce the burden of these condition⁽⁷⁾. It covered the whole area of prevention, including measures that individuals could take as well as population interventions and areas in which intersectoral action addressing the societal determinants of health are necessary. This policy, like its predecessor Building Healthier Hearts, made the distinction between population-based approaches, which target the entire population and high-risk approaches, which focus on individuals in contact with health services:



Population-based preventive strategies combine elements of wider public policy (addressing the core determinants of health, such as poverty, education, food production and marketing, environment, transport policy) and primary prevention, which focuses on reducing the incidence of disease through factors that increase risk, such as cigarette smoking and high blood pressure.



High-risk strategies incorporate secondary prevention, or the detection and treatment of disease at an early asymptomatic stage, and tertiary prevention, which focuses on minimising the progression and/or complications of established disease.

To date, there has not been a formal review of the policy's implementation or impact. While, *Healthy Ireland: A the Framework for Improved Health and Wellbeing 2013-2025*⁽²⁷⁾, is based on “an understanding of the determinants of health” and “seeks to address risk factors and promote protective factors at every stage of life”, primary prevention policy is still not sufficiently prioritised and resourced.



There remains a **significant gap** between the rhetoric of prevention and practice, particularly when policy proposals require significant supporting investment and/or face opposition from commercial interests.

In this context, it should be noted that in the Committee on the Future of Healthcare Sláintecare Report⁽¹⁶⁴⁾ it is argued that “Upfront investments and a powerful prevention strategy will prevent chronic disease from overwhelming the health service in the future.”

4.2 Healthy Ireland Strategic Action Plan 2013–2025

The Healthy Ireland (HI) Framework, which was launched in 2013, was designed to provide a cross-Government focus to deliver the vision for a healthy Ireland, where “everyone can enjoy physical and mental health and wellbeing to their full potential, where wellbeing is valued and supported at every level of society and is everyone’s responsibility”. The HI framework aims to:



The graphic shows the 'hi' logo with 'Healthy Ireland' and 'Sláintecare.' above it. Below is the title 'Healthy Ireland Strategic Action Plan 2013–2025' and the subtitle 'Building on the first seven years of implementation'. The main part of the graphic is a grid of 21 icons representing various health and wellbeing factors like physical activity, mental health, education, and social connections. At the bottom right is the Irish Government logo.

-  bring a concerted focus on life-long wellbeing and prevention of illness.
-  reduce health inequalities.
-  address the settings in which health and wellbeing are impacted.
-  highlight the need to empower people and communities to better look after their own health and wellbeing.

The Healthy Ireland Strategic Action Plan was developed following extensive stakeholder engagement within the Department of Health and with relevant partners in national and local government, the Health Service Executive (HSE) and key stakeholders in health and wellbeing, including Healthy Cities and Counties of Ireland Network. The HI outcomes framework includes key targets and performance indicators of direct relevance to CVD prevention, including:

-  measures of health status (prevalence of overweight and obesity, physical activity levels, current smoking rate, harmful use of alcohol, screen time exposure in young people).
-  measures of health outcomes (healthy life years and premature non-communicable disease mortality).
-  measures of wellbeing, including self-perceived health, access to green space and active travel.
-  a number of measures of the wider social determinants of health, including poverty measures, income inequality, educational attainment and air quality.

Healthy Ireland also encompasses specific policy initiatives, action plans, care models and collaborative initiatives of direct relevance to CVD prevention, including:

A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016–2025, with linked programmes and guidelines addressing:

- the voluntary codes of practice on advertising and marketing of food and non-alcoholic beverages
- the sponsorship of sports, festivals and other activities by food and alcohol providers
- best practices in public sector food procurement
- a voluntary food reformulation programme (including a specific roadmap for food product reformulation in Ireland with the Food Safety Authority of Ireland providing a dedicated supporting infrastructure)
- a proposed evaluation of the sugar sweetened drinks tax against the stated aims of the tax
- ongoing work on a nutrition and healthy eating policy
- work with Government to support the planning restrictions on outlets selling high calorie ‘junk food’ and beverages adjacent to schools
- a proposal to explore with key stakeholders the potential issues around the introduction of a Public Health (Obesity) Act, including examining restrictions on promotion and advertising aimed at children

The HSE Healthy Weight for Children (0-6 years) Framework and HSE Model of Care for the Management of Overweight and Obesity;

The National Physical Activity Plan for Ireland;

The Tobacco-Free Ireland policy;

The Healthy Ireland Alcohol policy;

Work with Healthy Cities and Counties of Ireland Network to improve health and wellbeing at a local level;

The Healthy Workplace Framework;

Engagement and collaboration with the Department of the Environment, Climate and Communications to align policy and initiatives with Healthy Ireland policy, including proposals to:

- extend the smoky coal ban to new towns
- publish the first ever clean air strategy
- invest in the network of monitoring stations to provide scientific evidence of air quality across different parts of the country, including real-time and localised air quality information
- engagement with the HSE Chronic Disease Management Programme within the wider context of the Sláintecare Health Reform Programme.

4.3 Healthy Ireland and CVD prevention

It is clear from this brief and incomplete overview of Healthy Ireland, focused on CVD prevention, that the overall programme represents a broad, comprehensive and inspiring vision for promoting health and wellbeing and preventing disease and premature mortality in Ireland. It is clear also that there is significant commitment to the programme within the Department of Health.

However, significant gaps remain between the vision and aspirations of Healthy Ireland and both the level of implementation of core actions and progress on key outcome measures.

To quote TS Eliot,

“...between the idea and the reality falls the shadow”.

In this document, it would not be feasible or appropriate to attempt a comprehensive overview of progress towards the overall vision and objectives of Healthy Ireland, including the range of issues that have impeded progress across the broad range of objectives addressed in this ambitious strategy. Instead, in the context of CVD prevention, we will focus briefly on the following issues:

- benchmarking of policies for tackling obesity and creating healthier food environments in Ireland.
- benchmarking of policies for tackling physical inactivity and creating healthier physical activity environments in Ireland.
- evaluation of the implementation of *A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016–2025*.
- Ireland’s food reformulation programme.
- current priorities for tobacco control in Ireland.
- the HSE Chronic Disease Management Programme.
- current priority issues in relation to air quality in Ireland.
- the need for greater alignment between Healthy Ireland and national policy in response to the climate emergency to ensure insofar as possible that the health co-benefits of climate action are fully realised.
- the potential to promote health and wellbeing through taxation as highlighted in the 2022 Foundations for the future: Report of the Commission on Taxation and Welfare.

4.3.1 Benchmarking of policies for tackling obesity and creating healthier food environments

In Ireland, as in other developed countries, the impact of poor diet on the burden of non-communicable disease (NCDs) is immense. As detailed in Section 2, poor diet is the single biggest risk factor for NCDs, exceeding the combined effects of tobacco, alcohol and physical inactivity.

It is now clearly understood that to prevent diet-related chronic disease, we need to understand and address the “**foodscape**”, the wide range of interconnected factors, such as food production, processing, marketing and distribution, that characterise our food system and largely determine our dietary intakes.



In November 2020, Dr Janas Harrington, working with colleagues in UCC's School of Public Health and international collaborators, published the first Irish healthy Food Environment Policy Index (Food-EPI)⁹ (165). The Food-EPI report is based on research from January 2018 to June 2020 with independent and government public health experts. It assessed the Government's implementation of policies and infrastructure support for improving the healthiness of the food environment against international best practice.

Ireland rates well against international benchmarks in ensuring the public has access to nutritional information and key documents through freedom of information legislation. Ireland is also at international best practice in:

- (i) monitoring overweight and obesity prevalence in the population and occurrence rates for the main diet-related NCDs and their risk factors
- (ii) implementing evidence-based, food-based dietary guidelines
- (iii) establishing mechanisms to achieve multi-sectoral action and policy coherence on NCD prevention policies.

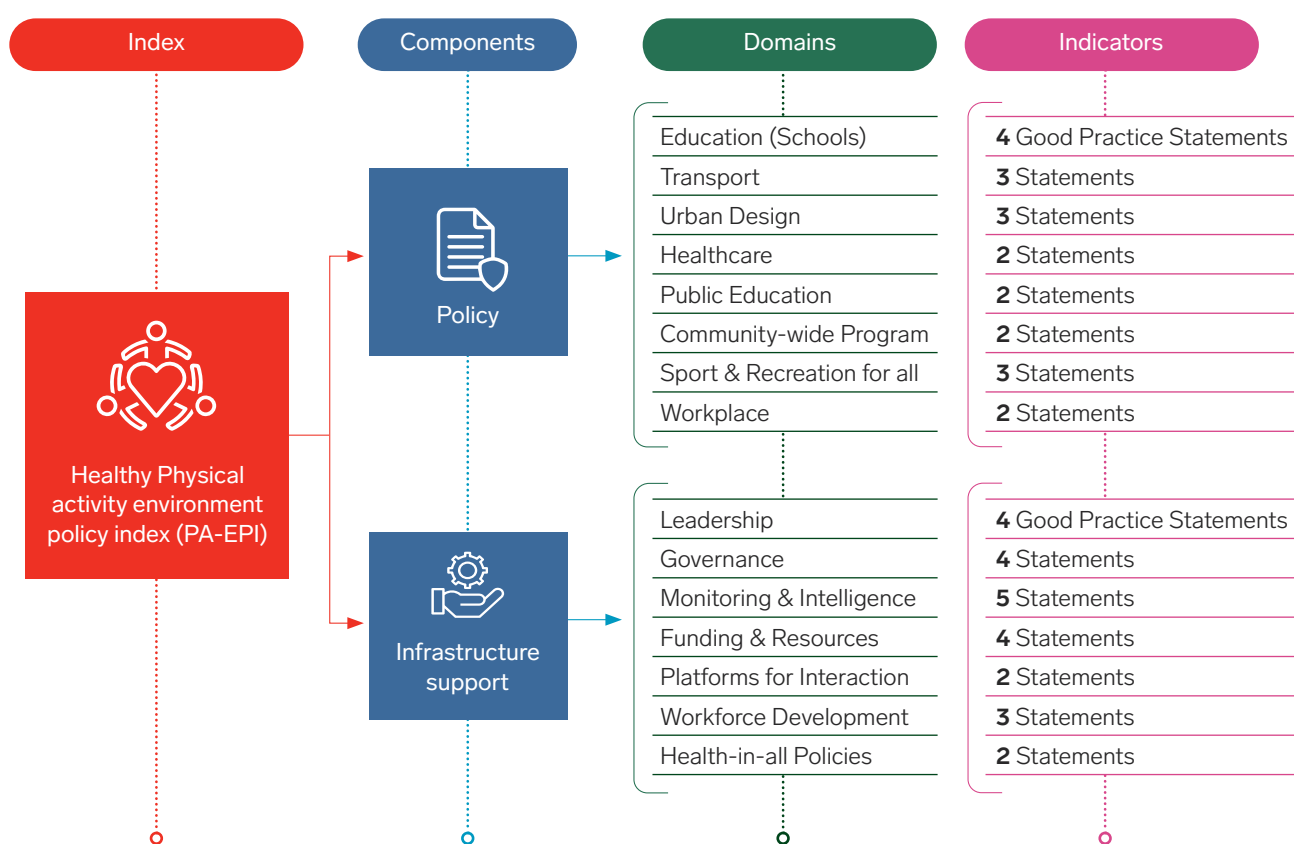
Ireland also rated well for implementing procedures to support evidence-informed policymaking. However, of concern was the high number of food environment policies rated as having 'low' implementation compared to international best practice. The issues of concern raised in this report are addressed in detail in Section 5 of this paper.

⁹ Food-EPI is an initiative of the INFORMAS Network (International Network for Food and Obesity/NCDs Research, Monitoring and Action Support).

4.3.2 Benchmarking of policies for tackling physical inactivity and creating healthier physical activity environments in Ireland

In August 2022, Professor Catherine Woods, working with colleagues in the Department of Physical Education and Sport Science at the University of Limerick, published a report detailing the development of a physical activity policy benchmarking tool to assess government policies and actions for creating a healthy physical activity (PA) environment. This tool is based on learnings from the INFORMAS Food-EPI framework. It addresses eight policy domains and seven infrastructure support domains (see Figure 28) ⁽¹⁶⁶⁾.

Figure 28: Physical Activity Environment Policy Index⁽¹⁶⁶⁾



Woods et al. have assessed the Government’s performance in this policy domain compared with international best practice. It is noteworthy that there were no indicators with a ‘high’ level of implementation across any of the policy and infrastructure support statements. Ireland was assessed as performing well (‘medium’) on eight of the 21 policy indicators (38%) and 11 of the 24 infrastructure support indicators (46%).

For the policy domains, the expert panel judged all the indicators in the community and sport domains as having a ‘medium’ level of implementation. Other indicators that received a ‘medium’ rating included the implementation of physical activity initiatives in schools (in the education domain), sustained media campaigns (in the mass media domain) and policies to promote travel to the workplace (in the workplace domain). For the infrastructure support domains, Ireland scored well for political leadership, having physical activity guidelines that cover all age groups and using evidence in the development of physical activity policies⁽¹⁵⁵⁾.

However, over half of all indicators in the policy domains were rated as having ‘low’ implementation compared with international best practice. This included all the indicators in the ‘transport, urban design and healthcare domains. Several indicators in the education domain received a ‘low’ rating from the experts, including mandatory physical education and promoting active travel to school. Similarly, over half of all indicators in the infrastructure support domains were rated as having ‘low’ implementation compared with international best practice. The indicator for the implementation of regulations for buildings that promote physical activity received a ‘very little/no implementation’ rating⁽¹⁵⁵⁾.

