WORLD HEART FEDERATION

WORLD HEART REPORT 2025

OBESITY & CARDIOVASCULAR DISEASE

CONTENTS

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The World Heart Report on Obesity and Cardiovascular Disease is the third in the World Heart Federation's (WHF) flagship series. WHF is grateful for the substantive contributions of the World Obesity Federation (WOF) and the University of Essex - Institute of Public Health and Well-Being (contributor to all three reports). We also gratefully acknowledge the support of Eli Lilly and Pfizer that made this World Heart Report possible. The content of the World Heart Report 2025 on Obesity and Cardiovascular Disease is the sole remit of the WHF.

AUTHORS

Francisco Lopez-Jimenez*, Mariachiara Di Cesare*, Jaynaide Powis, Shreya Shrikhande, Elisa Codato, Bin Zhou, Honor Bixby, Marvellous Adeoye, Natalie Evans, Kyla Lara-Breitinger, Mariana Arellano Rodriguez, Lisa Hadeed, Simon Barquera, Sean Taylor, Pablo Perel, Daniel Piñeiro, Jagat Narula, Fausto Pinto

REVIEWERS

Rick Chazal, Carl Lavie, David Lloyd, Amam Mbakwem, George Mensah, Bente Mikkelsen, Dorairaj Prabhakaran, Greg Roth

EDITOR

Edward Fox

*Joint first authors

EXECUTIVE SUMMARY

ONCE CONSIDERED AN ISSUE CONFINED TO HIGH-INCOME COUNTRIES, OBESITY IS NOW A FAST-INCREASING CHALLENGE FOR NEARLY EVERY COUNTRY OF THE WORLD, WITH PERVASIVE ECONOMIC AND HEALTH IMPACTS, PARTICULARLY AS IT RELATES TO THE WORLD'S BIGGEST KILLER – CARDIOVASCULAR DISEASE (CVD).

In 2022, 878 million adults lived with obesity, a quadrupling of the 194 million who lived with the disease in 1990. If the current growth trends continue, it is projected that nearly 2 in 3 adults aged 25 years or older could live with overweight or obesity by 2050.

The economic impact of overweight and obesity is significant and rising. Costs to the global economy from obesity-related healthcare needs, productivity losses and death are estimated to amount to 2.2% of global Gross Domestic Product (GDP) (just under US$2 trillion per year) and could reach 3% annually by 2060. Low- and middle-income countries (LMICs) and their health systems are set to bear the brunt of these impacts, though almost all countries will be affected.

In health terms, high Body Mass Index (BMI) causes 3.7 million deaths per year and are leading drivers of deaths from CVD. For example, annual global deaths from CVD attributable to high BMI more than doubled to 1.9 million in three decades, and high BMI now account for nearly 1 in 10 of all CVD deaths. That proportion is increasing in all but two regions of the world.

The prevalence of obesity and the number of CVD deaths attributed to the disease vary by country, region, age and sex. Despite these nuances, one thing is constant—the growing threat that obesity and overweight pose to current and future generations could quickly evolve into a crisis without urgent, coordinated action.

Crucial to efforts in tackling obesity and CVD is the need for a holistic approach across clinical and public health interventions that accounts for the myriad determinants of obesity. The role of these complex, interconnected factors underscores that obesity is far from being an individual choice. Determinants include environmental (access to exercise and green space), biological (genetic predisposition toward obesity), socio-economic status (income, education and occupation), and commercial (policies/regulations that address food marketing and affordability), among others.

Positive steps have been taken in recent years, with the implementation of several global, national, and local initiatives that show promise in tackling obesity and CVDs, in addition to the emergence of potentially game-changing medical interventions, such as glucagon-like peptide-1 receptor agonists (GLP-1RAs).

WHAT'S NEEDED NOW IS AN URGENT SCALING UP OF EFFORTS ACROSS ALL LEVELS, THAT INCLUDES EQUITABLE ACCESS TO INTERVENTIONS FOR ALL THOSE WHO SUFFER FROM THESE DISEASES.

NEARLY 2 IN 3 ADULTS AGED 25 YEARS OR OLDER COULD BE LIVING WITH OVERWEIGHT OR OBESITY BY 2050.

The World Heart Federation (WHF)—with its membership of more than 200 heart foundations, scientific societies, and patient organizations across more than 100 countries—is committed to working with all stakeholders to urgently reduce obesity and CVDs. To support efforts, this report provides the following key recommendations:

PUBLIC HEALTH INTERVENTIONS

1. Countries should implement evidence-based and cost-effective public health measures to address obesity and CVD, drawing on global frameworks and tools. Countries should also prioritise comprehensive, integrated, and equity-focused policies guided by national data on how determinants vary across population groups. Priority actions include national obesity roadmaps with defined targets, multisectoral policies addressing the broad scope of obesity determinants, and ensuring greater integration of obesity prevention and treatment into primary healthcare services.

2. Public health campaigns and policies must counteract the stigmatization of obesity through using person-first language, recognising that stigma is a hindrance to tackling obesity and CVD, and should also involve people living with obesity and CVDs.

CLINICAL INTERVENTIONS

1. Cardiovascular guidelines should incorporate obesity-specific recommendations to ensure CVD management is adequately adapted for people living with obesity. This includes equipping health professionals with the knowledge, guidance and tools necessary to optimally prevent, manage and treat obesity.

2. Health professional education and health system strengthening initiatives for obesity and CVD should focus on promoting person-centred, integrated care and where possible be responsive to disparities in obesity risk, prevalence and access to care.

3. Governments should increase efforts to expand the availability and affordability of obesity medications, such as GLP-1RAs. Governments should increase efforts to expand the public awareness, availability, and accessibility of specialized lifestyle modification programmes, such as nutrition, physical activity, weight loss, and cardiac rehabilitation programmes.

INTRODUCTION

Obesity is well established as a major contributing factor to the risk of CVD — a group of disorders that affect the heart, blood vessels, and blood — with multiple obesity-related mechanisms underpinning the development of CVD and leading to increased morbidity and mortality.

This third annual report from the World Heart Federation (WHF) will explore in depth the far-reaching impacts of obesity with a focus on the relationship of obesity with CVDs in adults. Obesity in childhood and adolescence is an important driver of early CVD risk factors and the development of CVDs later in life, which will be briefly covered.

Along with providing a comprehensive overview and analysis of the latest available data, this report aims to equip advocates, policymakers, and clinicians with the information they need to inform interventions that will help urgently reduce the burden of obesity and CVD.

Following an overview of the association between obesity and CVD, the report outlines the far-reaching health and economic impacts of obesity, including analysis of global prevalence levels and trends, and data on CVDs attributable to overweight and obesity. The report provides a comprehensive overview of the many factors that drive obesity levels and CVD before looking at successful interventions to mitigate their harms, including at the individual, community, and global levels.

10%
OF CARDIOVASCULAR DEATHS WORLDWIDE ARE DUE TO HIGH BMI

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The report uses the latest comprehensive data sources available that are disaggregated by country, age and sex[2,5] (see Online Appendix). Data presented are based on Body Mass Index (BMI), which remains inexpensive and straightforward to measure, and is widely used in epidemiological studies to effectively describe changes in obesity levels and impact of obesity on health conditions over time and across countries[10].

Three different classifications for global regions are used at different points in the report due to the need to draw from different data sets. These are noted where relevant—either in the text or figures—and include regional classification from the World Health Organization (WHO), the Institute for Health Metrics and Evaluation (IHME), and from the NCD Risk Factor Collaboration (NCD-RisC).

OVERWEIGHT, OBESITY AND CVD

Obesity—the existence of excessive body fat (adiposity)—is a major public health issue that hinders social development and economic progress[1]. In addition to being a disease itself, obesity is a risk factor for many non-communicable diseases (NCDs), including CVD, Type 2 diabetes and several cancers.

The WHO defines obesity in adults (aged 18 years or older) as having a BMI of 30 kg/m^2 or more, and overweight as a BMI of 25–29.9 kg/m^2. In children below the age of 5 years, overweight and obesity are defined respectively as weight-for-height >2 and weight-for-height >3 standard deviations above the WHO Child Growth Standards median, while in children aged 5–19 years, overweight and obesity are respectively defined as a BMI-for-age >1 and BMI-for-age >2 standard deviations above the WHO Growth Reference median[6].