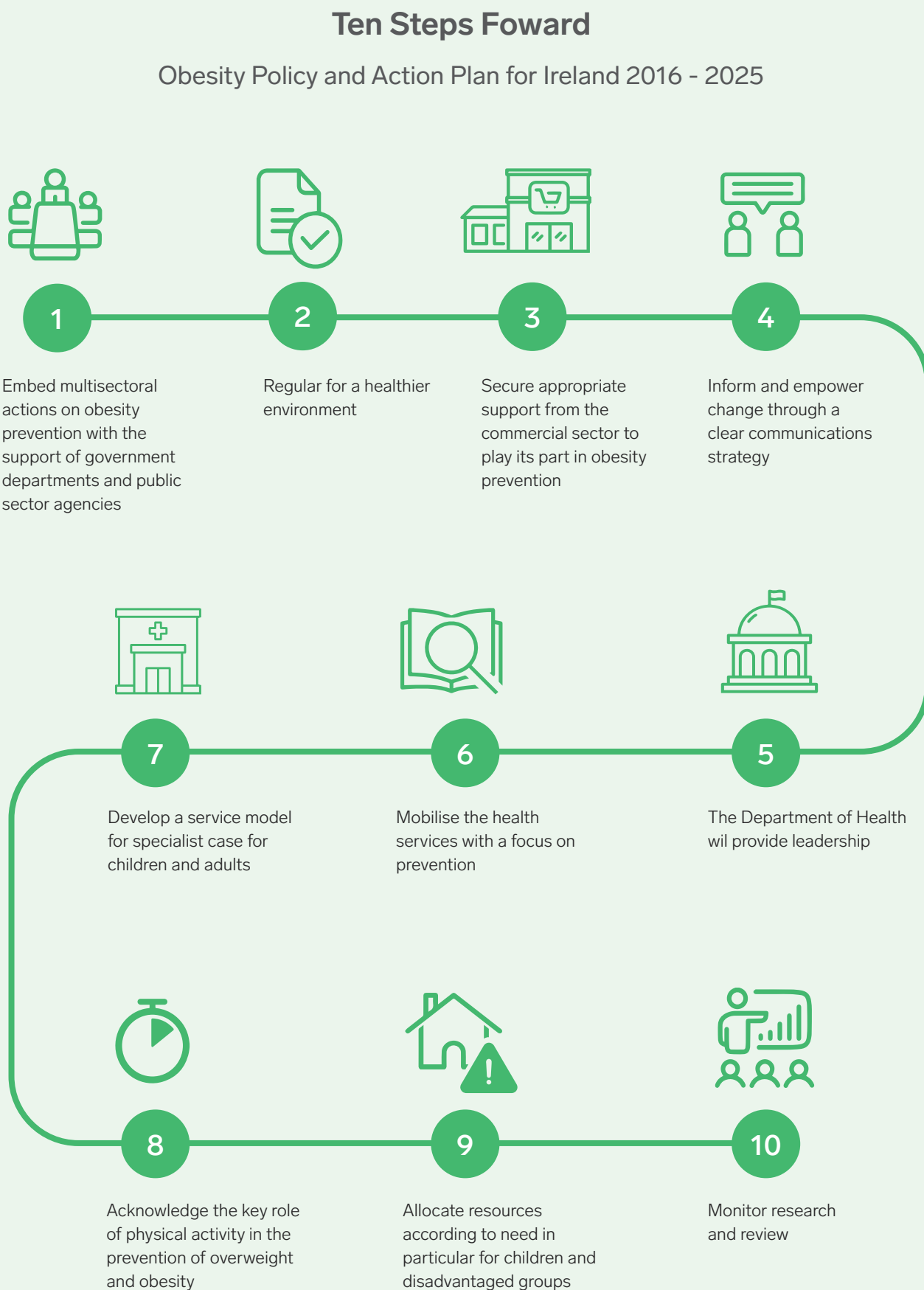
4.3.3 Evaluation of the Implementation of the Obesity Policy and Action Plan

In 2016, the Irish Government launched *A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016-2025 (OPAP)* a whole-of-Government policy to address the complex multi-factorial problem of obesity⁽⁸⁾.



The OPAP provides a 10 -year roadmap through which the Government and associated agencies can tackle this problem more effectively. To achieve the targets outlined in the policy, “Ten Steps Forward” have been identified (Figure 29). Within each interdependent step, a total of 60 actions were identified as necessary to achieve the desired targets and outcomes of the policy.

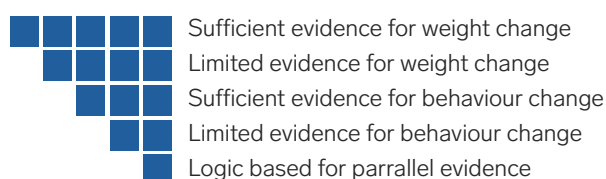
Figure 29: Obesity Policy and Action Plan 2016–2025⁽⁸⁾



Citing the McKinsey Global Institute report, *Overcoming Obesity: An Initial Economic Analysis* (2014), OPAP acknowledges the need for an “ambitious, comprehensive and sustained portfolio of interventions (to tackle obesity) by national government, local government, retailers, consumer goods companies, restaurants, employers, media organisations, educators, health care providers, and individuals”⁽¹⁶⁷⁾. Drawing on the McKinsey report, OPAP highlighted 44 potentially cost-effective interventions for obesity, including “portion size control, reformulation of food and drink, high calorie food/beverage availability, weight management programmes, parental education, school curriculum, healthy meals, bariatric surgery, labelling of food, price promotion, pharmaceuticals, media restrictions, tax on high sugar or high fat products, workplace wellness, active transport, and public health campaigns”, ordered on the basis of estimated impact across the full population (Figure 30).

Figure 30: Cost effective interventions for obesity⁽¹⁶⁷⁾

There is considerable scope to have high impact on obesity in a cost-effective way
 Cost-effectiveness and impact of obesity levers, United Kingdom



Intervention Group ¹	Estimated impact across full population	Estimated average cost per DALY ²	Strength of evidence rating ³
	Thousands DALYs saved	\$ per DALY saved	\$ per DALY saved
Portion Control	2,126	400	3
Reformulation	1,709	2,600	2
High calorie food/beverage availability	1,137	200	2
Weight-management programs	967	1,300	5
Parental Education	962	2,000	4
School Curriculum	888	600	3
Healthy Meals	888	14,000	1
Surgery	615	10,000	5
Labelling	575	2,000	2
Price Promotions	561	200	1
Pharmaceuticals	430	5,600	5
Media Restrictions	401	50	2
10% Tax on high sugar/high fat products ⁴	203	1,800	1
Workplace wellness	139	2,700	4
Active Transport ⁵	67	31,000	1
Public health campaigns	49	200	1

1 Includes only non-overlapping levers in each category. Where two levers overlapped such as plain and engaging labelling or gastric banding and bariatric surgery, the higher-impact lever was chosen.
 2 Impact and cost over lifetime of 2014 population; uses UK-specific cost effectiveness calculated using GDP and World Health Organization methodology.
 3 Based on the evidence rating system of the Oxford Centre for Evidence-Based Medicine
 4 All intervention impact modelling was subject to scaleable assumptions on potential reach. Tax levers are also subject to scalability of levy incurred. In this case, MGI modeled a 10 per cent tax on a set of high- sugar and high-fat food categories, based on empirical precedents and size of levy often studied. It is scalable, and impact would increase close to directly with increase in levy.
 5 Impact assessed here is only from reduced body mass index (BMI), not full health benefits of some interventions (e.g. cardiovascular health, mental health) For example, active transport health benefits are higher when all of these benefits are taken into account.

In September 2022, Dr Janas Harrington, working with colleagues in UCC's School of Public Health, presented the findings from an independent expert-led evaluation of OPAP at the mid-point of its implementation⁽¹⁶⁸⁾. The evaluation assessed opinions from an independent panel of experts on the level and rate of progress of implementation of the 60 OPAP actions from January 2016 to May 2021.

Overall, across all actions (short term, medium term and long term), only 10% (6/60) were rated by the expert panel with high levels of implementation, while 23% (14/60) were rated as having achieved high levels of progress. This evaluation and the accompanying evidence document highlight that progress has been made towards implementing policies and interventions to reduce population level obesity rates in Ireland. In particular, there was evidence of high level of implementation around the tax on sugar sweetened beverages (albeit without completion of the proposed evaluation of this tax), the development of a suite of healthy eating guidelines across the population, the appointment of a clinical lead on obesity, the implementation of a national physical activity plan and sustaining the ongoing monitoring activities of the Childhood Obesity Surveillance Initiative (COSI) and Healthy Ireland. However, a number of action gaps were identified by the expert panel, including the:



development of guidelines to support materials for those working in the built environment for urban development and planning.



development of an **obesity database** for surveillance and planning.



development and implementation of appropriate **child development growth and monitoring systems**.



development and implementation of a dedicated **nutrition policy and action plan**.



development and implementation of a **national physical activity surveillance system**.

4.3.4 Ireland’s food reformulation programme

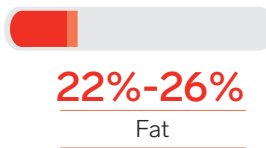
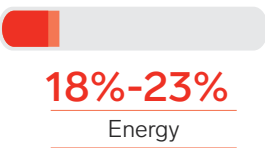
Step 3 of the 2016 Obesity Policy and Action Plan addresses the need to:

“Secure appropriate support from the commercial sector to play its part in obesity prevention and agree food industry reformulation targets and review progress”.

Reformulation is defined as changing the nutrient content of a processed food product to either reduce the content of negative nutrients such as sodium, saturated fat, trans fat or energy (kilojoules) or to increase the content of beneficial nutrients such as dietary fibre, wholegrains, fruit, vegetables and unsaturated fats. This definition does not include the addition of vitamins, minerals or nutrients through fortification processes.



Foods and drinks that are high in **fat, salt and sugar** such as sugar-sweetened beverages, cakes, biscuits, confectionery and crisps are currently staples in the Irish diet.

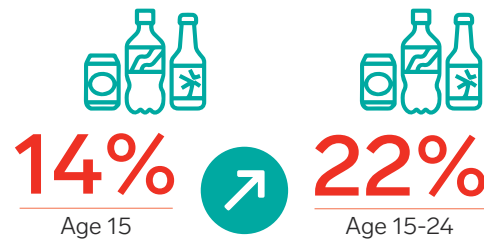


Among children aged 5-12 years and teenagers (13-17 years), these foods contribute 18% to 23% of energy from food and 22% to 26% of total fat intake.

Based on the findings from the Healthy Ireland 2018 Survey, it is estimated that



of the population aged 15 years or older eat **high fat, salt and sugar (HFSS) snacks every day**, with a majority (42% of the population) eating six or more portions daily.








In addition, 14% of those aged 15 and older consume **sugar-sweetened drinks daily**. This rises to 22% among 15-24 year olds.

Thus, it is now clear that food reformulation is a critical element in achieving population nutrient goals consistent with preventing obesity and chronic disease and promoting health and wellbeing. In this context, it is particularly important to protect infants and children from unhealthy food products through reformulation and related food policy measures.

Research published in 2019 assessed the impact of food reformulation on nutrient intakes and health through a systematic review of 33 modelling studies. Of these, 20 studies addressed sodium, five addressed sugar, three addressed fats and five addressed multiple nutrients ⁽¹⁶⁹⁾. In these modelling studies, the evidence on the positive effects of reformulation on consumption patterns and health outcomes was stronger for sodium interventions than for interventions targeting sugar and fats. There is also compelling evidence on the cost effectiveness of reformulation, especially for interventions focused on sodium/salt. For example, a five-year investment of £15 million by the United Kingdom Food Standards Agency on a comprehensive salt reduction program (which was heavily reliant on reformulation) is estimated to have prevented 6,000 cardiovascular deaths per year and saved approximately £300 million a year ⁽¹⁷⁰⁾. Ireland had previously endorsed the EU Roadmap for Action on Food Product Improvement in 2016, and the Obesity Policy Implementation Oversight Group (OPIOG) established a Reformulation Sub-Group to prepare a report with recommendations on the effective implementation and monitoring of reformulation in Ireland in light of national and international policy and experience and relevant scientific evidence. As a high proportion of Irish food companies and food companies operating in Ireland are selling into the UK market in Britain and Northern Ireland, the Reformulation Sub-Group recommended that the Reformulation Programme in Ireland should be aligned with the established and well-resourced Public Health England (PHE) Reformulation framework, with similar targets and food product categories (see Table 3) ⁽¹⁷¹⁾.

Table 3: Roadmap for Food Production Reformulation in Ireland: Food and drink reformulation targets for Ireland 2015-2025 ⁽¹⁷¹⁾

Nutrient	Target
 Salt	10% reduction focused on 76 food groups that contribute most to people’s salt intakes
 Sugar	A 20% reduction is proposed in the sugar content of nine food categories* that are currently the focus of PHE sugar reduction programme
 Saturated fat	A 10% reduction in the saturated fat content of processed foods that contribute most to saturated fat intakes in Ireland is proposed
 Calories	A 20% reduction in calories is proposed, focused on product categories that contribute significantly to childrens’ calorie intakes
 Products targeted explicitly at babies and young children	The FSAI will develop targets for this category based on its previous work in this area (2012 and 2018)

* Breakfast cereals, Yogurt and fromage frais, Biscuits, Cakes, Morning goods (buns, pastries etc). Puddings, Icecream, lollies and sorbets, Chocolate confectionery, Sweet confectionary, Sweet spreads and sauces.

Voluntary versus mandatory reformulation: The OPIOG Reformulation Sub-Group considered and addressed the issue of a voluntary versus a mandatory approach to food reformulation. Given the scale of the obesity epidemic in children and adults, the burden of diet related disease and the available evidence on dietary intakes in Ireland, it was argued in the Reformulation Roadmap report that there is a clear and urgent need to achieve substantial reductions in the salt, sugar, saturated fat content, calorie density and/or single serving portion size across a wide range of major food and drink products in Ireland. The report also highlighted the need to ensure that sectors of the food and drinks industry that embrace reformulation and calorie reductions are not at a competitive disadvantage relative to other sectors who have not engaged with the process.

It was also acknowledged that the scientific and public health case for a mandatory as opposed to a voluntary food reformulation framework is compelling.

However, the Reformulation Sub-Group recommended voluntary action as a first step, in line with the Obesity Policy and Action Plan, but with a clear proviso that the issue of whether the current voluntary framework will need to be supplemented with additional fiscal and/or mandatory reformulation measures (with robust and transparent monitoring) should remain under review.

Nutritional signposting, unhealthy food marketing to children and public procurement: The OPIOG Reformulation Sub-Group highlighted the issue of nutritional signposting and endorsed Nutri-Score, a relatively simple whole food approach to food labelling as opposed to more complex nutrient-based food labelling approaches.



Nutri-Score labelling is currently being promoted and supported at EU level, based on evidence of its positive effects on consumer behaviour/dietary intakes. We also have evidence from Ireland that consumption of food products with higher (unfavourable) Nutri-Score ratings is associated with a range of biological markers of inflammation and adverse health outcomes⁽¹⁷²⁾.

The potentially significant role of public procurement (in the health sector and in other public sectors such as local government) as a driver of food and drinks reformulation is acknowledged in the Reformulation Roadmap Report and it is suggested that Ireland should seek to be an exemplar of best practice in the area at EU level.

Reformulation is inextricably linked to the issue of unhealthy food marketing to children. The Irish Heart Foundation has campaigned with other public health stakeholders for over two decades for a complete ban on all forms of unhealthy food and beverage marketing to children⁽¹⁷³⁾. During the period 2020 to 2023, Ireland has co-lead with Portugal, work at EU level addressing the challenge of transposing best practices in reducing unhealthy food marketing to children into national legislation. This work was part of the EU Joint Action Best ReMaP programme (best practices in reformulation, marketing, and public procurement), a three-year initiative involving the Department of Health, the Food Safety Authority of Ireland (FSAI) and the School of Public Health at University College Cork⁽¹⁷⁴⁾.