While there are limitations associated with using BMI as a diagnostic tool for obesity and overweight in clinical practice (see section on the limitations of using BMI to define and diagnose obesity), it remains among the most useful, simple, and accessible indicators for disease surveillance, research studies, and estimating obesity at a population level. Consequently, the data in this report relies on BMI as a measure of obesity.

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THE LIMITATIONS OF USING BMI TO DEFINE AND DIAGNOSE OBESITY

BMI can present several diagnostic challenges—primarily that it does not differentiate between fat and lean mass.

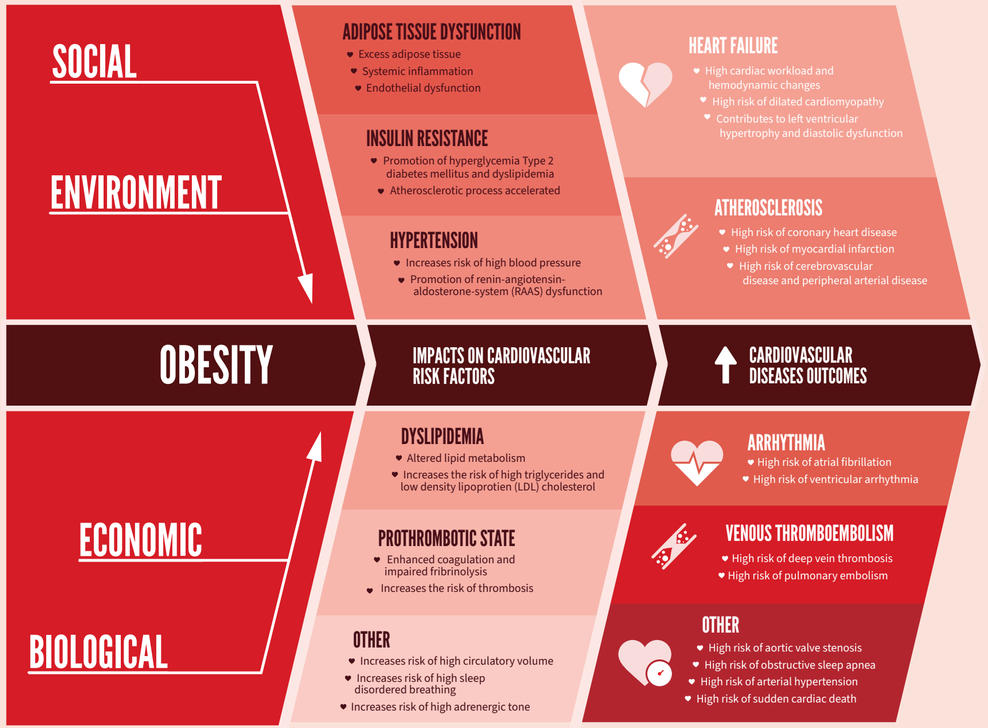
For example, individuals with high muscle mass may be categorized as living with obesity or overweight despite having low excess body fat and therefore low risk for other diseases. Conversely, those with low muscle mass, such as the elderly, might be assessed within a healthy BMI range, despite possessing elevated body fat percentages. Additionally, BMI fails to account for fat distribution, particularly the level of fat around and infiltrating the vital organs (visceral adiposity), which is more strongly associated with metabolic risk (a cluster of metabolic factors that are associated with an increased risk of developing CVDs, including high blood pressure, high triglyceride levels, impaired fasting blood glucose levels and excess abdominal weight).

Differences in the relationship between BMI and body fat across different ethnic groups further complicate the accuracy of BMI as a measure, potentially leading to underestimation or overestimation of health risks. These limitations underscore the necessity for more comprehensive assessment tools in clinical practice[7]. Obesity stakeholders have long called for a better way to define and diagnose obesity than strictly based on BMI. Recent efforts to arrive at a common standard include the 2025 Lancet Commission on the Definition and Diagnosis of Clinical Obesity[8].
The Commission recommends incorporating direct measures of adiposity, such as waist circumference or body fat percentage, alongside BMI to improve diagnostic accuracy[8]. The Commission also proposes a novel diagnostic framework for obesity, categorising it into pre-clinical and clinical obesity to enhance clinical relevance and accuracy based on the presence or absence of health conditions linked to excessive body fat. This strategy aims to better identify individuals at risk for obesity-related complications and to inform more targeted interventions, which could ultimately improve the cost-effectiveness of obesity treatments, and the prioritization of treatment based on the burden of obesity-associated conditions.

OBESITY IMPACTS SEVERAL CARDIOVASCULAR RISK FACTORS AND SUBSEQUENT CVD OUTCOMES THROUGH COMPLEX MECHANISMS (SEE FIGURE 1).

These include the development of risk factors, such as insulin resistance, adipose tissue dysfunction and dyslipidaemia, which contribute to the exacerbation of CVD outcomes, such as coronary heart disease, heart failure, myocardial infarction and thromboembolisms.

FIGURE 1:
THE ASSOCIATION BETWEEN OBESITY AND CVDS



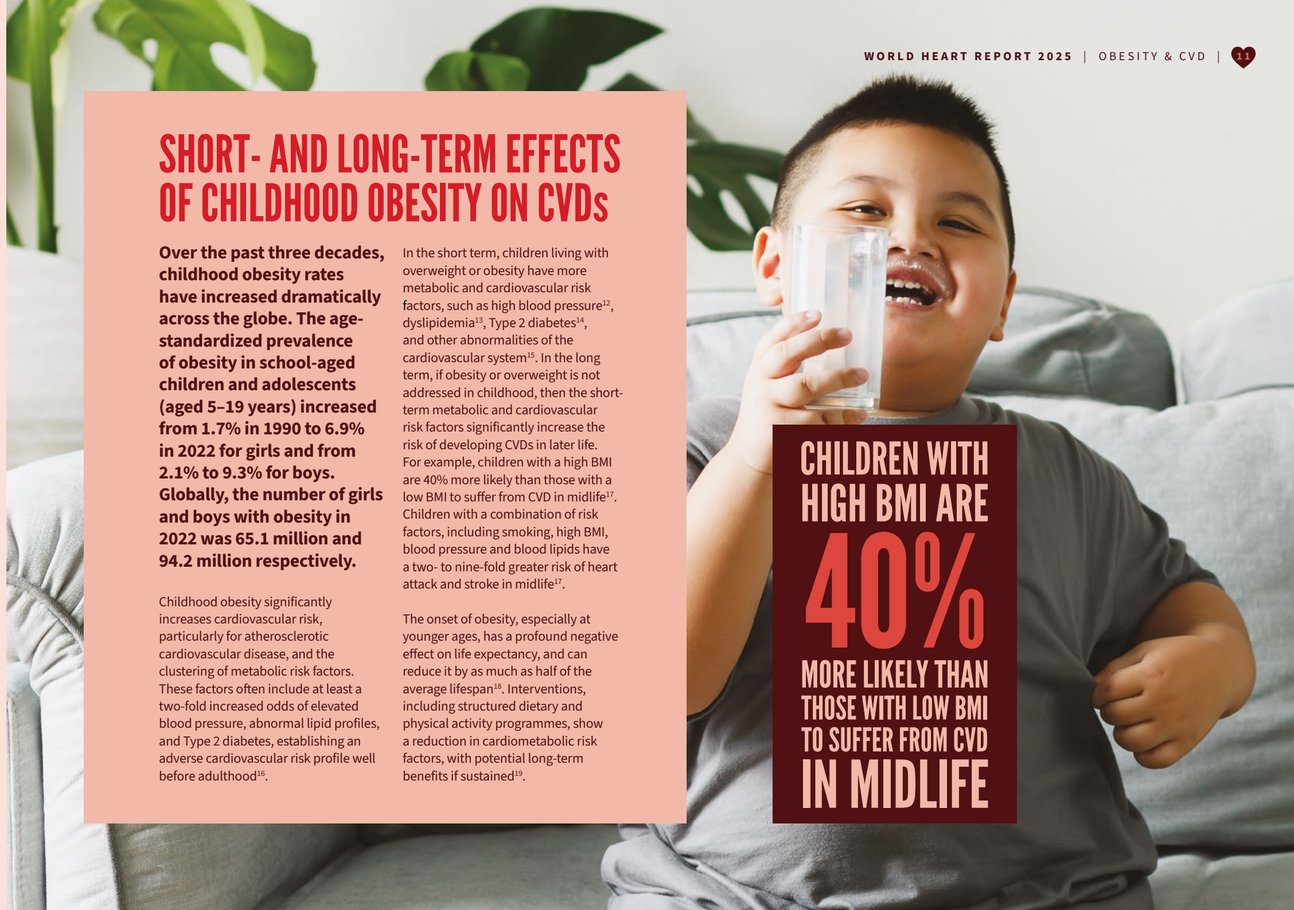
SHORT- AND LONG-TERM EFFECTS OF CHILDHOOD OBESITY ON CVDs

Over the past three decades, childhood obesity rates have increased dramatically across the globe. The age-standardized prevalence of obesity in school-aged children and adolescents (aged 5–19 years) increased from 1.7% in 1990 to 6.9% in 2022 for girls and from 2.1% to 9.3% for boys. Globally, the number of girls and boys with obesity in 2022 was 65.1 million and 94.2 million respectively.