Specifically, Ireland led work on developing guidance for implementing marketing codes of practice that protect children's rights and work on developing, testing and adapting effective food marketing monitoring protocols, with a particular focus on digital marketing. In addition, under this initiative, Ireland collaborated with EU partner countries on work to promote the public procurement of healthy food (with reduced salt, sugar, and fat) in public settings. It is envisaged that this EU joint action will create:



a European standardised monitoring system for reformulating processed foods.



an EU-co-ordinated approach to reducing unhealthy (digital) food marketing to children and adolescents based on the use of existing tools for monitoring digital marketing campaigns.



a prototype catalogue of food to be tested in the public procurement procedures that will help assure transparency in the quality of procured foods within public institutions.

The outputs from this programme will provide a valuable platform to advance critical work on creating healthier commercial food environments. Regarding the latter issue, the protection of children from marketing that promotes overweight and obesity, the Irish Heart Foundation has argued that a policy focused on reducing unhealthy (digital) food marketing to children and adolescents is insufficient and we need an EU-wide ban on all online marketing of junk food and drinks. In this context we need to consider whether current food and beverage marketing practices in Ireland are in breach of the Thirty-first Amendment of the Constitution (Children) Act 2012 as signed into law in 2015.

Food Reformulation Task Force: In response to the Reformulation Roadmap Report, the Department of Health has established the Food Reformulation Task Force based on a strategic partnership between the Food Safety Authority of Ireland and Healthy Ireland. The purpose of the task force is to implement the Roadmap for Food Product Reformulation in Ireland.

This is a welcome development given the technical challenges of reformulation and the need to engage with the food sector at a granular level of detail over a large and ever-changing range of food products. In this context, it should also be noted that a significant proportion of highly processed food products are beyond the reach of reformulation, and we need to ensure that reformulation is not used to endorse food products that are simply best avoided, especially in situations where healthy and enjoyable alternatives are readily available. It should also be noted that reformulation is ultimately a political process, and one that faces resistance and inertia from sections of the food industry – a powerful, well-resourced lobby group and a major source of employment and state revenue. The commercial determinants of health as discussed briefly in Section 2 are well illustrated by the manner in which the food industry defines the dominant narrative on food culture and food policy in Ireland. If Ireland is to persist with a voluntary approach to food reformulation it will be important to ensure that the issues of transparency, governance and accountability flagged in the Reformulation Roadmap Report (see Table 4) are adequately addressed.

Table 4: Proposed Standards for Self-Regulatory Activities of the Food Industry⁽¹⁷¹⁾

Aim	Standard
Transparency	Transparent self-regulatory standards created by a combination of independent scientists and representatives of leading nongovernmental organisations.
	No one party given disproportionate power or voting authority
Meaningful objectives and benchmarks	Specific codes of acceptable behaviours based on scientifically justified criteria
	Predefined benchmarks to ensure the success of self-regulation
Accountability and objective evaluation	Mandatory public reporting of adherence to codes, including progress toward achievement of full compliance with pledges and attainment of key benchmarks
	Built-in and transparent procedures for outside parties to register objections to self-regulatory standards or their enforcement
	Objective evaluation of self-regulatory benchmarks by credible outside groups not funded by industry to assess health, economic, and social outcomes
	Periodic assessment/audits to determine compliance and outcomes
Oversight	Possible oversight by an appropriate global regulatory or health body (e.g. the World health organization or the FSAI in Ireland)

4.3.5 Priorities for tobacco control in Ireland

Robust, evidence-based and enforced public health legislation has been the foundation of tobacco control in Ireland for over two decades. Ireland is now a global leader in tobacco control with bold measures like the workplace smoking ban in 2004 and progressive restrictions on the promotion, marketing, sale and affordability of tobacco products in the intervening years, including the introduction of Public Health (Standardised Packaging of Tobacco) Act 2015— all framed around evidence-based measures recommended by the WHO (Figure 31). These efforts, currently guided by over 60 recommendations set out in Tobacco Free Ireland, the 2013 report of the Tobacco Policy Review Group, have translated into reduced smoking prevalence, and Ireland is now entering the late phases of the epidemic of smoking-related harm. However, the end of the epidemic of smoking-related harm in Ireland is not yet in sight, with 4,500 smoking-related deaths per year and continuing high levels of respiratory illness, cardiovascular disease, cancer and other smoking related illness and impairment of quality of life⁽¹⁷⁵⁾.

Figure 31: World Health Organization’s MPOWER framework



While there are no grounds for complacency, Ireland is currently regarded as having the most comprehensive tobacco control policies worldwide and we are currently ranked first of 37 European countries in the 2021 Tobacco Control Scale⁽¹⁷⁶⁾. The Tobacco Control Scale, first introduced in 2006, is based on the six core MPOWER policy areas. Ireland and the UK currently score 82 points on the scale out of a maximum of 100. While this is clearly commendable, there is room for further improvement in the “Budget” policy domain, which reflects tobacco control spending per capita by the government (Table 5).

Table 5: Adapted from the results of the Tobacco Control Scale 2019 in Europe

Ranking 2019 (ranking 2016)	Country	Price (30)	Public place bans (22)	Budget (10)	Ad bans (13)	Health warning (10)	Treatment (100)	Illicit trade (3)	Art 5.3 (2)	Total (100)
1 (1)	United Kingdom	25	22	0	12	9	9	2	1	80
2 (4)	France	22	18	4	11	9	7	2	1	74
3 (2)	Ireland	18	22	1	13	9	8	1	1	73
4 (3)	Iceland	23	17	9	13	4	4	0	0	70
0	Norway	22	17	1	13	8	4	1	0	66
6 (6)	Finland	18	18	2	13	5	5	1	0	62

There are additional concerns that Ireland, in common with other EU countries, is also failing to keep pace with the changing product landscape of innovative and novel tobacco and nicotine products. Regarding e-cigarettes, Healthy Ireland survey data indicate that e-cigarette ever-use in Irish teenagers increased significantly from 23% to 37.2% between 2015 and 2019, and e-cigarette current-use increased significantly from 10.1% to 18.1%. As highlighted in Section 2 of this paper, there is growing evidence that e-cigarettes can act as a gateway to traditional tobacco, and significant concerns that e-cigarette flavouring is enticing young people to start vaping in the first place. Without decisive action from Government, we risk losing a whole new generation to transitioning to smoking, nicotine addiction and prematurely death from tobacco-related diseases.

From “tobacco control” to “tobacco endgame”: Through current government policy as articulated in Tobacco-Free Ireland 2013, Ireland joined a small number of countries who have committed to leading the way in transitioning its efforts from “tobacco control” to “tobacco endgame”. A Tobacco-Free Ireland goal was set to reduce smoking prevalence to less than 5% by 2025. “Tobacco endgame” has been described as the introduction of policy measures designed to “change permanently the structural, political and social dynamics that sustain the tobacco epidemic, in order to end it by a specific time”¹⁰. Fundamentally, this involves redirecting goals of tobacco policy towards ending the tobacco epidemic completely. The tobacco endgame approach is not designed to divert attention and resources from “tobacco control” measures. Rather, it seeks to build on continued implementation of existing measures and augment them with additional policy innovation, including a proposal to work towards a ‘nicotine-free generation’ by a specific date, whereby a cohort born after a specific earlier date can no longer legally purchase any form of nicotine products (excluding nicotine replacement therapy). The latter measure was recently coined as ‘denicotinisation’ of a generation. Nicotine-free generation policies are now in place in New Zealand, Canada and Philippines.

¹⁰ Cited in Bringing the Tobacco Epidemic to an End: Public Views on “Tobacco Endgame” in Ireland May 2022. See <https://www.hse.ie/eng/about/who/tobaccocontrol/news/tobacco-endgame-report-2022.pdf>

Tobacco endgame tactics can be classified into four themes:

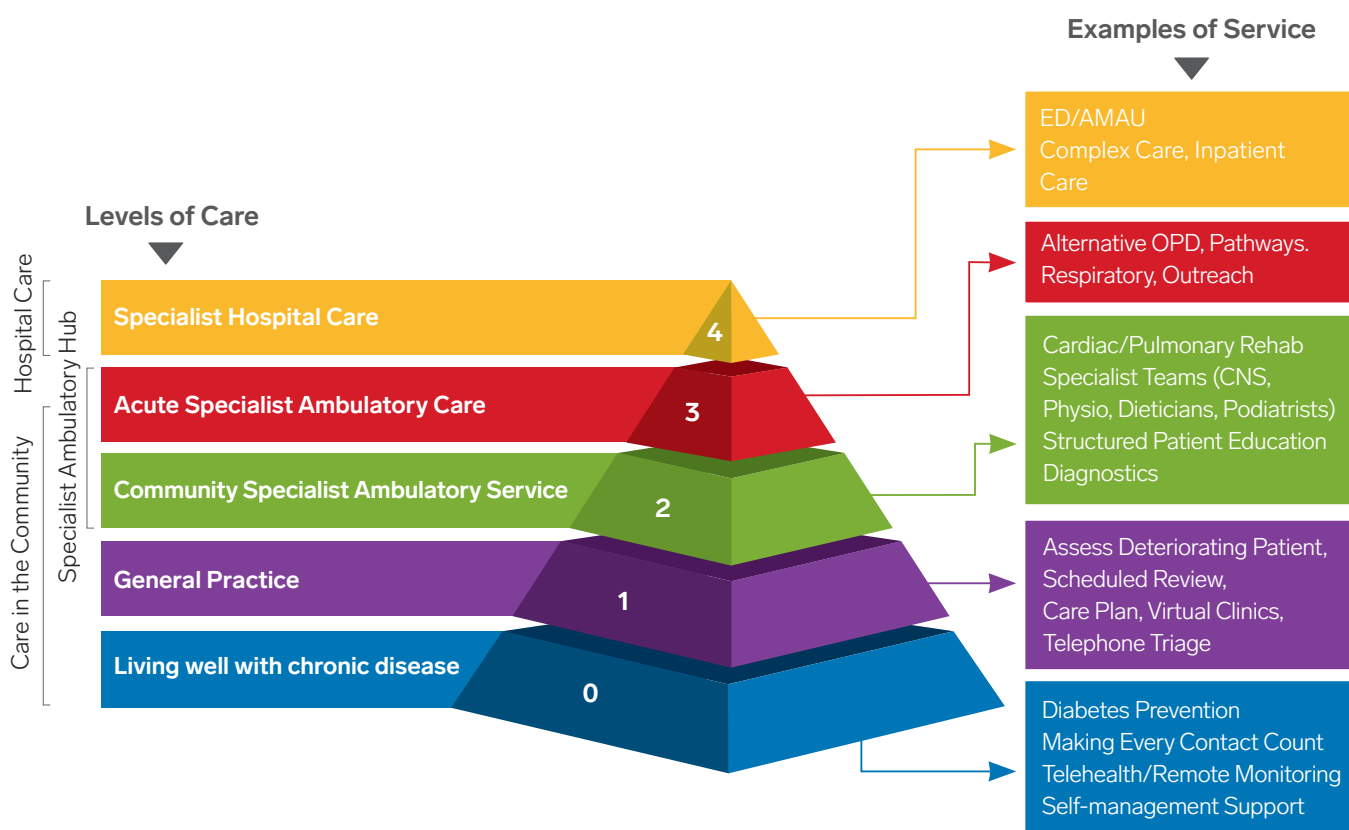
- users, which target product affordability and access.
- supply, which target availability and retailers.
- product, which targets product appeal and addictiveness.
- institutional structure, which includes tactics directly targeting tobacco industry production.

While the target of reducing smoking prevalence to less than 5% will not be met by 2025, it remains viable and is well supported by the general public⁽¹⁷⁷⁾. In May 2022, the HSE Tobacco Free Ireland Programme reported on the findings from a national survey to assess the public’s views on “tobacco endgame” policies. The findings suggest a high level of public support for tobacco endgame in Ireland. There is also a deep reservoir of public support for actions to support people who are currently addicted to tobacco products to ensure that nobody is left behind.

4.3.6 HSE Chronic Disease Management Programme

The HSE has developed a National Framework for the Integrated Prevention and Management of Chronic Disease. This framework encompasses a continuum of health promotion, disease prevention, diagnosis, treatment, disease management and rehabilitation services that are coordinated across different healthcare providers and healthcare settings. Figure 32 provides a schematic overview of the large and ambitious programme.

Figure 32: HSE model of care for the integrated prevention and management of chronic disease⁽¹⁷⁸⁾

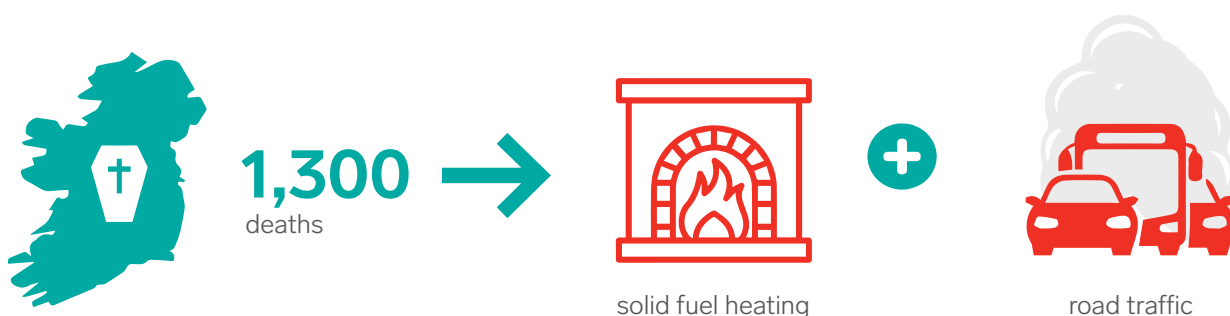


The framework includes a Structured Chronic Disease Management Programme in General Practice, designed to provide additional supports to GPs in caring for people living with chronic disease (including CVD) in the community. In Phase 2 of the Structured Chronic Disease Management Programme launched in 2022, provision is made for opportunistic case finding (OCF) and a dedicated general practice-based prevention programme in patients aged over 65. The OCF programme will enhance the detection of hypertension and other risk factors for CVD. The prevention programme is focused on CVD and diabetes. It includes an annual review of risk factors, with a review of medications and the patient’s self-management care plan, with provision of additional supports and/or referrals as necessary. Appropriate medical treatment (e.g., for hypertension, smoking cessation, blood lipids) will be prescribed and appropriate blood tests carried out.

The development of the Structured Chronic Disease Management Programme has raised the issue of whether a more intensive approach to CVD prevention in general practice is required. This has led to the development of a pilot High-Risk Prevention Programme (HRPP), led by the Irish Heart Foundation, University College Dublin (UCD) and the HSE⁽¹⁷⁹⁾. The HRPP pilot aimed to design, deliver and evaluate an intensive, six-week behaviour change programme among people at high risk of CVD living in Irish communities. It ran from February 2021 until February 2023. Six general practices agreed to take part in the project, and it was envisaged that up to 400 patients at high risk of CVD would attend six-week one-to-one consultation programme focusing on self-managing health issues led by either a practice nurse or health promotion professional. The project findings will inform whether a relatively intensive general practice-based intervention to prevent CVD among at-risk patients is feasible and acceptable in practice with potential for a positive impact on CVD morbidity and mortality. Based on the research summarised in Section 3 of this paper, the issue of effectiveness and cost effectiveness is uncertain and will require rigorous evaluation in a large-scale intervention study.

4.3.7 Priority issues in relation to air quality in Ireland

As discussed in Section 2, poor air quality has a negative impact on people’s health and there are an estimated 1,300 premature deaths in Ireland per year due to particulate matter in our air. Air monitoring results in 2021 from EPA stations across Ireland show that fine particulate matter (PM2.5), mainly from burning solid fuel in our homes and nitrogen dioxide (NO₂) mainly from road traffic, remain the main threats to good air quality.



In September 2022, the Environmental Protection Agency (EPA) launched its annual air quality report *Air Quality in Ireland, 2021*. The report shows that, while air quality in Ireland is generally good and compares favourably with many of our European neighbours it does not meet the health-based World Health Organization (WHO) air quality guidelines for a number of pollutants including particulate matter (PM), nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and ozone (O₃) due to the burning of solid fuel in our towns and villages and traffic in our cities.

Ireland collects and retains extensive data on air quality under the Clean Air for Europe Directive (CAFÉ Directive 2008/50/EC) to protect public health and the environment and comply with the legal thresholds for ambient air pollutants. Unfortunately, although the Clean Air Directive refers to the protection of public health, there are significant barriers to linking air quality and health data in Ireland due to limited investment in digital health, limited development of a trusted, secure research environment infrastructure for data linkage and the lack of national unique health identifiers. These issues are addressed in a pending report *INHALE: Irish Nationwide Health and Air Quality Linkage*, prepared for the Environmental Protection Agency by researchers at the Schools of Public Health and Chemistry, the Centre for Research into Atmospheric Chemistry and the Environmental Research Institute at University College Cork.

4.3.8 Need for greater alignment between Healthy Ireland and national policy on the climate emergency

In these early decades of the 21st century, we face a series of interlinked problems that pose both profound threats to the health and wellbeing of populations and fundamental challenges to the existing political and economic world order. We are stretching critical planetary boundaries that define the earth's safe operating space with accelerating greenhouse gas (GHG) emissions and climate change, species extinction and loss of biodiversity and the profligate abuse of finite resources including freshwater and croplands, all driven by an increasing global population that is projected to reach 10 billion by 2050.

The WHO has stated,

"...climate change is the greatest challenge of the 21st century, threatening all aspects of the society in which we live and the continuing delay in addressing the scale of the challenge increases the risks to human lives and health"⁽¹⁸⁰⁾.

Broadly, climate change can impact human physical and mental health and wellbeing either directly, for example due to increased temperatures and a higher frequency of extreme weather events, or indirectly through disruptions to natural, human or socio-economic systems, resulting in death, disease, illness, disabilities or injuries. Figure 33 from the US Centers for Disease Control and Prevention provides a simplified overview of the major impacts of climate change on human health, including core mediating factors and major health outcomes.

Figure 33: Overview of potential impacts of climate change on human health and wellbeing



Adapted from US center of Disease Control and Prevention¹¹

11 See <https://www.cdc.gov/climateandhealth/effects/default.htm>

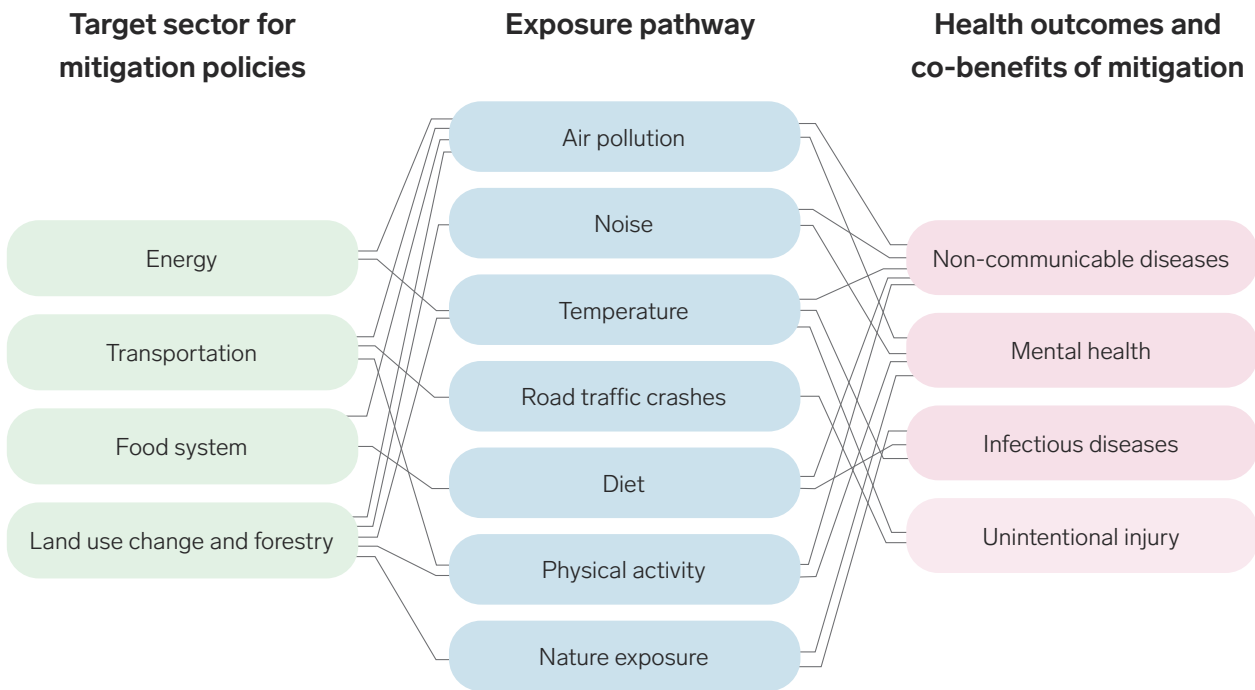
Climate change threatens to undermine the last half century of gains in development and global health. While the impacts of climate change will bear most heavily on lower- and middle-income countries, all countries and regions are vulnerable.

In Ireland, as in other developed countries, the adverse effects of climate change will be heavily concentrated among those who are most marginalised and socially disadvantaged and will tend to exacerbate existing social inequities and inequalities in health.

With the passage of the Climate Action and Low Carbon Development Act 2021, Ireland is now on a legally binding path to net-zero GHG emissions no later than 2050, and to a 51% reduction in emissions by 2030. The Environmental Protection Agency estimates Ireland's GHG emissions for 2021 at 61.53 million tonnes carbon dioxide equivalent (Mt CO₂eq). These estimates are 4.7% higher than emissions in 2020 and over 1% higher than pre-COVID-19 pandemic 2019 estimates. The energy, transport and agriculture sectors accounted for 72% of total GHG emissions in 2021, with agriculture being the single largest contributor to the overall emissions, at 37.5%. Thus, despite the 2021 legislation, challenges remain at many levels to engaging in strong and decisive climate action. In particular, the political system and the wider societal discourse has not yet fully grasped the urgency and scale of the changes required to avert catastrophic climate breakdown.


Mitigation and adaptation: As eloquently described by a Scientific Expert Group Report on Climate Change and Sustainable Development in 2007, confronting climate change requires efforts to avoid the unmanageable (mitigation) and manage the unavoidable (adaptation)⁽¹⁸¹⁾. Simply put, mitigation refers to measures taken to decrease the sources of GHGs that drive climate change by, for example, reducing the use of fossil fuels, reducing methane emissions from agriculture and/or enhancing GHG sinks via increased forest cover and other methods of carbon sequestration. Adaptation refers to adjusting to the current and future effects of climate change. The overall priorities and strategies for mitigation and adaptation need to be agreed at national level, informed by data on the major sources of GHG emissions, the level of vulnerability to extreme weather events such as flooding or heat waves, issues of technical feasibility and a range of other social, cultural, economic and cultural factors. Figure 34 provides a simple conceptual model of sectors targeted by mitigation policy, exposure pathways and health co-benefits.


Figure 34: Conceptual model linking sectors targeted by mitigation policy, exposure pathways and health co-benefits ⁽¹⁸²⁾





Climate action and CVD prevention: It is increasingly clear that climate change mitigation and adaptation in various sectors, including agriculture, housing, transportation and energy, has significant potential health co-benefits (see Figure 35).

Health co-benefits of particular relevance to preventing obesity and CVD include:

- 

a transition towards more sustainable and less atherogenic plant-based diets.
- 

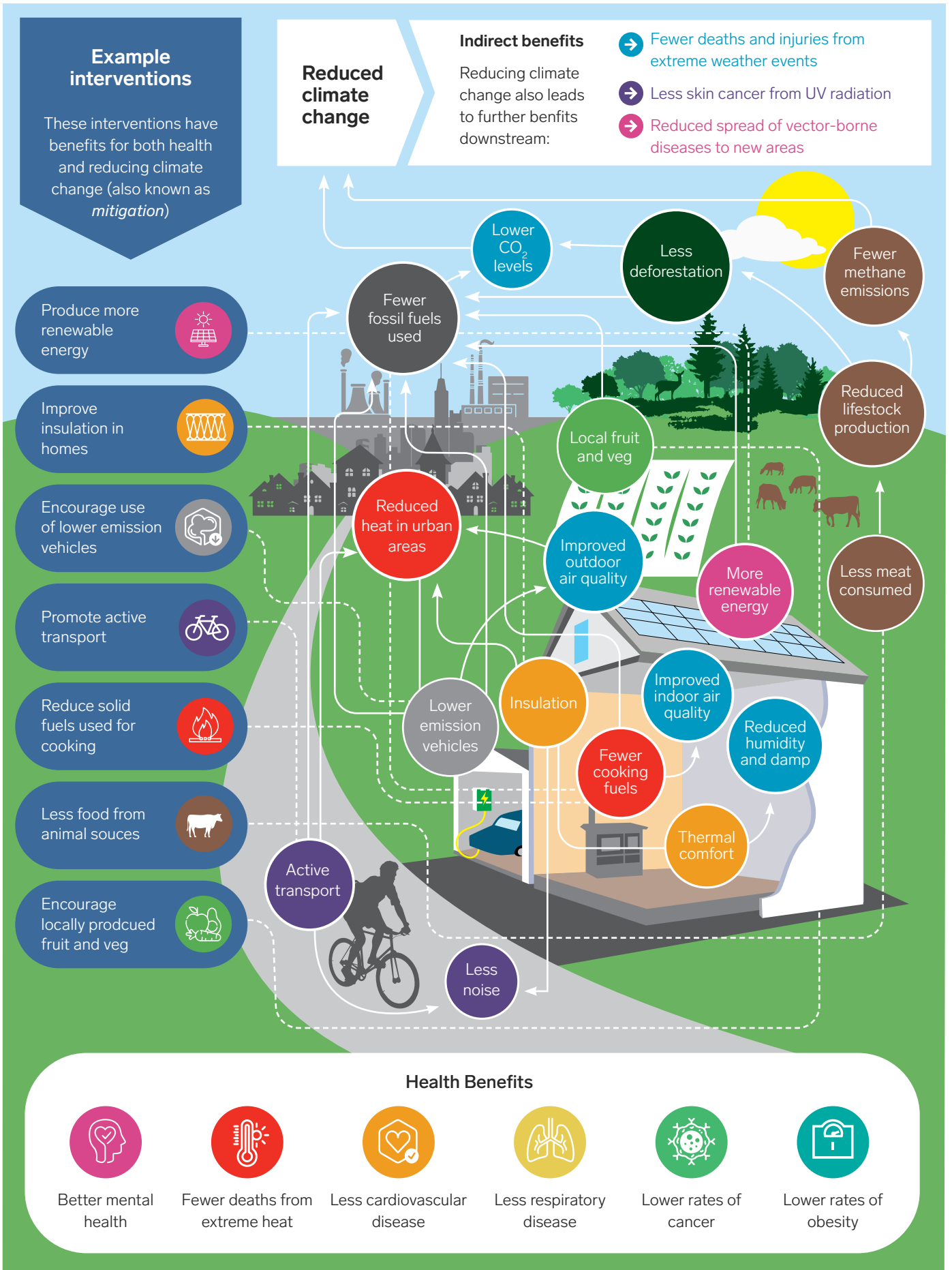
reduced use of fossil fuels, linking to improvements in indoor and outdoor air quality.
- 

increased uptake of public and active transport and increased provision of high-quality green spaces in urban areas, with associated increases in physical activity levels in the population and related benefits for health and wellbeing.
- 

improved insulation in homes with reductions in excess winter deaths from CVD and other conditions.

The authors of the second Lancet Commission on Health and Climate Change, published in 2015 suggested that “tackling climate change could be the greatest global health opportunity of the 21st century” ⁽¹⁸³⁾.

Figure 35: Examples of health and climate co-benefits ⁽¹⁸⁴⁾



Promotion of healthy and sustainable Diets and a healthy food environment: As detailed above, in Ireland the agricultural sector accounts for one-third of our emissions, which include (in addition to CO₂), methane and nitrous oxide emissions from beef and dairy production and fertiliser use. Within agriculture, beef and dairy production are major sources of GHGs. As we confront the challenge of feeding a population of 10 billion people on the planet by 2050, the wasteful practice of growing crops that we feed to cattle for slaughter will not be sustainable anywhere on earth and it will become increasingly unacceptable as the animal welfare issues associated with intensive beef and dairy production are more fully appreciated.

Over the past decade, scientists from diverse disciplines have identified and begun to quantify a set of nine planetary boundaries that define a safe operating system for humanity.

These boundaries include climate change, freshwater use, land use, biodiversity and the nitrogen and phosphorus cycles.



Our current system of food production with its heavy reliance on meat and dairy is therefore unsustainable not just because of its effects on climate change but because it places a strain on many of these other boundaries as well.