Childhood obesity significantly increases cardiovascular risk, particularly for atherosclerotic cardiovascular disease, and the clustering of metabolic risk factors. These factors often include at least a two-fold increased odds of elevated blood pressure, abnormal lipid profiles, and Type 2 diabetes, establishing an adverse cardiovascular risk profile well before adulthood[16].

In the short term, children living with overweight or obesity have more metabolic and cardiovascular risk factors, such as high blood pressure[12], dyslipidemia[13], Type 2 diabetes[14], and other abnormalities of the cardiovascular system[15]. In the long term, if obesity or overweight is not addressed in childhood, then the short-term metabolic and cardiovascular risk factors significantly increase the risk of developing CVDs in later life. For example, children with a high BMI are 40% more likely than those with a low BMI to suffer from CVD in midlife[17]. Children with a combination of risk factors, including smoking, high BMI, blood pressure and blood lipids have a two- to nine-fold greater risk of heart attack and stroke in midlife[17].

The onset of obesity, especially at younger ages, has a profound negative effect on life expectancy, and can reduce it by as much as half of the average lifespan[18]. Interventions, including structured dietary and physical activity programmes, show a reduction in cardiometabolic risk factors, with potential long-term benefits if sustained[19].



COMBATING MISCONCEPTIONS ABOUT OBESITY

MISCONCEPTION 1: OBESITY RESULTS FROM AN IMBALANCE BETWEEN CALORIE INTAKE AND EXPENDITURE

The narrative around obesity has long centred around the over-simplified equation of "calories consumed - calories burnt = body weight," with some healthcare providers even perpetuating this myth. However, the reality is more complex. Energy consumed is determined by both the quantity of food and the amount of food-derived energy that the gastrointestinal tract absorbs. This absorption is dependent on several factors, including digestive enzymes, gut hormones, microbiota and neural signals, all of which are beyond the control of the individual. Similarly, energy expended is not only dependent on physical activity, but also an individual's metabolic rate, which accounts for 60–80% of the total daily expenditure[65]. With the exception of highly athletic people, the average individual's energy expenditure from exercise is relatively small[66] and some people may have naturally slower metabolic rates than others i.e., they burn fewer calories when resting. To maintain weight within an individualized range, the homeostatic regulatory system has also been shown to initiate compensatory responses (e.g., increasing hunger pangs or decreasing metabolic rates) to counteract efforts to reduce weight.

MISCONCEPTION 2: OBESITY IS A LIFESTYLE CHOICE

People with obesity often face accusations of their disease being a personal choice, or that weight gain is due to a sedentary lifestyle and over-eating. The reality is more nuanced. Robust evidence exists linking obesity in most cases to social, biological, environmental, and commercial determinants, among others, (see section on Determinants of obesity and CVD). For example, a study comparing energy expenditure between hunter-gatherers in the African Savannah and adults living in European and American cities showed similar levels of energy expenditure, despite the former group having significantly higher levels of physical activity[67]. This conflicts with conventional views attributing obesity purely to lifestyle choices.

MISCONCEPTION 3: OBESITY IS NOT A DISEASE

Defining a disease requires empirical and objective, medical and biological evidence. Many people living with obesity meet these criteria, including specific symptoms or signs (e.g., increased adiposity), reduced life quality, increased risk of related complications, or well characterized pathophysiology (e.g., inflammation, endothelial dysfunction, insulin resistance, alterations in hormones regulating satiety or hunger).

The WHO and the WHF (through the 2015 Nagoya Declaration) and many other leading international and national bodies define obesity as a disease or disease process[68,32].

HOW THE RISE IN OBESITY PREVALENCE HINDERS SDG PROGRESS

Obesity poses a significant barrier to achieving several Sustainable Development Goals (SDGs) by 2030, including:

- **SDG 1 (No Poverty)** due to the economic impacts of obesity on individuals and healthcare systems.
- **SDG 2 (Zero Hunger)** through contributing to the "double burden of malnutrition," where undernutrition and obesity coexist within communities and perpetuate cycles of poor health outcomes.
- **SDG 3 (Good Health and Well-being)** due to the role obesity plays in increasing mortality and morbidity from NCDs and exacerbating health inequalities through disproportionately impacting LMICs.
- **SDG 13 (Climate Action)** through high-resource food production and increased greenhouse gas emissions from ultra-processed foods that are key contributors to obesity.

GLOBAL LEVELS AND TRENDS OF OBESITY

In 2022, it was estimated that more than 1 billion people—878 million adults (over the age of 20 years) and 159 million children and adolescents—were living with obesity worldwide[2]. There were 504 million women and 374 million men with obesity respectively.

IN 2021, 3.7 MILLION DEATHS AND 128.5 MILLION DISABILITY-ADJUSTED LIFE YEARS (DALYs) WERE LOST DUE TO HIGH BMI[5].

Compared to 1990, the age-standardized[2] obesity prevalence more than doubled for women (from 8.8% to 18.5%) and nearly tripled for men (from 4.8% to 14%), while the overall number of adults with obesity more than quadrupled from 194 million to 878 million. This increase is in part due to the contributing factors of population growth and longer lifespans.

Should current growth trends continue, obesity prevalence among adults over the age of 20 years is projected to rise to 17% of men and 22% of women by 2030[3]. There is concern potential that almost 2 in 3 adults over the age of 25 years could be affected by overweight or obesity by 2050[4].

A. One DALYs represents the loss of the equivalent of one year of full health. DALYs for a disease or health condition are the sum of the years of life (YLLs) lost to due to premature mortality and the years lived with a disability (YLDs) due to prevalent cases of the disease or health condition in a population.

B. Age-standardization is a technique used to better compare disease outcomes, such as death rates, across populations. It calculates what the disease outcome would be if the population age-structure were the same for all countries. This allows an assessment of whether the observed differences are due to factors related to the disease, rather than the age structure of the population.

COUNTRIES HAD VARYING LEVELS OF OBESITY PREVALENCE IN 2022. PREVALENCE WAS HIGHEST AMONG WOMEN IN TONGA. AMERICAN SAMOA, AND SAMOA (75–81%) AND AMONG MEN IN AMERICAN SAMOA, NAURU AND TOKELAU (67–70%).

It was also high in many other Pacific and Caribbean Island nations, such as the Bahamas and Saint Kitts and Nevis (around 38% for men and around 55% for women) and countries in the Middle East and North Africa region, such as Qatar and Kuwait (39–41% for men) and Egypt and Qatar (53–59% for women). Obesity prevalence was lowest among women in Vietnam, Timor-Leste, and Japan (2–4%) and among men in Ethiopia, Timor-Leste and Rwanda (1–2%). Prevalence was also low (<5%) in other Asian and East African countries.

Obesity increased in nearly every country from 1990 to 2022, with the largest increases observed in the Bahamas for women (from 22.8% to 55.8%) and Romania for men (from 6.7% to 38.3%). Over this period, a decrease in obesity prevalence was only seen among women in Spain (by 4.6 percentage points), France, Moldova and Lithuania (all by 1–2 percentage points).

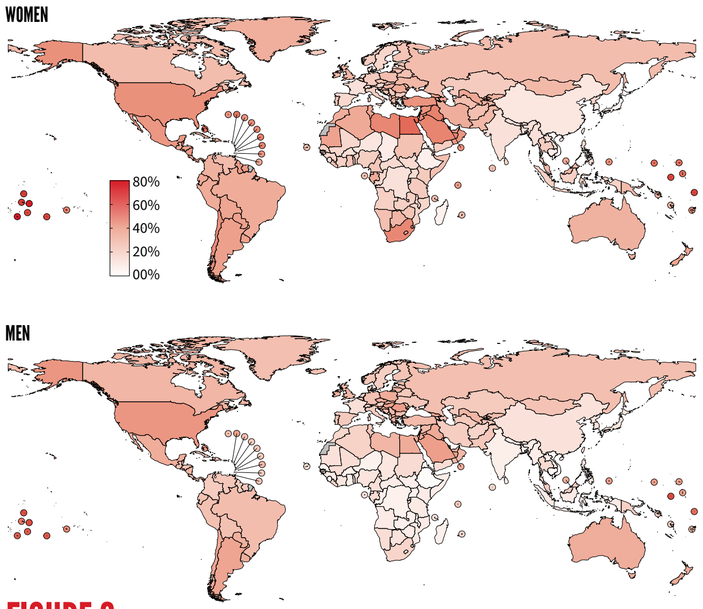


FIGURE 2:
AGE-STANDARDIZED PREVALENCE OF OBESITY IN 2022.

Source: NCD Risk Factor Collaboration.

THE ECONOMIC IMPACT OF OBESITY

In 2019, the global economic impact of obesity was estimated to be equivalent to 2.2% of global Gross Domestic Product (GDP), or just under US$2 trillion annually[69]. This figure includes the costs associated with obesity-related healthcare needs, productivity losses and a reduction in human capital from premature death.

Though obesity has economic impacts for all countries, there is significant variance. In 2019, this ranged from a low of 0.9% of GDP in low-income countries to 2.5% in high-income countries. At the regional level, it ranged from 1.1% of GDP in the WHO African Region to 3% in the WHO Region of the Americas in 2019.

If current trends in obesity levels continue, analysts project that the economic impacts will rise to over 3% of GDP per year globally by 2060. This would break down to 2% of GDP in the WHO African Region, over 4% in the WHO Region of the Americas, and over 5% in the WHO Eastern Mediterranean Region. The biggest increases in the economic impact of obesity will be concentrated in LMICs, with significant implications for health systems. Additionally, the impact is projected to triple in high income countries and increase twenty-three-fold in upper middle-income countries.

If coordinated and evidence-based action can reduce obesity and overweight prevalence to 2019 levels, it will translate into savings of US$2.2 trillion in costs every year between 2020 and 2060 globally.

GLOBAL CVD MORTALITY ATTRIBUTABLE TO HIGH BMI

Over the last three decades, the number of annual CVD deaths globally attributable to high BMI (at least 25 kg/m² or over) more than doubled, reaching 1.9 million in 2021—more than half of the total 3.7 million deaths from high BMI and 9.8% of total CVD deaths. The increased prevalence of high BMI, along with increased population size and longer lifespans, are contributing factors to this rise.

Globally, age-standardized CVD-mortality rate attributable to high BMI was 22.8 deaths per 100,000 people in 2021, moderately lower than in 1990 due to the decline in overall CVD mortality.

Regionally, age-standardized CVD mortality rate attributable to high BMI is now highest in middle-income countries and lowest in high-income countries (see Online Appendix Table 1). The age-standardized CVD mortality rate attributable to high BMI ranged from 14.4 deaths per 100,000 people in high-income regions to 67.5 deaths per 100,000 people in North Africa and the Middle East. In 2021, there were an estimated 300,000 more CVD deaths globally attributable to high BMI among women compared with men.

High BMI is the eighth most important risk factor for deaths from CVD globally (Table 1). Since 1990, its risk ranking increased compared to other CVD mortality risk factors—high BMI ranked higher in 2021 compared to 1990 in all but two regions (South Asia, and Southeast Asia, East Asia, and Oceania) where the rankings remained the same.

At the national level, high BMI is the third most important risk factor for CVD mortality in 14 countries, including the Cook Islands, Gabon, and Dominica, while it ranked fourth in an additional 44 countries.

TABLE 1:

AGE-STANDARDIZED GLOBAL AND REGIONAL CVD MORTALITY ATTRIBUTABLE TO HIGH BMI AND RANKING AMONG ALL RISK FACTORS, FOR BOTH SEXES COMBINED.

REGION	1990		2021		% CHANGE
	AGE-STANDARDIZED CVD MORTALITY ATTRIBUTABLE TO HIGH BMI	RANK	AGE-STANDARDIZED CVD MORTALITY ATTRIBUTABLE TO HIGH BMI	RANK	AGE-STANDARDIZED CVD MORTALITY ATTRIBUTABLE TO HIGH BMI
SOUTH ASIA	7.0	10TH	14.8	– 10TH	↑ 110.0 %
SOUTHEAST ASIA, EAST ASIA AND OCEANIA	12.5	10TH	18.3	– 10TH	↑ 46.8 %
SUB-SAHARAN AFRICA	21.2	8TH	29.8	↑ 5TH	↑ 40.6 %
HIGH-INCOME	23.4	8TH	14.4	↑ 4TH	↓ -38.4 %
LATIN AMERICA AND CARIBBEAN	26.2	8TH	22.8	↑ 4TH	↓ -13 %
CENTRAL EUROPE, EASTERN EUROPE AND CENTRAL ASIA	54.6	7TH	51.5	↑ 4TH	↓ -5.6 %
NORTH AFRICA AND MIDDLE EAST	63.8	6TH	67.5	↑ 5TH	↑ 5.9 %
GLOBAL	24.4		22.8		

SOURCE:

Institute for Health Metrics and Evaluation.

NOTE:

Regional classification based on the Global Burden of Disease classification level; The 12 level 2 risk factors are (in the order of contribution to global CVD mortality in 2021): high systolic blood pressure, dietary risks, air pollution, high LDL cholesterol, tobacco, kidney dysfunction, high fasting plasma glucose, high BMI, non-optimal temperature, other environmental risks, high alcohol use, low physical activity.

VOICE OF A PATIENT

STEVEN MACARI

As a former figure skater, I never expected that I would one day be overweight, battling heart failure and sleep apnea. **A heart attack at 50 years old, 3 years after quitting smoking made me recall the signs I had missed: as much as 6 months prior, I had often been feeling out of breath. It came on following a period of inactivity and overindulgence in not the right nutrition; this plus a sedentary job and lifestyle were all to blame.** By 2018, I was also diagnosed with Type 2 diabetes.

I'm a retired secondary school teacher but sometimes it's hard to follow your own lessons. I've had stretches of time where I slacked off, not implementing the lifestyle changes that I know are for my own good, and that work hand in hand with the prescribed medications I take every day. Sometimes it's still very difficult to get up and move, even if it means going for a short walk.

Being a patient advocate is one of the most rewarding outcomes of my brush with premature death. **Thanks to suggestions of nurses who themselves had gone through patient training; I took courses to be able to support others facing what I have been living through.** As a member of various health and patient Councils and Boards, I feel that I can give back, empower others, and keep the focus on patients as people, not victims.