This concept of a safe operating space for humanity guided the work of the EAT-Lancet commission on healthy diets from sustainable food systems, which was published in 2019⁽¹⁸⁵⁾. This report was drafted by 37 leading scientists from 16 countries in various disciplines including human health, agriculture, political sciences, and environmental sustainability. It addressed the environmental impacts of various diets and found, unsurprisingly, that a diet rich in plant-based foods and with fewer animal source foods confers improved health and environmental benefits. The EAT-Lancet Commission Report has been heavily criticised in Ireland as an inappropriate effort to prescribe a global dietary pattern without reference to regional and local dietary options, preferences and circumstances. In reality, the 2019 Report should be seen as the first step in an ongoing international collaborative process to identify a range of potential transition pathways to healthy, sustainable and equitable food futures, adapted to local circumstances. A further report (EAT-Lancet 2.0) is due in 2024 and Ireland (including its agri-food sector) should engage positively with this process in detail instead of carping from the periphery.

Given that Ireland is now one of the wealthiest countries in the world, we should aim to be a global leader on the issue of healthy and sustainable diets. If we expect countries with substantial fossil fuel reserves to prioritise climate change mitigation over short-term economic benefits, we should not engage in special pleading on behalf of our agri-food sector. It is also unjust to argue that reducing our livestock numbers in Ireland to achieve climate neutrality will have no impact on global emissions as competing countries will increase their output of beef and dairy produce. This “tragedy of the commons” argument is unsustainable given the narrow window of opportunity that remains to avert catastrophic climate breakdown. These critical issues are addressed in further detail in the Climate and Health Alliance report *Fixing Food Together: Transitioning Ireland to a healthy and sustainable food system*.



Role and composition of Climate Change Advisory Council: In 2016, the Government established a Climate Change Advisory Council, an independent advisory body tasked with assessing and advising on how Ireland is making the transition to a low carbon, climate resilient and environmentally sustainable economy by 2050. The Council, with the support of its Secretariat, conducts evidence-based analysis on how best to respond to the impact of climate change and provide timely advice on the most effective policies to assist with Ireland's transition to a low carbon and climate resilient economy. As part of this work, the Climate Change Advisory Council also provides regular reports on Ireland's progress in achieving its national policy goals and greenhouse gas emissions targets agreed by the European Union.

The Climate Change Advisory Council draws on high level expertise in climate and environmental science and on a range of disciplines relevant to climate change mitigation and adaptation in the public and private sectors. However, it is noteworthy that, despite the implications of climate change for population health and wellbeing, public health is not listed among the 10 areas of relevant expertise to be considered by the Minister in making appointments to the Council. This is both an important issue in its own right and a symptom of our tendency to regard the climate emergency as primarily a technical, scientific issue with implications for the economy as opposed to an existential issue with implications for all sections of society.

Need for a broader discourse on the climate emergency: The major challenges that we face in addressing the climate emergency are not primarily scientific or technical but societal in terms of values, priorities and the agility of democratic institutions. We need to work at all levels of society towards consensus on the difficult decisions we need to make in the short-term to avert catastrophic climate impacts in the medium- and long-term. In particular, we need to consider how scientists and activists can work with disciplines and groups in the social sciences, arts and humanities to form a collective narrative and shared sense of purpose at local, national and global level to confront this existential crisis.

In co-creating this narrative, we need to acknowledge the collective greed and delusion (including the delusion of endless economic growth on a planet with finite resources) that has brought us to the current climate precipice. We also need to reconnect with nature and expand our circle of compassion and moral concern to include animals, plants and the wider environment. Gustave Speth, former Dean of the School of Forestry & Environmental Studies at Yale, crystallised this issue when he said:

"I used to think that the top environmental problems were biodiversity loss, ecosystem collapse and climate change. I thought that thirty years of good science could address these problems. I was wrong. The top environmental problems are selfishness, greed and apathy, and to deal with these we need a cultural and spiritual transformation. And we scientists don't know how to do that."

4.3.9 Potential to promote health and wellbeing through taxation

In reviewing the literature on optimal strategies for the primary prevention of cardiovascular disease in Section 2 and Section 3, the profound impact and the high cost-effectiveness of population-based strategies, including taxation, are evident. It is noteworthy that this approach is also endorsed in Foundations for the Future: Report of the Commission on Taxation and Welfare, published in July 2022. In this report, it is clear that the Commission supports the use of taxation to promote public health in Ireland. Specifically, the commission supports

“the levying of excise duties/taxes at high rates related to the social cost arising from the consumption of alcohol, tobacco and sugar sweetened drinks.”

The Commission also recommends that the

“Government develop fiscal measures which could be introduced to encourage a reduction in the consumption of ultra-processed foods, to support reformulation measures to reduce the harm of such foods and promote healthier eating”.

In the report it is also stated, “In developing such proposals, Government should be conscious of the distributional effect of proposed changes and the influence of fiscal and other policies on consumer purchasing and their impact on overweight and obesity.” This report of the Commission on Taxation, which will inform the political debate and Government policy on taxation over the next decade and beyond, provides a clear policy framework to implement effective population-based fiscal strategies to prevent CVD and other non-communicable disease and thereby promote the health and wellbeing of the population. In particular it provides a compelling rationale for the introduction of the Public Health (Obesity) Act, with restrictions on food and drinks promotion and advertising aimed at children, as flagged in the 2016 Obesity Policy and Action Plan.

4.4 CVD prevention and broader political environment

In the earlier sections of this paper, we have addressed the core social, economic, commercial and political determinants of health and it is clear that the challenges of preventing cardiovascular and other disease and the promotion of health and wellbeing are ultimately political, revolving around how we organise ourselves as a society. The German pathologist and polymath Rudolf Virchow, one of the founding figures in “social medicine’ in Europe in the 19th century articulated this understanding clearly:

“Medicine is a social science, and politics is nothing else but medicine on a large scale” and “If medicine is to fulfil her great task, then she must enter the political and social life....”

Deborah Shipton from Public Health Scotland, with colleagues, has recently argued that the dominant economic approaches being pursued in most countries have not only failed to address but have exacerbated the major public health threats of high and sustained health inequalities and climate change. Specifically, they suggest that reliance on redistributive measures and policies such as progressive taxation and strengthening the social safety net have failed to reduce inequalities and that our economies should be “hard-wired” for equity. In essence they make the case for an inclusive economy.

Attributes of an inclusive economy ⁽¹⁸⁶⁾
The economy is designed to be equitable: The institutions, governance mechanisms and goals of the economy are designed to deliver equity for the population.
The benefits of the economy are equitably distributed: This includes (A) essential goods and services produced; (B) economic participation (e.g., income, networks); (C) assets (e.g., wealth, capital); and (D) value ascribed (e.g., to female dominated sectors, the non-monetary economy).
There is equitable access to the resources (e.g., education) needed to participate in the economy.
The economy operates within planetary boundaries.

This concept of an inclusive economy clearly represents a broad and ambitious agenda – one that is well beyond the remit of the health sector and associated stakeholders – that requires radical change led at the level of national government and involving all sectors of society. However, it is an agenda that should frame our overall approach and perspective as we address deeply entrenched, inter-generational, social inequalities in health (including CVD), originating in childhood and extending over the entire life course to old age.

4.4.1 Healthy Cities and the Sláintecare Healthy Communities Programme

Within this broad, social determinant of health framework we need to consider how best to create supportive environments for optimal health in specific settings, including workplaces, schools, colleges, cities and other community settings. The WHO Healthy Cities movement is of particular importance in this regard. Healthy Cities in Europe was launched in 1987–1988 with the ambitious aim to put health high on the social, economic and political agenda of city governments. Its evolution over more than three decades reflects our growing appreciation of the significance of the social, economic, environmental, cultural, commercial and political determinants of health and wellbeing.

The now global Healthy Cities movement strives to translate global and national aspirations for health and wellbeing into action at the local level based on recognition of **three core issues**:



the importance of local knowledge and action in protecting and promoting health and wellbeing in the population.



the specificity and importance of urban settings for health and wellbeing.



the key role of local governments and local communities in creating the conditions and supportive environments for health and wellbeing for all.

Core issues in the prevention of CVD are addressed within this critical settings-based framework, including work on poverty, social and educational deprivation, social isolation, air quality, the promotion of active travel and access to green spaces, the promotion of a healthy and sustainable food environment and climate change mitigation and adaptation⁽¹⁸⁷⁾.

Taking a somewhat similar settings based approach to promoting health and wellbeing is the Sláintecare Healthy Communities Programme, which was launched in 2021 to bring together the HSE, local authorities and community agencies to provide increased health and wellbeing services in 19 community areas across Ireland.

An evidence-based process identified local areas in which health and wellbeing risk factors are particularly concentrated and where specific initiatives, including dedicated smoking cessation services, parenting programmes, nutrition and cookery courses and social prescribing will be delivered to help promote and improve the overall health and wellbeing of people in those communities.

It is noteworthy that each of the local authorities will co-ordinate and support the Sláintecare Healthy Communities Programme with the Local Community Development Committees and their existing Healthy City and Healthy County plans as well as recruit Healthy Community Local Development Officers to co-ordinate activity. This increase in resources for local authorities is aimed at integrating a health and wellbeing agenda within their broader programme and supporting a social determinants approach to health inequalities.

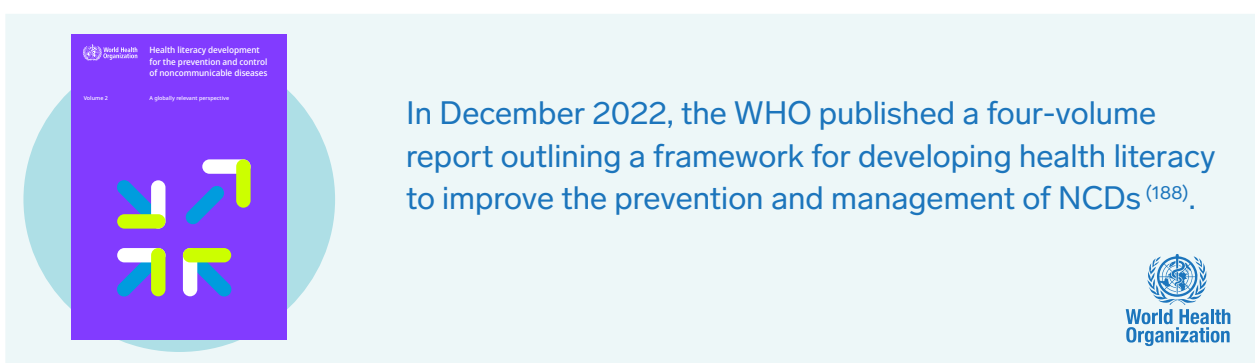
4.4.2 National Traveller Health Action Plan 2022–2027

A social determinants perspective on health and wellbeing also requires that we address the challenges of promoting health and wellbeing in specific groups in society that have experienced high levels of discrimination, racism and marginalisation, such as the Traveller community. This perspective underpins the National Traveller Health Action Plan launched in 2022.

In this action plan, the systemic racism and discrimination that the Traveller community has endured is explicitly acknowledged; there is a major focus on the social determinants of health — education, employment, and accommodation — and a commitment to strengthening partnership between the HSE, Traveller health units, local Traveller organisations and Traveller primary healthcare projects in the design and delivery of health services. The publication and most critically the implementation of this action plan is long overdue, and will have significant implications for population health, including CVD prevention in Ireland.

4.4.3 Promotion of health literacy for NCD prevention and control

The importance of health literacy in preventing CVD and other non-communicable disease (NCD) is increasingly recognised.



Poor literacy skills among adults are surprisingly common even in the most economically developed countries. Not surprisingly, low literacy in a population is associated both directly and indirectly with a range of poor health outcomes. Indirectly, low literacy is often linked to poor socio-economic circumstances, and this in turn is associated with adverse effects on health that are independent of other risk factors. The 2008 WHO Commission on the Social Determinants of Health identified the “central role” of literacy in determining inequities in health in both rich and poor countries. Thus, improving access to education and achieving high levels of literacy in a population is not only a key sustainable development goal in its own right but also has the potential to produce substantial public health benefits.

Literacy is not a fixed asset. It is both content and context specific. Although the possession of generic literacy skills in reading, writing and understanding text improves an individual’s ability to access, understand and act on new information, it is no guarantee that a person can consistently

apply their skills in situations requiring specific content knowledge, or in unfamiliar settings. In this context, more specialist knowledge and more specific skills may be required. This has led to the recognition of different specialist “literacies”, including health literacy. Health literacy can be considered in this context as the possession of the specific literacy skills that are required to make health-related decisions in a variety of environments. The concept of health literacy has developed in two distinctive settings – in clinical care where low health literacy is viewed as a risk factor for poor health and poor compliance with healthcare advice and in public/community health where health literacy is viewed as a personal and population asset offering greater autonomy and control over health decision-making.

WHO has adopted a definition of health literacy that reflects a health promotion orientation, as follows:

“Health literacy represents the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways that promote and maintain good health.”



Health literacy comprises a set of skills that enable people to participate more fully in society and exert a higher degree of control over everyday events. These skills have been categorised in different ways, including functional, interactive and critical health literacy.

- **Functional health literacy** describes the literacy skills sufficient to acquire and act on information on defined health risks and recommended health services use, and comply with recommended health and disease management strategies.
- **Interactive health literacy** describes the literacy skills required to extract, understand and discriminate between health information from different sources, and to apply new information to changing circumstances.
- **Critical health literacy** describes the most advanced cognitive skills combined with the social skills required to critically analyse health information from a variety of sources, and to use this information to exert greater control over both personal health decisions and wider influences on those decisions.

Within this paradigm, health education may involve the communication of information not only on personal health risks but also on the social, economic and environmental determinants of health. This type of health literacy can be more obviously linked to population benefit, alongside benefits to the individual⁽¹⁸⁹⁾.

Given the level of investment and leadership in health literacy from the WHO and the resources now available, there is an opportunity for the Irish Heart Foundation to work with the Department of Health and other stakeholders to develop a profile of health literacy in the Irish population and identify priorities for action on this issue in Ireland.

4.4.4 Ireland's public health infrastructure

In this review of the Healthy Ireland Framework and the wider policy landscape relevant to CVD prevention, the gap between vision and implementation is a recurring issue. The prevention of CVD and other non-communicable disease poses complex, system level challenges that require system level solutions. The discipline of public health, which is fundamentally concerned with creating and sustaining the conditions for a healthy society, brings a system level perspective to the causes and prevention of disease in the population. The COVID-19 pandemic has highlighted the need for substantially increased investment in local, national and global public health infrastructure. There is limited understanding of the core elements of our public health infrastructure and, unfortunately, investment in this critical infrastructure is not an easy sell to politicians or the public in Ireland. This issue is addressed in further detail in Section 5.