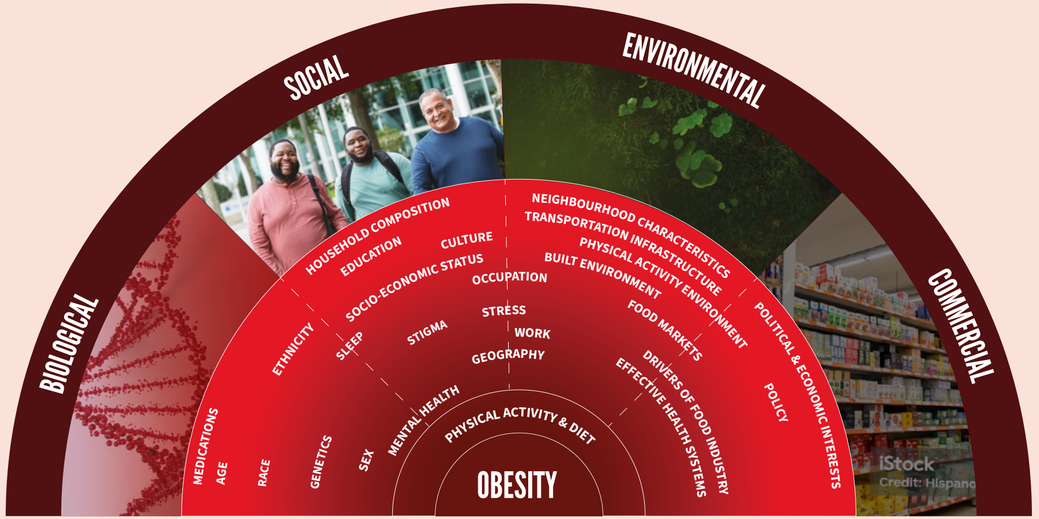
Today, I'm still a teacher—engaged this time in educational therapy and behavioural coaching to promote better health outcomes, and now I learn from others too, patients included.

I'm starting to address my diabetes and dropping some of the weight which gives me hope.

You don't have to give up life because you have heart failure.

There's a lot one can recommend. If I had to boil down advice, it would be these three main things: persevere, join an association, and question, question, question so you get clarity from your health practitioner who is, after all, your partner in care.

DETERMINANTS OF OBESITY AND CVD



Obesity is the result of multiple, interrelated factors, including social, psychological, biological, economic, and environmental that contribute to the development and persistence of obesity and increased risk for CVDs[21].

FIGURE 3:
DETERMINANTS OF OBESITY AND CVDS.

OBESITY AND STIGMA

People living with overweight or obesity regularly face social stigma, which refers to "individual's social devaluation and denigration due to their excess body weight, leading to negative attitudes, stereotypes, prejudice, and discrimination".

People living with obesity can be perceived as lazy, gluttonous, and lacking in self-discipline, with stigmatization manifesting as harmful language or negative portrayals in popular culture and/or media[32]. This can have long lasting psychological and physical consequences for victims[31]. Children and young adults are especially vulnerable to bullying and discrimination based on their weight, and obesity is now the leading cause of such bullying in schools, affecting children's education and their mental health[36–39].

Evidence shows that the impact of weight stigma is pervasive and extends to the workplace, education, and healthcare settings. In high-income countries, for example, workplace discrimination among people living with overweight or obesity is common and can result in reduced likelihood of being recruited or lower starting salaries[33]. Within healthcare settings, studies have found some health professionals to hold negative biases about obesity and to spend less time with these patients, viewing them as non-compliant to health advice[34,35]. This can deter people with obesity from seeking medical care, including prevention and screening, and thereby compromise their overall healthcare.

Long-standing weight stigma and discrimination has hindered efforts to tackle obesity and thus contributed to the rise of CVDs. It is therefore urgent to address weight-based stigma and foster an inclusive society that ensures equity in protection, health, rights, and dignity of individuals, regardless of their body size. Necessary actions include improved use of language (such as "people-first language") in medical settings, research, the media, and public health campaigns, and the use of messaging that recognises that obesity is a multifactorial, and complex condition.

LONG-STANDING WEIGHT STIGMA AND DISCRIMINATION HAS HINDERED EFFORTS TO TACKLE OBESITY AND THUS CONTRIBUTED TO THE RISE IN CVDs

© World Obesity

VOICE OF A PATIENT

DESSISLAVA HRISTOZOVA

I think about food and my obesity non-stop. **Every minute of my life, it follows me. It's like a shadow and I can't escape it.** I am a journalist for the National Bulgarian Television station. When I was a child, I was told "You are fat". This did not make me a fit woman. On the contrary, it made me eat more. I ate to forget, to feel better, to switch off from a world that hates me.

Obesity is an epidemic, which slowly but surely enters not only our bodies, but our whole way of life. I have high blood pressure. I have insulin resistance, my joints hurt, my knees hurt, and I am 40 years old. I don't know what will happen after 60. Losing weight is not just about losing weight. It's a life change. And because of this, it's very important that your doctor, who monitors you, and the nutritionists know how you feel emotionally.

Change cannot be quick, but it must start somewhere. It should start with informing the public. It is very important to understand that there are ways to lead a healthy lifestyle without going to extremes.

Without pointing fingers, I think that the whole society together should be involved in solving the problem. Definitely.

I really want to find a special formula to be positive all the time, despite my negative attitude towards me and my body.

I haven't lost weight yet but I believe there's still hope.

If most parents tell their children 'be like me', I tell them 'don't be like me'.

SEX

Obesity prevalence is significantly associated with sex. Women have a higher obesity prevalence than men, and resultantly there is a stronger association between obesity and CVD for women than men[22].

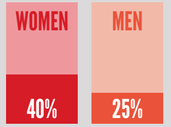
Globally the age-standardized prevalence of obesity in 2022 was higher in women than in men by 4.5 percentage points, a figure that has remained largely stable since 1990. Regionally, the obesity disparity between women and men was largest in Central Asia, the Middle East and North Africa, where 40% of women live with obesity compared with 25% of men. Obesity prevalence was also higher in women than men in South Asia, Southeast Asia, Latin America and the Caribbean, Oceania and sub-Saharan Africa. In Central and Eastern Europe, the high-income Western Region and East Asia and the Pacific, obesity prevalence was similar between women and men.

In 2022, women had higher prevalence of obesity than men in over three quarters of countries worldwide (Figure 4), with the difference exceeding 30 percentage points in South Africa, Jamaica, Saint Vincent, and the Grenadines. From 1990 to 2022, the female-male gap in obesity grew larger in most countries in sub-Saharan Africa, Latin America and the Caribbean, Southeast Asia, and in some countries in Central Asia, the Middle East and North Africa. In contrast, the female-male gap in obesity shrank in all countries in Central and Eastern Europe, East Asia, the Pacific, and most high-income western countries. Males have a higher obesity prevalence in 39 countries worldwide.

Socio-cultural, economic, and biological factors all contribute to sex-based differences in obesity. For example, women are more likely to experience food insecurity[23], which impacts diet quality, and can face increased barriers to staying physically active[24], including cultural norms, safety concerns, and responsibilities for caregiving[25].

The association between obesity and CVD differs for men and women. For example, larger waist circumference and waist-to-hip ratio is linked to a greater excess risk of myocardial infarction in women than in men[26] and similarly, higher BMI is associated with higher risk of Type 2 diabetes in women than in men[27].

REGIONALLY, THE OBESITY DISPARITY BETWEEN MEN & WOMEN WAS LARGEST IN CENTRAL ASIA, THE MIDDLE EAST & NORTH AFRICA WHERE,



40% OF WOMEN WERE LIVING WITH OBESITY COMPARED WITH 25% OF MEN

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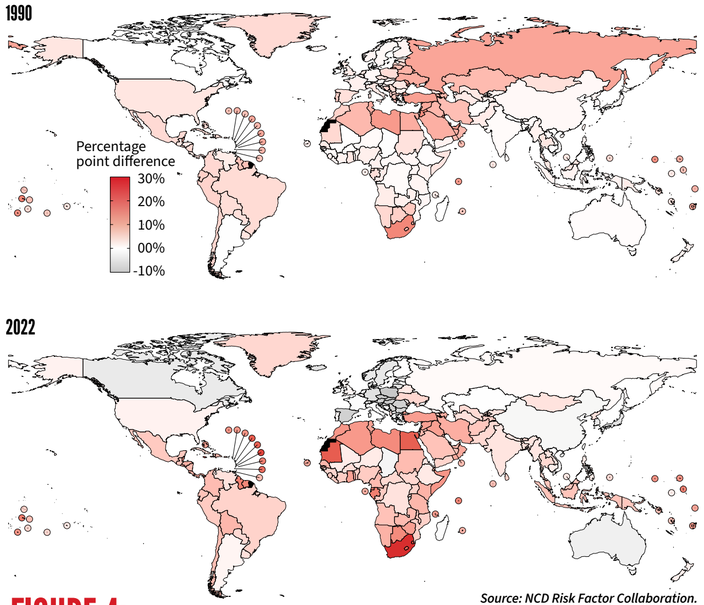
FOR WOMEN, 10.8% OF CVD DEATHS ARE ATTRIBUTED TO HIGH-BMI COMPARED TO 8.9% FOR MEN. A SIMILAR PATTERN EXISTS FOR CVD (DALYs), WITH 11.6% FOR WOMEN COMPARED TO 9.8% FOR MEN. GLOBALLY, BMI WAS THE FIFTH HIGHEST CONTRIBUTOR TO CVD DALYs FOR WOMEN, COMPARED TO BEING THE SEVENTH BIGGEST CONTRIBUTOR FOR MEN.



Source: NCD Risk Factor Collaboration.

FIGURE 4:

ABSOLUTE DIFFERENCE IN THE AGE-STANDARDIZED PREVALENCE OF OBESITY BETWEEN WOMEN AND MEN IN 1990 AND 2022. A POSITIVE DIFFERENCE INDICATES THE PREVALENCE IS HIGHER AMONG WOMEN; A NEGATIVE DIFFERENCE INDICATES THE PREVALENCE IS HIGHER AMONG MEN.

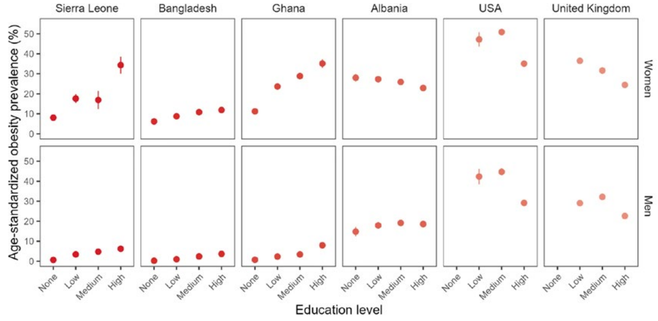
SOCIO-ECONOMIC STATUS

SOCIO-ECONOMIC STATUS (SES) VARIABLES, SUCH AS EDUCATION, INCOME LEVELS AND OCCUPATION, ARE IMPORTANT DETERMINANTS OF OBESITY.

While there are some similarities across countries and regions in the relationship between SES variables and obesity, there are also key differences. For example, in higher-income countries the prevalence of obesity is higher among people with lower levels of education, whereas in LMIC the prevalence of obesity is higher among people with higher levels of education (Figure 5).

Several studies conducted in high-income countries have found an association between lower SES, obesity, and the risk of developing CVD risk factors during adulthood, including a 20% increase in the odds of developing central obesity i.e., a larger waist circumference[28]. Lower SES has also been linked to lesser time to engage in physical activity and the consumption of energy dense and nutrient poor diets[29], all of which can be contributing factors to obesity. Conversely, a higher SES is associated with greater odds of healthy lifestyles and behaviour, including consumption of balanced and nutritious diets, more physical activity and health-seeking behaviour for the prevention and control of obesity[30].

FIGURE 5:
AGE-STANDARDIZED PREVALENCE OF OBESITY BY EDUCATION LEVEL IN ADULTS AGED OVER 25 YEARS IN SELECT COUNTRIES.



NOTE:

Country income groupings for this figure are as follows - Low-income: Sierra Leone; Lower-middle-income: Bangladesh and Ghana; Upper-middle-income: Albania; High-income: USA and the United Kingdom.

DATA SOURCES:

All data are based on publicly available nationally representative health examination surveys, including - Sierra Leone, DHS 2019; Bangladesh, DHS 2022; Ghana, DHS 2022; Albania, DHS 2017–2018; United Kingdom, Health Survey for England 2017–2019, USA NHANES, 2021–2023.

ENVIRONMENTAL

PEOPLE'S LIVING ENVIRONMENT PLAYS A MAJOR ROLE IN SHAPING INDIVIDUAL AND POPULATION HEALTH, INCLUDING IN THE DEVELOPMENT OF OBESITY AND CVD.

The term "obesogenic environment" is often used to refer to the role of physical, cultural, social, and economic factors that promote the development of obesity.

It includes structural factors that facilitate the availability and access to safe and easy physical mobility, including infrastructure for walking, running or cycling, and the access and availability of local, sustainable and safe food at locally affordable prices.

Cross-sectional and longitudinal studies show how environmental factors, such as traffic safety, connectivity, and availability of recreational facilities and green spaces, are linked with levels of physical activity, BMI, and CVD[21]. For example, a lack of or an inadequate walkable environment is associated with hypertension, obesity and Type 2 diabetes[40]. Similarly, residential proximity to green spaces is associated with improved cardiovascular health and associated risk factors[41,42].

In recent years, new concepts have emerged related to people's food environment, such as food deserts, wherein people, especially those in densely populated urban environments, have limited access to healthy and affordable food. The problems around the food environment are especially stark in LMICs, where the persistence of different forms of undernutrition accompanied by the increase in diet-related NCD risk factors, such as overweight and obesity, have led to the "double burden of malnutrition". These countries must navigate that burden—one compounded by inadequate prenatal and childhood nutrition and cheap, processed food that is rich in fat, sugar, salt and energy dense—at the national, community, household, and individual levels[43].

Neighbourhood deprivation, disorder and crime are also associated with obesity. People living in areas with high rates of crime have 28% lesser odds of achieving the required levels of physical activity, whereas perceived safety increases the odds of higher levels of physical activity by 27%[44].

An increasing number of jobs that require more desk time than physical activity contribute to the development of obesity, too. For example, in the United States, the shift in the nature of private industry employment, which went from 50% of jobs requiring moderate-to-heavy physical activity in 1960 to less than 20% requiring it in 2010, is associated with weight gain[45], while sedentary work, with long hours spent at the desk, has long been associated with the development of CVDs[47,48]. Further, long working hours and frequently working overtime is also associated with obesity, especially among men[46].

THE PSYCHOLOGICAL TOLL OF OBESITY

The link between obesity and psychological distress and/or stress is complex and multi-directional. Studies show a significant link between obesity and increased levels of psychological distress, such as depression, anxiety, eating disorders and hostility, including among children and adolescents[49]. The interconnected mechanisms linking obesity and stress are a function of cognitive, behavioural and physiological factors[49].

Socio-psychological risk factors, such as stress, are among the determinants of obesity and several social determinants—including financial difficulties, personal conflicts, low self-esteem, and acceptance by peer or social groups—which play a role in the development of chronic stress for people with obesity[51,52].

Stress and psychological distress in general—usually marked by elevated levels of the stress hormone cortisol through a disruption of the hypothalamic-pituitary-adrenal axis—is shown to promote the accumulation of abdominal fat. Cortisol plays a role in the redistribution of adipose tissue to the abdomen and in increasing hunger signals and food cravings[50]. Additionally, it causes an imbalance in other hormones and peptides such as leptin, ghrelin and neuropeptide Y.

Stress affects cognitive processes (e.g., self-regulation), behavioural factors (e.g., eating habits), and sleep patterns and plays a role in decreasing physical activity, as people working long, stressful jobs often lack the mental energy or motivation to engage in physical activity.

Structured behavioural and lifestyle interventions—especially those involving physical activity and diet—can improve both physical and psychological health in children and adults, even if weight loss is minimal. Mental health considerations should be embedded in weight loss messaging and intervention programmes to address the full scope of obesity's impact.

URBAN VS RURAL SETTINGS

The picture on how urban and rural settings contribute to obesity and CVD is nuanced. Urbanization has often been associated with increased CVD mortality and obesity prevalence, yet recent evidence shows how the global rise in age-standardized mean BMI from 1985 to 2017 was in large part due to the rise in BMI in rural populations (Figure 6).

While in many LMICs the age-standardized mean BMI of urban residents remains higher than that of their rural counterparts, over the last four decades the faster rise in rural areas has resulted in a rural-to-urban convergence of BMI. For example, in 1985 urban residents in South Asia had higher mean BMI than their rural counterparts (by 3.2 and 3.0 kg/m^2 for women and men, respectively), but by 2017, the urban-rural BMI gap had decreased to 1.9 and 1.2 kg/m^2 in women and men respectively. This trend was seen during the same period in women in Latin America and the Caribbean, East and Southeast Asia, Central Asia, the Middle East, and North Africa and men in Oceania.