05

Recommendations for implementing effective CVD primary prevention policies and programmes in Ireland

5.0 RECOMMENDATIONS FOR IMPLEMENTING EFFECTIVE CVD PRIMARY PREVENTION POLICIES AND PROGRAMMES IN IRELAND

5.1 Overview

The recommendations in this section are framed within the overarching context of the need to:

- 1 prioritise population-based strategies for primary CVD prevention over high-risk primary prevention strategies on grounds of health and wellbeing, economics and social justice as addressed in Section 3 of this paper.
- 2 acknowledge current detailed and comprehensive preventive strategies and programmes addressing major NCDs including cardiovascular disease linked to *Healthy Ireland*, other initiatives and relevant HSE prevention programmes as detailed in Section 4.

They cover potential actions, interventions and issues for consideration at the level of:



Government policy and wider society in addressing the fundamental social, economic, commercial and political determinants of health and wellbeing.



the Department of Health, the HSE, the Irish Heart Foundation and other agencies in addressing disease prevention and health promotion with a particular focus on big five risk factors for CVD, poor health and premature mortality (poor diet, physical inactivity, obesity, smoking and excessive alcohol), mindful of the need to consider social inequalities in health.



the clinical arena.

5.2 Political culture and CVD prevention

In the late 19th century, the British Prime Minister Benjamin Disraeli declared, “The care of the public health is the first duty of the statesman.” Public health – “the science and art of preventing disease, prolonging life and promoting health through the organised efforts of society” – is a core task for government and wider society, a task that depends on a political culture that acknowledges and is willing to address the broad range of determinants of health, including the inequitable distribution of power, status, income, and resources in society.

Clearly, the prevention of cardiovascular disease must be set within this broad government and societal agenda. In 2018, Barnish and colleagues presented findings from 176 international comparative studies that together provide compelling evidence that political culture is related to health and specifically that democracy, welfare state generosity and left-of-centre democratic political tradition are positively associated with population health⁽¹⁹⁰⁾. Based on recent history in countries that are culturally and politically close to Ireland, it is clear that social democracy and welfare state generosity are fragile and need protection on their own merits and with regard to potential impacts on population health.

5.3 Policy alignment on climate action and public health

While the *Climate Action and Low Carbon Development Act, 2021* represents a step-change in our national response to the climate emergency.



It is not clear that the political system and the wider societal discourse have fully grasped the urgency and scale of the changes required to avert catastrophic climate breakdown or the potential to realise significant health co-benefits from climate action.

As discussed in Section 4, in the 2015 Report of the Lancet Commission on Health and Climate Change, it was suggested that

“tackling climate change could be the greatest global health opportunity of the 21st century”.

In Section 4, we also discussed the extent to which the major challenges we face in addressing the climate emergency are not primarily scientific or technical but societal in terms of values, priorities, the agility of our democratic institutions and the lack of a societal consensus on the difficult short-term decisions that are required to avert medium- and long-term catastrophic climate impacts.

To date, the debate on climate action in Ireland has been largely dominated by controversy on the sectoral targets for greenhouse gas (GHG) emissions reductions, including potential threats to livelihoods and ways of life in the agricultural sector and in rural communities, and the need for restraint and sacrifices in relation to fossil fuel consumption. This debate plays out against a backdrop of fatalism in relation to global GHG emissions targets and growing concerns about the increasing number of extreme weather events in Ireland and worldwide. This is a recipe for disengagement and apathy.

Unfortunately, the range of health co-benefits of climate action, discussed in Section 4, have received scant attention. There is therefore an opportunity for Government and other stakeholders to engage more positively with the public on climate action and enlist their support for necessary system level change by highlighting potential short-term health co-benefits of climate action, including beneficial effects on diet, the food environment, public transport, access to green spaces, air quality and home insulation, all framed within the context of our obligations to our children and future generations.

To move this agenda forward, the Government should add public health to the list of areas of relevant expertise to be considered by the Minister in making appointments to the Climate Advisory Council. While we are moving towards a whole-of-government approach to the climate crisis, there is also an urgent need to establish an interdepartmental working group (chaired by An Taoiseach and involving a range of Departments, including health, environment, agriculture, local government, transport, tourism, sport and culture) with a specific focus on the health co-benefits of working towards the GHG emission reduction targets for 2030 specified in the Climate Action and Low Carbon Development Act, 2021.

Alignment on climate action and public health policy will depend on deep engagement and collaboration with relevant local and national public, NGO and private sector stakeholders, including the National Healthy Cities and Counties of Ireland Network, the Sláintecare Healthy Communities Programme and local Community Development Committees. The Healthy Cities movement has demonstrated the key role of local government and local communities in promoting health and wellbeing and reducing regional and social inequalities in health by creating and continually improving our physical and social environments, including for example, work on social isolation, air quality, the promotion of active travel and access to green spaces and the promotion of a healthy and sustainable food environment⁽¹⁸⁷⁾.

5.4 Promotion of health and wellbeing through taxation

We welcome and support the recommendations on the use of taxation to promote public health in Ireland as set out in *Foundations for the Future: Report of the Commission on Taxation and Welfare*, published in July 2022. We recommend the establishment of an expert group to advise the Government on the implementation of the Commission's recommendations in chapter 15 of the report, titled *Promoting Good Public Health*. In particular, we note the report's recommendation that the

“Government develop fiscal measures which could be introduced to encourage a reduction in the consumption of ultra-processed foods, to support reformulation measures to reduce the harm of such foods and promote healthier eating”.

Taxes on ultra-processed foods: It is noteworthy that the Commission on Taxation and Welfare has highlighted the growing evidence of an association between ultra-processed food consumption and adverse health outcomes, as discussed in Section 2. In examining the potential for fiscal measures to reduce consumption of ultra-processed food and the best approach to such measures, the Department of Health should immediately seek to progress the proposed evaluation of the sugar-sweetened drinks tax, as specified in *A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016–2025*.

In Mexico, a peso-per-litre (roughly \$0.80 per litre) tax on SSBs enacted in 2014 resulted in an average reduction in sales of 7.6% of taxed beverages two years after implementation⁽¹⁹¹⁾. Households at the lowest socioeconomic level had the largest decreases in purchases of taxed beverages over this time, and purchases of untaxed beverages increased by 2.1%⁽¹⁹¹⁾.

Modelling the effect of food taxes and subsidies on population health and health costs:

While many countries have now implemented taxes on sugar-sweetened drinks, few have implemented food subsidies or taxes on other products, reflecting uncertainty about substitution effects between foods and concerns that food taxes are regressive. In a significant international collaborative study, published in 2020, researchers modelled and compared the effects in New Zealand of (i) a 20% fruit and vegetable subsidy, (ii) saturated fat, sugar and salt taxes (each set at a level that increased the total food price by the same magnitude of decrease from the fruit and vegetable subsidy) and (iii) an 8% tax on non-essential, energy-dense food (broadly equivalent to ultra-processed foods)⁽¹⁹²⁾. The group modelled the effect of price changes on food purchases, the consequent changes in fruit and vegetable and sugar-sweetened beverage purchasing, nutrient risk factors and body-mass index, and how these changes affect health status and health expenditure. In this rigorous modelling study, drawing on rich and extensive public health nutrition databases in New Zealand, the authors estimated the largest health gain for a sugar tax. However, all modelled food taxes and subsidies brought health gains larger than a comparably modelled 10% per annum increase in tobacco tax from 2011 to 2025. Estimated health expenditure savings are also large, ranging from US\$500 to \$2000 per citizen over the remainder of their lives, even when discounted at 3% per annum⁽¹⁹²⁾.

Restrictions on food and drinks promotion: In the context of the Report of the Commission on Taxation and Welfare, it is also recommended that the Government progress the Public Health (Obesity) Act, with restrictions on food and drinks promotion and advertising aimed at children, as also flagged in the 2016 Obesity Policy and Action Plan. A compelling case can be made for:

- banning all online marketing of junk food and drinks
- extending the broadcast watershed for junk food ads to 9:00 pm
- removing junk food ads from State-owned transport, buildings and other public infrastructure.

Regarding the protection of children from marketing practices that promote overweight and obesity with consequences for health and wellbeing, the issue of whether current practices are in breach of the 2015 children’s rights amendment of the Constitution merits active consideration.

5.5 Investment in Ireland's public health infrastructure

As discussed in Section 4, the Healthy Ireland framework represents a broad, comprehensive and inspiring vision for promoting health and wellbeing and preventing disease and premature mortality in Ireland. However, to narrow the gap between the vision and aspirations of Healthy Ireland and the level of implementation of core actions and progress on key outcome measures, there is an urgent need for greater investment in the human capital and the processes required to understand, protect and promote the health and wellbeing of the population, including the capacity to plan for our future health and social care needs and respond appropriately to a wide range of potential public health emergencies.

In broad terms, we need to invest in people, data systems, and the physical infrastructure required to support large, dynamic, multidisciplinary public health teams at the level of scale that we take for granted within the health care system. Investment in the public health workforce is a priority. In response to the COVID-19 pandemic, the issue of whether public health medicine consultants should receive the same level of remuneration as hospital consultants was finally resolved. However, public health is broader than public health medicine. We need to invest in training and career development within public health departments and other agencies for non-clinical public health staff, many with undergraduate and post graduate qualifications in public health, health promotion or in related disciplines such as statistics, health informatics, microbiology, psychology and economics.

Data on the health and wellbeing of the population is our core currency in public health. We need to urgently progress the issue of unique health identifiers and address the legal, ethical, practical and scientific issues that currently impede our ability to access, share, link and analyse large and complex population health and health services datasets. These are critical areas of public health infrastructure where Ireland has fallen well behind international norms. We also need to address the issue of physical infrastructure; Ireland's public health and health promotion agencies, departments and units are widely and inefficiently dispersed. In addition, the continued separation of academic public health units from service-oriented public health departments cannot be justified.

In the interest of clarity and focus on this issue, we recommend that the Department of Health document and set specific targets for the proportion of total health spending allocated to public health and prevention activities.

Working group on multidisciplinary public health and health promotion in Ireland:

In 2020, the Institute for Public Health in Ireland established a broadly representative Working Group, chaired by Professor Ivan Perry and commissioned Crowe, a consultancy firm, to develop a discussion paper on the *"Recognition and Regulation of Multidisciplinary Public Health and Health Promotion in Ireland"*. The discussion paper, published in June 2023, examined public health systems in nine other countries – Wales, Australia, Canada, Finland, Israel, the Netherlands, New Zealand, Slovenia, and Switzerland¹². The authors also sought the views of stakeholders already working within existing structures in Ireland and drew on insights from international experts in the field of public health.

¹² See <https://www.cdc.gov/climateandhealth/effects/default.htm>

Stakeholders in Ireland identified a problem of “trapped talent” with skilled graduates and practitioners unable to enter career pathways in public health beyond the routes available for medical graduates. This has resulted in “lost talent”, with staff moving to other disciplines or working in public health abroad. The paper highlighted the success of the Welsh multidisciplinary public health model, which has been supported by modernised public health legislation and strategy, integration with local government, and a registration system for a wide range of public health practitioners. Based on discussion with international leaders and academic experts in the field of public health it is proposed that a similar multidisciplinary workforce could be developed in Ireland through a strategic roadmap, inter-disciplinary competency frameworks for skills development, a registration system for public health professionals, as well as a regulatory body, accreditation, and professional development. The discussion paper concludes that, to be prepared to address current and future challenges, the public health workforce will need sufficient breadth of skills, diversity and capacity to meet these demands, to address the socioeconomic and environmental determinants of health, and to work across sectors, borders, professional disciplines, agencies, and specialities. It is anticipated the recommendations in this report will inform those emanating from the Public Health Reform Expert Advisory Group (established by the Minister of Health in January 2022) and the ongoing work on the Public Health Reform Programme, led by the Chief Clinical Officer (CCO).

5.6 CVD prevention targets and population health monitoring

Given the recent slowdown in the CVD-mortality decline in Ireland, the Department of Health and the HSE need to develop specific and ambitious targets for reductions in CVD mortality, incidence and prevalence over the next decade. These need to draw on high quality population health and health services datasets and be augmented by sustained, high level investment in the annual Healthy Ireland (HI) surveys. Efforts to reduce CVD mortality, incidence and prevalence also need to leverage international collaboration on disease burden and modelling via the international Global Burden of Disease (GBD) network.

The quality of data from the Healthy Ireland surveys is critically dependent on response rates. Current response rates are approximately 60% across households where it is possible to make contact. Response rates at this level are close to the margins of scientific validity. Therefore, current prevalence estimates for CVD risk factors and related variables depend heavily on technical adjustments, including population weighting and non-response adjustments. Given current unfavourable trends in participation rates in health and lifestyle surveys among the general public, significant investment in survey fieldwork resources will be required to ensure and sustain response rates for the HI surveys at the level required to track significant trends in health and wellbeing and evaluate the effects of policy.

In the specific context of CVD prevention targets, we recommend annual tracking of the distribution of the five core protective behaviours among adults in the general population: being physically active, a non-smoker, a moderate alcohol consumer, having adequate fruit and vegetable intake (or an alternative marker of diet quality) and maintaining a healthy body weight, supplemented by regular surveys involving measurement of blood pressure, glycosylated haemoglobin and blood lipids.

5.7 Diet, physical activity, obesity and CVD prevention

5.7.1 Overview

As detailed in Section 2, poor diet, lack of exercise and obesity together with smoking are the major causes of cardiovascular disease in Ireland and globally. As detailed in Section 4, the importance of these factors in the prevention of CVD and the promotion of health and wellbeing is well acknowledged in the Healthy Ireland framework. These issues are currently being addressed through a range of policy initiatives, action plans, care models and collaborative initiatives, including but not confined to:



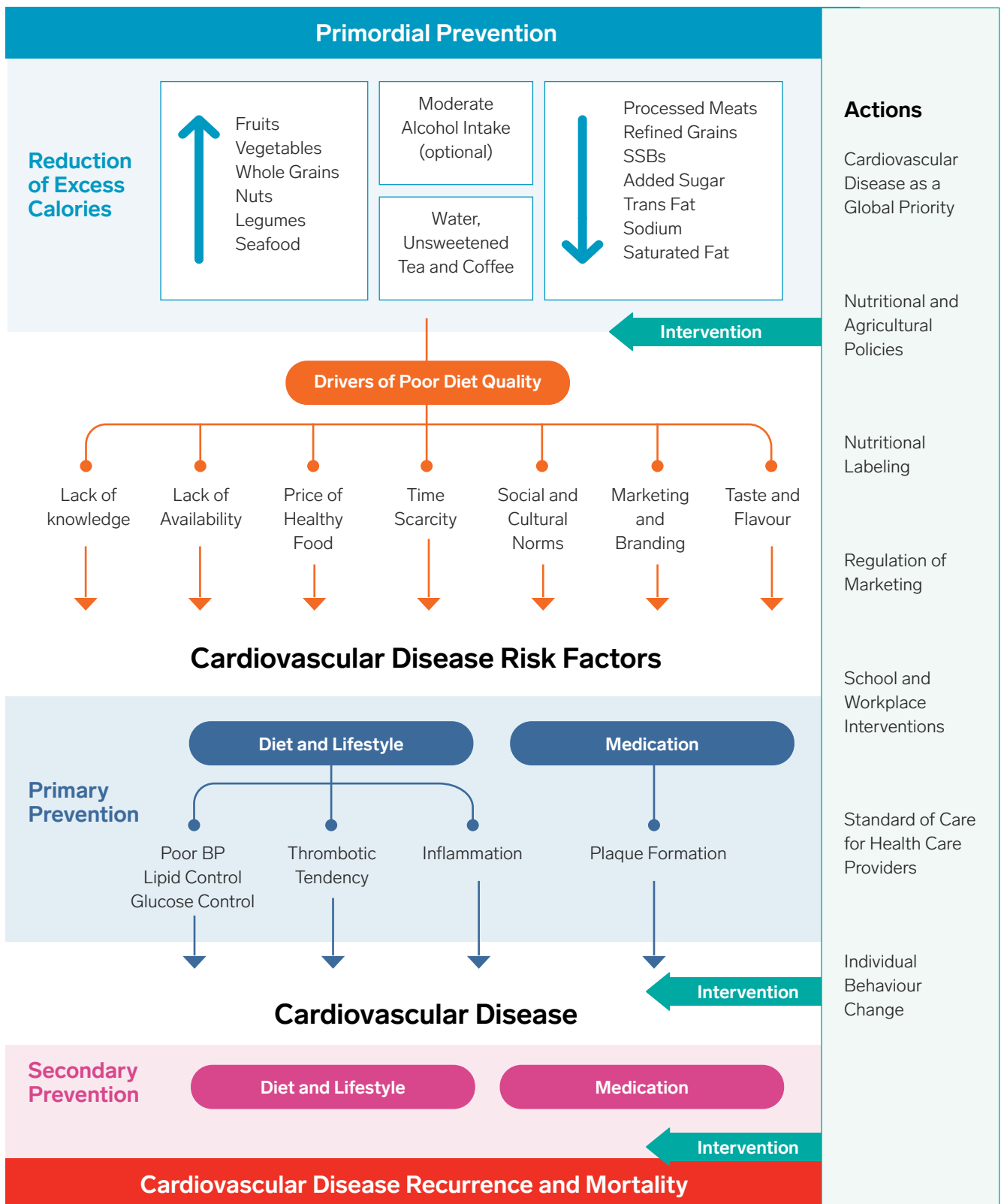
A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016–2025 and



Get Ireland Active, the National Physical Activity Plan for Ireland.

The current recommendations on diet, physical activity and obesity are framed in the context of the Healthy Ireland framework and the wider policy environment, and the need to prioritise system-wide, policy level interventions for primary CVD prevention as opposed to individual and health system level interventions, as summarised by Yu and colleagues⁽¹⁹³⁾ (Figure 36). They draw on international evidence on effective interventions and policies, including data from observational studies, trials and modelling studies, together with national guidelines such as the UK NICE public health guidelines on cardiovascular disease prevention⁽¹⁰⁾ and the findings and recommendations from the Report of the Commission on Taxation and Welfare (discussed above), the Food Environment Policy Index (Food-EPI)⁽¹⁶⁵⁾, the Obesity Policy and Action Plan (OPAP) mid-point evaluation report⁽¹⁶⁸⁾, the Roadmap for Food Production Reformulation in Ireland⁽¹⁷¹⁾ and the Physical Activity Environment Policy Index (PA-EPI)⁽¹⁶⁶⁾.

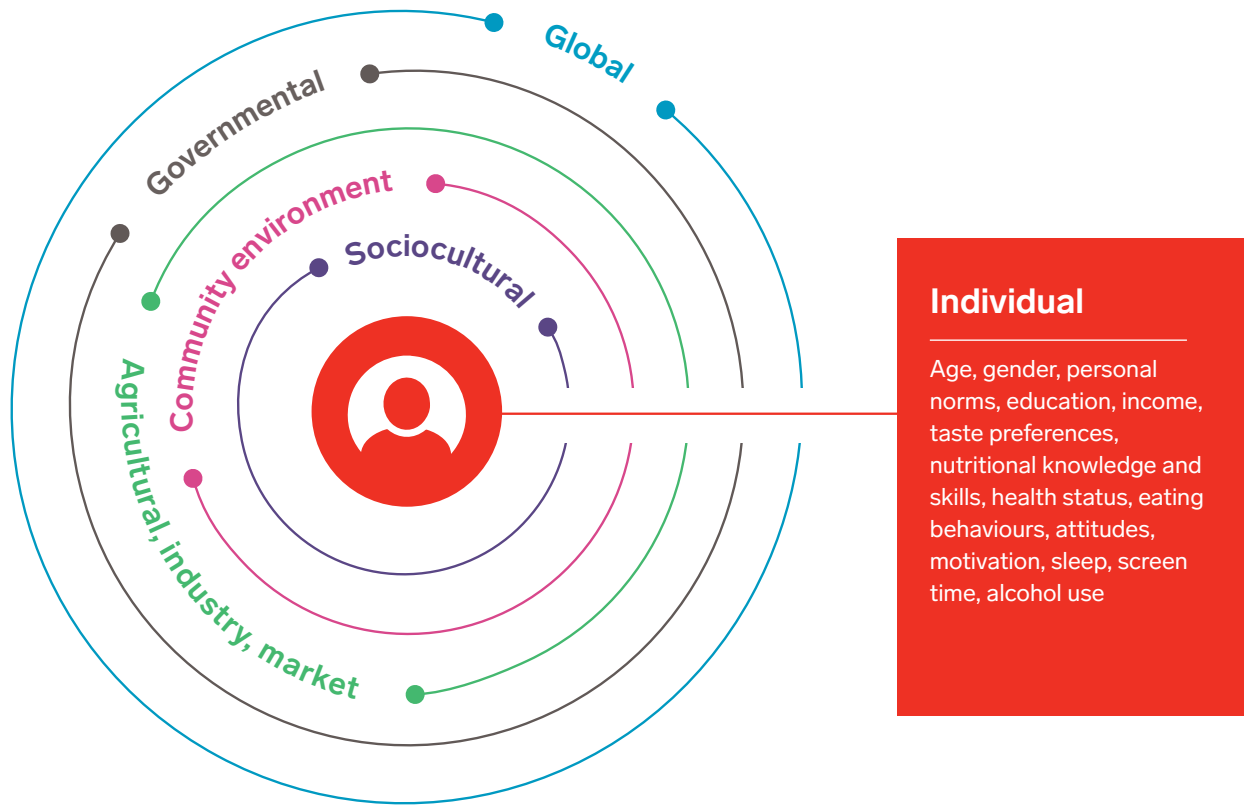
Figure 36: Cardiovascular disease prevention by diet modification⁽¹⁹³⁾



The promotion of healthy dietary habits and physical activity and the prevention of obesity in the population depends on actions at multiple levels, from the individual to the global level, as summarised for healthy diet by Dariush Mozaffarian and colleagues (see Figure 37).

Figure 37: Potential levels of intervention in the promotion of healthy diet ⁽¹⁹⁴⁾

Barriers and opportunities for healthy eating



Individual

Age, gender, personal norms, education, income, taste preferences, nutritional knowledge and skills, health status, eating behaviours, attitudes, motivation, sleep, screen time, alcohol use

Sociocultural

Social and culture norms
Social support
Social class
Race-ethnicity

Community environment

Workplace food environment
School food environment
Food availability at local stores
Accessibility to supermarket and grocery stores
Accessibility to restaurants and fast food outlets
Accessibility to transport
Neighbourhood socioeconomic status

Agricultural, industry, market

Land use transportation
Food production and distribution systems
Food and beverage industry incentives
Agriculture and food industry lobbying
Food and marketing and media
Food safety

Governmental

Government society structures
Government policies
Food and agricultural policies
Food assistance programs
Economic systems
Healthcare systems

Global

Global food availability
Climate and season
International trade agreements
International food standards
International commodity pricing
International food distribution and shipping
Multinational corporate lobbying
Dietary research and science

5.7.2 Mandatory limits on the salt content of bread and processed meat

In Section 2, we highlighted the evidence from observational studies and clinical trials linking dietary salt intake to the development of hypertension and the incidence of coronary heart disease and stroke. In Section 3, we summarised the findings from modelling studies on the profound effects (comparable to tobacco control) of population-wide salt reductions on the burden of morbidity and mortality from CVD. In Section 3, we also discussed the effectiveness hierarchy of preventive interventions and the extent to which ‘downstream’ preventive activities addressing salt intake, such as 1:1 personal advice and food labelling, are markedly less effective than interventions aimed further ‘upstream’ such as regulation and market control. In addition, we presented the findings from an Australian modelling study on which interventions offer best value for money in the primary prevention of cardiovascular disease. In these analyses it was estimated that best value for money (by a considerable margin) is achieved by mandating moderate limits on salt in the manufacture of bread, margarine and cereal⁽¹²⁰⁾.

Spanish government initiative on dietary salt intakes: As of April 2022, the Spanish government has a mandatory upper limit of 1.31 grams of salt per 100 grams of bread (13.1 g of salt per kilogram of bread or the corresponding 0.52 g of sodium per 100 g of bread). The mandatory upper limit was announced in May 2019, thereby given the food industry three years to make the required adjustments to manufacturing processes. It is noteworthy that this mandatory approach to reformulation is permissible under current EU single market regulations.

We recommend that Ireland adopt a similar approach and specify mandatory upper limits to the salt content of bread and other major sources of salt in the Irish diet, such as processed meat, with a 2–3-year lead time. This would lead to significant reductions in population level salt intakes in Ireland with positive impact on CVD morbidity and mortality. The possibility of mandatory reformulation of additional food products would also accelerate progress towards the targets agreed under the current voluntary food reformulation programme.

Multi-component interventions addressing salt intake: The impact of mandatory upper limits on the salt content of bread and other processed food would be greatly enhanced if it formed part of a multi-component intervention with linked initiatives addressing food labelling, public sector procurement and mass media campaigns, similar to approaches that have been successfully adopted in Japan and Finland⁽¹⁹⁵⁾. These issues are addressed below.

5.7.3 Implementation of recommendations from 2020 Irish Healthy Food Environment Policy Index (Food-EPI)

As detailed in Section 4, the Irish healthy Food Environment Policy Index (Food-EPI)⁽¹⁶⁴⁾ benchmarked current Irish policies for tackling obesity and creating healthier food environments against international best practice. While Ireland rates well against international benchmarks in some policy areas, a total of eight food environment policies were rated as having ‘low’ implementation compared to best practice:

- the limited use of fiscal policies to support healthy food choices
- the need for greater emphasis on reducing the marketing of unhealthy foods to children on social and non-broadcast media and the need for measures to restrict the promotion of unhealthy foods to children on food packaging
- the need for food composition targets/standards for processed foods and targets for out-of-home meals
- the need for evidence-informed labelling for front-of-pack displays and menu boards
- no discernible progress towards establishing public sector procurement standards for food service activities to provide and promote healthy food choices
- limited support for communities to limit availability and accessibility of unhealthy food outlets including the lack of zoning legislation “No Fry Zones” to prohibit the placement of unhealthy food outlets within 400 metres of primary and secondary schools and failure to implement policies that encourage availability of outlets selling nutritious foods
- limited support for private companies to promote healthy foods in their workplaces
- the need for income support programs for healthy foods.

It is noteworthy that the Food-EPI is cited in the 2022 Report of the Commission on Taxation and Welfare. Actions to address these food policy issues would contribute significantly to the primary prevention of CVD, type 2 diabetes and other non-communicable disease in Ireland. We also recommend ongoing commitment and engagement with this informative national food policy and food environment quality audit.

Food labelling: The issues of fiscal policies, food marketing and food composition targets/standards are addressed briefly above. The issues of food labelling and public sector procurement are considered in detail in the 2021 Roadmap for Food Production Reformulation in Ireland⁽¹⁷¹⁾ and, as detailed in Section 4, and were addressed in the EU Joint Action Best ReMaP programme (Best practices in Reformulation, Marketing, and Public Procurement)⁽¹⁷⁴⁾.

It is clear that food reformulation needs to be combined with both front-of-pack food labelling initiatives to signpost the consumer towards healthier food choices and appropriate public awareness campaigns. The Irish Government should continue to endorse and promote *Nutri-Score*,

a relatively simple, front-of-pack, whole food approach to food labelling as opposed to the more complex nutrient-based food labelling approaches. As detailed in Section 4, *Nutri-Score* labelling is currently being promoted and supported at EU level, based on evidence of its positive effects on consumer behaviour/dietary intakes. We have evidence from Ireland that consumption of food products with higher (unfavourable) *Nutri-Score* ratings is associated with markers of increased risk of cardiovascular disease.

‘No fry zones’: In 2018, the Oireachtas Children’s Committee Report on Childhood Obesity recommended the introduction of planning legislation that would ban unhealthy food outlets being located within 400 metres of schools. Movement on this issue is vital in tackling obesity and CVD risk and should be combined with the setting of minimum standards for portion size and nutritional quality in the fast food and broader out-of-home eating sector. The latter standards would ideally be monitored and enforced by local environmental health officers.

Promotion of healthy foods in their workplaces: It is imperative that the public sector, including the HSE and local government, take a lead on promoting healthy food in the workplace. Regarding private sector workplaces, we have Irish evidence from a pragmatic non-randomised intervention study, that an intensive and well-resourced healthy catering initiative has the potential to achieve significant improvements in dietary intakes in the workplace with beneficial spill over on consumption in the home, a fall in body mass index and reduced workplace absenteeism, achieved at an estimated cost of €100 per QALY⁽¹⁹⁶⁾ (197) (198). While these findings require replication in a cluster randomised controlled trial, they raise the possibility for greater private sector engagement with the promotion of healthy dietary habits.