Historically, lower incomes in rural areas restricted food consumption, and domestic and work-related activities had high energy demands, which led to typically lower BMI levels.

The rapid increases in BMI in some rural populations reflects broad changes to people's lives, including increased household incomes[53] and changes to daily activity patterns due to the introduction of technologies (e.g., the connection to a water supply in the home removes the need for manual water collection)[54].

In contrast, women in sub-Saharan Africa saw diverging BMI trends in urban and rural areas with the urban-rural gap widening from 2.6 kg/m^2 in 1985 to 3.2 kg/m^2 in 2017. Some countries in sub-Saharan Africa (e.g., Niger and Burkina Faso) had larger urban-rural gaps in BMI than any other country in the world, in part because urbanization has preceded major economic growth in sub-Saharan Africa[55]. Manual farming in rural areas remains common, while in cities many people work in the service sector and commercially prepared and processed foods are readily available[56], coupled with limited time and dedicated space for recreational physical activity and cultural perceptions of healthy body sizes[57].

In high-income and industrialized countries, urban-rural disparities in BMI were less pronounced, with persistently higher BMI in rural areas since 1985 reflecting rural economic and social disadvantage[58–60].

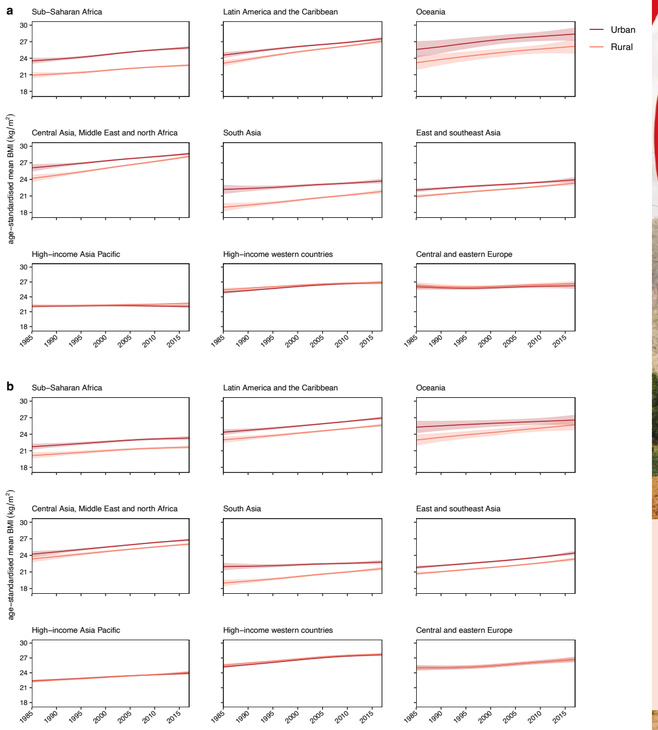


FIGURE 6:
REGIONAL TRENDS IN AGE-STANDARDIZED MEAN BMI FROM 1985 TO 2017, BY URBAN AND RURAL PLACE OF RESIDENCE A) IN WOMEN, B) IN MEN.

COMMERCIAL

COMMERCIAL DETERMINANTS ARE THE WAY IN WHICH COMMERCIAL PRODUCTS, SERVICES AND ACTIVITIES IMPACT PUBLIC HEALTH, DIRECTLY OR INDIRECTLY.

For NCDs, including obesity, this is usually seen in the form of business marketing strategies, labelling, lobbying and other tools to increase consumption of products to increase profits.

Commercial practices contribute significantly to the global burden of NCDs such as obesity and CVD, with 44% of global NCD deaths linked to commercial products and commercial practices[61]. Commercial practices in the food industry are particularly detrimental to obesity and CVD prevalence. Practices have led environments flooded with unhealthy food that is cheap, accessible, ultra-processed and convenient, yet bad for the population's health. Regarding obesity, marketing strategies have been found to exploit individual vulnerabilities and encourage unhealthy behaviours that exacerbate the risk of disease, with such strategies often operating in environments with minimal regulation. Further, market concentration in sectors like food and beverages has the potential to strengthen companies' political influence via lobbying[62].

BIOLOGICAL

Genetics can play a fundamental role in determining an individual's risk for obesity. Monogenic obesity, for example, is caused by mutations in a single gene, and certain syndromes are associated with genetic alterations that lead to obesity, such as Prader-Willi syndrome, Bardet-Biedl syndrome, and Alström syndrome. Mutations in the LEP (leptin) gene or the LEPR gene (which encodes the leptin receptor) can directly affect appetite regulation and fat storage, leading to severe obesity that does not respond to leptin replacement therapy[63].

Obesity can also be influenced by epigenetics—heritable changes in gene expression that do not alter the DNA sequence. Individuals with a genetic predisposition to obesity are more susceptible to adverse environmental factors such as diet, stress, physical activity levels, and exposure to chemicals, all of which can influence epigenetic modifications. For example, microRNAs (miRNAs) play a significant role in regulating genes involved in fat accumulation and metabolism, with some, like miR-221 and Ruminococcus, linked to triglyceride storage and microbiota composition[63].

Another important biological determinant of obesity is the composition of the gut microbiota, which plays a key role in digestion, energy extraction, and metabolism. The gut microbiota contributes to energy balance by regulating the production of short-chain fatty acids (SCFAs), which influence energy storage and fat accumulation. Alterations in the microbiota composition, known as gut dysbiosis, are associated with metabolic disorders, including obesity. Moreover, maternal microbiota can be transmitted from mother to child, predisposing the offspring to metabolic dysfunctions[64].

VOICE OF A PATIENT

MODDY TEMBO

I didn't notice that I was gaining weight. I thought maybe my husband is keeping me well! The symptoms were there: trouble sleeping, trouble breathing, a dry cough and feeling so tired. It was 2022 and I went for a check-up at the medical clinic in Lusaka.

My blood pressure reading was high, so they prescribed medication. Over the next several months, the doctors had to adjust and change the medication. They finally found one that worked best for managing my blood pressure and keeping it in a safe range. They said they found a heart problem and that I needed further tests.

At the hospital, the EKG and echocardiogram results confirmed that my heart was not pumping blood properly. Over the course of many months, I had additional tests like these, along with blood pressure monitoring.

My legs were often swollen so I had to start taking a prescribed diuretic. Then last year, the doctors told me I had Type 2 diabetes, adding a medication for this as well.

Along with the medication, the recommendation was for me to lose weight. I started by reducing food portions but still, losing weight has been a struggle. Being tired often, it is difficult to get exercise, to walk, to keep moving. I used to be a shopkeeper and was more active before this health situation.

Of course, I feel much better with medication, but it is so expensive, and not covered by national health insurance. The clinic is 50 kilometers away, so I must book a taxi to get there, adding more costs.

They said, 'your heart is not ok', and I was worried because I know my heart is my life.

I wish that medications were more affordable and that I can get them easier. In the meantime, I continue with my regular checkups, trying to keep the weight off, with the support of those around me.

OBESITY DIAGNOSIS AND CLINICAL MANAGEMENT

Modest weight reductions of 5–10% can lead to substantial improvements in cardiovascular risk factors, such as hypertension, dyslipidaemia, and insulin resistance, while greater weight loss is associated with more pronounced benefits, including reduced incidence of myocardial infarction and stroke.

While patients engaged in weight loss programmes have achieved >5% weight loss, maintenance of this weight loss in the long-term can be challenging for multifactorial reasons.

The prevention of obesity and obesity-related CVD in adulthood must ideally begin during and even before childhood. This includes addressing risk factors for childhood obesity such as maternal obesity, maternal diabetes, large-for-gestational age, or breastfeeding for less than six months, among others[79]. Early detection and screening of childhood obesity should include age-specific and sex-adjusted BMI, assessment of physical activity, and nutritional education in school programmes. All adults should be screened by measurement of BMI, waist-to-hip ratio, waist circumference, impaired fasting glucose/prediabetes/diabetes, and shortness of breath unrelated to other conditions.