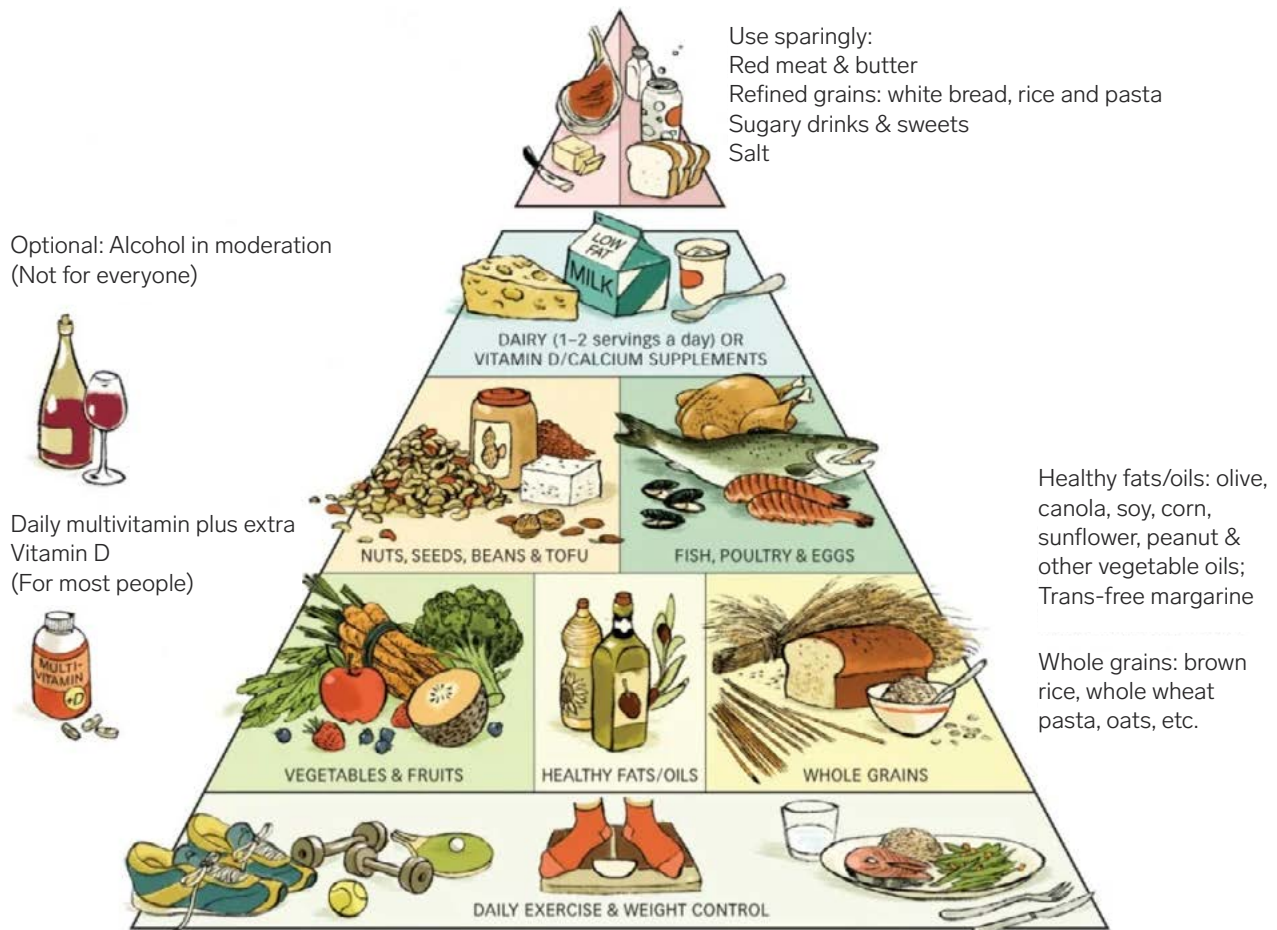
Food poverty: The Roadmap for Social Inclusion 2020–2025, published in January 2020, is the national strategy for poverty reduction and improved social inclusion. It includes a commitment to further explore the drivers of food poverty and identify mitigating actions. In 2021, the Government committed €89 million to programmes, schemes and supports that address food poverty. This is obviously a priority issue in the promotion of health and wellbeing at all times but particularly during the current period of high food inflation and rising energy costs.

5.7.4 Obesity Policy and Action Plan (OPAP) mid-point evaluation report

As highlighted in Section 4, the independent evaluation of the Obesity Policy and Action Plan rated only 10% of actions (6/60) with high levels of implementation and only 23% (14/60) of actions as having achieved high levels of progress. The OPAP is one of the Government’s flagship public health programmes under the Healthy Ireland framework. There is evident commitment to the programme from the Department of Health with an active Obesity Policy Implementation Oversight Group (OPIOG) led by a senior civil servant with engagement of relevant stakeholders and dedicated resources. Thus, the findings from the mid-point evaluation are a cause of concern and highlight the capacity deficits in Ireland’s public health infrastructure, discussed above.

A revised national food pyramid: The mid-point evaluation report highlighted the need for further work on the development and implementation of a dedicated nutrition policy and action plan, notwithstanding the excellent work completed to date on this issue in the Department of Health. Based on the scientific evidence on diet and health, summarised in Section 2 of this paper and the policy issues considered in Section 3, we recommend that the Department of Health set out a revised national food pyramid for Ireland designed to promote both human and planetary health, inspired by the Harvard healthy eating pyramid (see Figure 38) and adapted as much as possible to Ireland’s climate and food production capacity, drawing on relevant national and international expertise, including the ongoing work of the EAT-Lancet Commission on healthy diets from sustainable food systems⁽¹⁸⁵⁾. Ultimately, we need to develop cohesive food, nutrition and agriculture and agri-food policies that do not compete against one another.

Figure 38: Harvard School of Public Health Healthy Eating Pyramid



5.7.5 Promotion of physical activity and the Physical Activity Environment Policy Index (PA-EPI)

There is widespread agreement on the need for major investment in Ireland's walking and cycling infrastructure over the next decade, consistent with climate change targets for 2030 and other relevant government policies including those relevant to public health, sport and tourism. It is noteworthy however that the OPAP mid-point evaluation report identified two action gaps relevant to these objectives: (i) the development of guidelines to support materials for those working in the built environment for urban development and planning, and (ii) the development and implementation of a national physical activity surveillance system. Similarly, in the Physical Activity Environment Policy Index (PA-EPI) report, summarised in Section 4, it is a cause of concern that:

- there were no indicators with a 'high' level of implementation across any of the policy and infrastructure support statements
- all the indicators in the 'transport', 'urban design' and 'healthcare' domains were rated as having 'low' implementation compared with international best practice
- the implementation of regulations for buildings that promote physical activity received a 'Very little / no implementation' rating⁽¹⁶⁶⁾.

Both the PA-EPI and the OPAP mid-point evaluation report provide a clear agenda for government and local authorities to address core issues in relation to urban planning, infrastructure and amenities, building design, regulatory and design guidelines and frameworks as set out in detail in the WHO's *Global Status Report on Physical Activity, 2022*⁽¹⁹⁹⁾.

Measures to reduce sedentariness: In addition to the promotion of physical activity, measures to reduce levels of sedentariness, especially in the workplace, are urgently needed. In this context, of particular interest are findings, published in 2022, from a cluster randomised controlled trial addressing sedentariness in office workers. This study assessed the impact of a multicomponent intervention, including a height adjustable desk, on daily sitting time in 756 desk-based employees recruited from 78 workplaces in the UK. Two of three interventions, which included educational components, were associated with a significant reduction in sitting time. However, the addition of a height-adjustable desk was found to be particularly effective⁽²⁰⁰⁾.

5.8 Tobacco control

As discussed in Section 4, Ireland has emerged as a global leader in tobacco control over the past two decades. In *Tobacco-Free Ireland 2013*, Ireland joined a small number of countries that have committed to leading the way in transitioning its efforts from ‘tobacco control’ to ‘tobacco endgame’. This reflects ambition and effective leadership from Government, the Department of Health and the HSE. However as discussed in Section 4, we face ongoing challenges in our efforts to address the scourge of preventable suffering and death from tobacco products. Tobacco control spending per capita by the government is lower than in other European countries, including France and the Netherlands. Regulation of e-cigarettes is also weak relative to international benchmarks, and we are failing to keep pace with the changing product landscape of innovative and novel tobacco and nicotine products. The use of e-cigarettes has increased in adolescents and during pregnancy. The recommendations that flow from this overview of tobacco control policy are therefore clear:

- (i) sustain and further increase the current high level of tobacco taxes adjusted for GDP;
- (ii) implement new legislation increasing the legal age of sale of tobacco products and e-cigarettes from 18 years to 21 years, a measure that has reduced smoking in that age group in the US by up to one third;
- (iii) begin a consultation process on the implementation of New Zealand style smoking restrictions in Ireland, including measures to prevent children born after a certain date from ever legally purchasing tobacco or products or e-cigarettes, reduce the amount of tobacco allowed in tobacco products and cut the number of retailers allowed to sell tobacco by 90%;
- (iv) increase regulation of e-cigarettes and newer nicotine products among youths and adolescents;
- (v) design and launch awareness campaigns addressing the use of e-cigarettes and related nicotine products during pregnancy;
- (vi) allocate additional funding to Ireland’s tobacco control budget.

5.9 Air quality

While air quality in Ireland is generally good, it does not meet current WHO guidelines for a number of pollutants including particulate matter (PM), nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and ozone (O₃). In addition, there are an estimated 1,300 premature deaths in Ireland per year due to particulate matter in our air. Reductions in the burden of disease linked to air quality (including significant effects on coronary heart disease and stroke) will form a significant element of the health co-benefits of working towards the greenhouse gas emission reduction targets for 2030. Although Ireland collects and retains extensive data on air quality, we need to address significant barriers to linking air quality and health data due to limited investment in digital health, limited development of a trusted, secure research environment infrastructure for data linkage and the lack of national unique health identifiers.

In the broader context of policy alignment on climate action and public health the following recommendations are offered:

- Adopt the 2021 WHO Air Quality Guidelines as legally binding targets.
- Improve enforcement of existing air quality legislation by providing additional resources to local authorities for monitoring and enforcement and increasing penalties for breaches of regulations.
- Transition from the remaining solid fuels available and support those in energy poverty who are most reliant on these traditional forms of home heating.
- Expedite and allocate necessary resources to meet the national retrofitting scheme target of 500,000 homes by 2030, prioritising social housing and households most vulnerable to energy poverty.
- Facilitate a shift to more sustainable forms of active travel, including walking, cycling, and public transport, by rapidly expanding infrastructure and deterring private car use while supporting those in rural Ireland to transition from fossil fuel vehicles to cleaner electric vehicles.
- Develop an all-island air quality strategy in coordination with the government of Northern Ireland and establish a statutory alignment of air quality legislation.

5.10 Interventions in the clinical arena

5.10.1 Hypertension awareness, detection and control

The detection and effective treatment of high blood pressure in the primary prevention of cardiovascular disease is clearly of critical importance. As discussed in Section 3, the challenges of hypertension awareness, detection and control have been addressed over many decades. While there is evidence of progress in some settings, there are no panaceas. Irish data on the hypertension control cascade (levels of hypertension awareness, treatment and control in the population) are now over 10 years old and should be updated in a Healthy Ireland survey or through a dedicated Department of Health or HSE-funded national study.

Hypertension awareness: The available evidence suggests that mass media campaigns on levels of blood pressure awareness and detection in the population have a variable and often short-lived impact, but a case can be made for a sustained and well-resourced campaign, led by the Irish Heart Foundation with support from the Department of Health and potentially the health insurance sector.

Hypertension detection and control: Phase 2 of the HSE Structured Chronic Disease Management Programme in general practice, launched in 2022, provides for opportunistic case finding (OCF) to enhance the detection of hypertension and other risk factors for CVD, including atrial fibrillation. This a welcome development, particularly if it is linked to a broader support structure or programme, including self-monitoring of blood pressure, appointment reminders,

nurse and/or pharmacist-led care, as highlighted by Professor Liam Glynn and colleagues in their 2010 Cochrane review. The operation of the HSE Structured Chronic Disease Management Programme in general practice, including its further development, as suggested here, will require rigorous and continuous audit and quality control.

5.10.2 CVD risk factor screening in primary care

Clinical trials do not support widespread, whole population CVD risk factor assessment in primary care. However, based on data from the NHS Health Check Programme, a tentative case on grounds of effectiveness and equity can be made for screening in the most deprived areas of the country, where CVD risk is concentrated, if the screening is combined with structural population-wide interventions targeting unhealthy diet and tobacco control, as addressed above. The case is tentative due to concerns about uptake of screening and cost effectiveness, as discussed in Section 3.

Based on evidence summarised in Section 3, it is worth considering an individual practice level strategy of estimating patients' cardiovascular risk score from existing practice records before issuing an invitation for screening. Unfortunately, however, the costs per QALY estimated from rigorous studies of such targeted screening strategies compare extremely unfavourably with system level, upstream, population-based strategies for primary CVD prevention.

In this context, the ongoing work led by the Irish Heart Foundation and University College Dublin (UCD) on the development of a High-Risk Prevention Behaviour Change Programme (HRPP) in general practice is of particular interest. As discussed in Section 4, the issues of scaling, effectiveness and cost effectiveness are uncertain and will require rigorous evaluation in a large-scale intervention study.

5.10.3 CVD risk factor screening and management in the pharmacy setting

Based on the evidence summarised in Section 3, a strong case can be made for CVD risk factor screening and management in the pharmacy setting. One research study indicated that delivery of a one-stop cardiovascular risk assessment service by community pharmacies is feasible in the setting of a large city in the UK. The research identified an appreciable number of individuals – around two-thirds of those screened – for whom intervention for cardiovascular risk or an additional risk factor was indicated. In this study, there was higher than expected uptake among individuals from more deprived areas and areas with a minority ethnic background. There is also good evidence from randomised controlled trials and economic analyses that pharmacist interventions on blood pressure management are highly cost effective.

As discussed in Section 3, the findings from the Irish Pharmacy Union pilot study to detect hypertension and atrial fibrillation in the community were encouraging. However, further work is needed to assess the feasibility of scaling the intervention at national level, the uptake

of screening, the scope for involving pharmacists in Ireland in the management of confirmed hypertension and the overall cost effectiveness of both screening and potential management interventions in the pharmacy setting.

5.10.4 Multifaceted screening for asymptomatic CVD

Although beyond the scope of this paper, there is evidence that multifaceted screening for asymptomatic CVD, specifically for abdominal aortic aneurysm, peripheral artery disease, hypertension and dyslipidaemia in older men may be effective, and possibly cost-effective. Additional long term follow-up data from the excellent Danish DANCAVAS trial (summarised in Section 3) will be highly informative in this regard.

5.10.5 Use of emerging technologies in CVD risk factor detection and management

There is some evidence that smartphones and Bluetooth®-enabled tele-monitoring devices may have a role to play in CVD risk factor detection and management, including detection of hypertension and atrial fibrillation, the management of hypertension and the monitoring and promotion of walking (with step counters) and other forms of physical activity. Unfortunately, however, it is difficult to offer specific recommendations in this area due to the paucity of evidence from well-designed intervention studies. However, the WHO-endorsed Stroke Riskometer mobile app(201), developed and supported by an Australian research group with an international profile in stroke prevention, should be validated and assessed in Ireland.

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**Irish Heart
Foundation**

The National Stroke & Heart Charity

Irish Heart Foundation,
17-19 Rathmines Road Lower,
Dublin 6, D06 C780

 01 668 5001
 01 668 5896

 info@irishheart.ie
 www.irishheart.ie

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