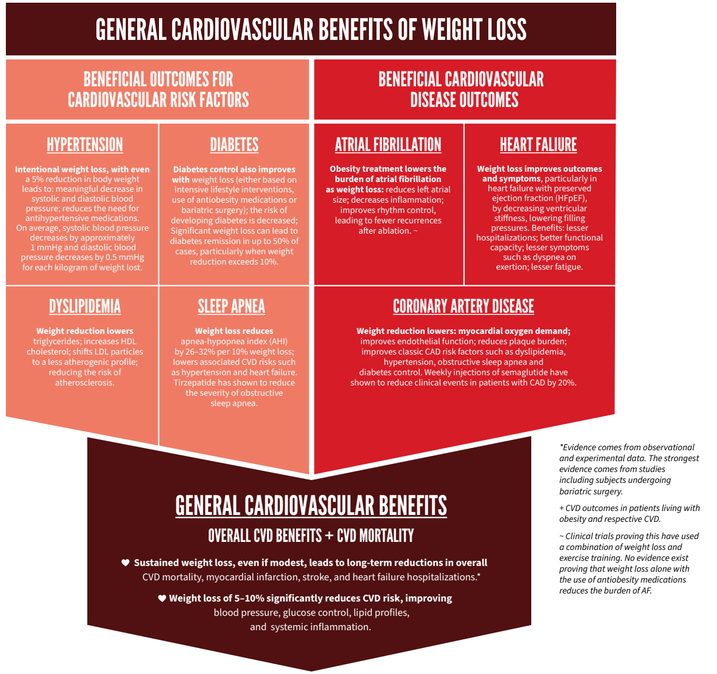


FIGURE 7:
CARDIOVASCULAR BENEFITS OF WEIGHT LOSS

Source: 78.

CLINICAL MANAGEMENT

Clinicians play a pivotal role in addressing obesity to prevent and treat CVD and should assess patients' weight status and help implement individualized, evidence-based interventions to promote weight loss and mitigate CVD risk, including through referral to specialist clinicians.

Comprehensive and long-term obesity management involves a multidisciplinary approach that can rely on intensive lifestyle management and the establishment of a continuum of care with a primary care physician, including, but not limited to:

- **Behavioural interventions**
- **De-stigmatization of obesity**
- **Nutritional guidance to determine individualized dietary programmes that are pragmatic and realistic**
- **Physical activity promotion**
- **Pharmacotherapy or surgery**

In adults with increasingly excess weight, minimally invasive surgery can be an effective long-term treatment, with about 90% of patients achieving at least 15–40% weight loss and the improvement in obesity-related conditions.

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MEDICATIONS FOR TREATING OBESITY

Medications for obesity, when used in conjunction with lifestyle interventions, can be effective in increasing weight loss and, when used appropriately, maintaining it in the long term[72]. These medications can include stimulants, central nervous system acting agents, and gastrointestinal malabsorption agents.

Recently, more novel treatments known as glucagon-like peptide-1 receptor agonists (GLP-1RAs) and their analogues (originally developed to treat diabetes) are used in treatment plans. GLP-1RAs are naturally occurring incretins released by the intestine after a meal that work by delaying gastric emptying, thus acting peripherally to decrease hunger, and increase insulin sensitivity, among other effects. GLP-1RAs and their analogues are shown to treat cardiometabolic disease by improving outcomes across several areas—including weight loss, waist circumference, glucose control, dyslipidaemia, diabetes, blood pressure, and inflammation—decreasing major adverse cardiovascular events for secondary prevention[73], and improving symptoms in patients with heart failure with preserved ejection fraction (HFpEF)[74,75]. There is growing evidence that these classes of medications benefit all organ systems through decreasing inflammation and increasing weight loss[76]. Tirzepatide, a dual GLP-1RA/GIP analogue, is the first medication that has been FDA approved to treat obstructive sleep apnea[74].

GLP-1RAs have transformed the medical management of obesity as earlier medications provided modest weight loss (<5-10%) and had challenging side effects for patients[72]. Many also act as stimulants, which can be harmful for cardiovascular conditions.

A recent meta-analysis of people treated with GLP-1RAs compared to a placebo reported the reduction in various cardiovascular outcomes in people with Type 2 diabetes (67,769 participants across ten trials), and in people with established CVD and no Type 2 diabetes (17,604 from one trial)[76]. Among people with Type 2 diabetes that took GLP-1RAs, the meta-analysis found a 14% reduction in major adverse cardiovascular events (MACE) and cardiovascular death, and a 13% reduction in hospitalization for heart failure. In people with CVD and no Type 2 diabetes, GLP-1RAs reduced MACE and non-fatal myocardial infarction by 20% and 28% respectively.

CHALLENGES IN CARDIOVASCULAR EVALUATION AND MANAGEMENT OF PATIENTS WITH OBESITY

Obesity can complicate cardiovascular diagnosis, management, and treatment.

This underscores the importance of a multidisciplinary approach for managing obesity in cardiovascular disease, and integrating medical, lifestyle, pharmacologic, and/or surgical strategies tailored to each patient's needs. Given the high prevalence of obesity in populations experiencing cardiovascular problems, future clinical guidelines should incorporate obesity-specific recommendations to improve patient outcomes[17].

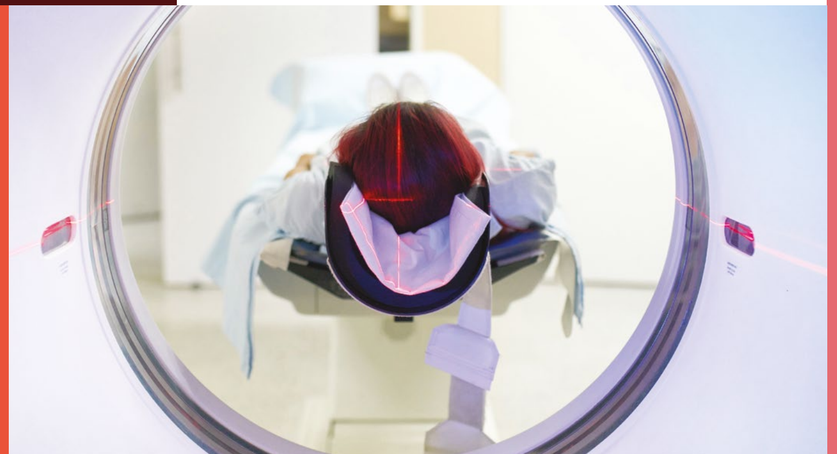
1 DIAGNOSIS

The presence of excess fat (adipose tissue) can result in:

- Less accurate or distorted electrocardiograms.
- Poor acoustic windows or limited penetration with transthoracic echocardiograms.
- Reduced accuracy of stress tests.
- Reduced accuracy for imaging (single-photon emission computerized tomography (SPECT), cardiovascular magnetic resonance imaging (CMR), and computed tomography coronary angiography (CTCA).

These limitations necessitate alternative imaging modalities and specialized approaches for optimal patient care, such as cardiac MRI or PET scans, which may still have practical constraints related to equipment size and patient weight.

FUTURE CLINICAL CVD GUIDELINES SHOULD INCORPORATE OBESITY-SPECIFIC RECOMMENDATIONS



2 TREATMENT

PHARMACOLOGICAL

Obesity significantly alters drug pharmacokinetics and pharmacodynamics, affecting how medications are absorbed, distributed, metabolized, and eliminated. For example:

- Lipophilic drugs (drugs that are fat-soluble, allowing them to cross cell membranes to enter cells or fatty tissue e.g., atorvastatin, timolol) may have an increased volume of distribution.
- Renal and hepatic clearance of drugs can be unpredictable, requiring careful dose adjustments to avoid under- or over-dosing.
- Anticoagulant dosing presents a challenge in obesity, as there is limited evidence to guide appropriate adjustments for direct-acting oral anticoagulants (DOACs). Higher body weight may reduce drug concentrations, increasing the risk of thrombosis, while excessive dosing could raise the likelihood of bleeding, creating a difficult balance in anticoagulation therapy.

Although new medications (e.g., GLP-1RAs) achieve substantial weight loss, their effects on mental health are mixed, necessitating further long-term research.

SURGICAL

- Percutaneous coronary interventions in people with obesity pose technical difficulties, including challenges with vascular access, higher risks of stent thrombosis, and complications related to haemostasis. The radial artery is often preferred for access in patients with obesity, as femoral access is more challenging and associated with higher bleeding risks.
- Cardiac surgery outcomes in people with obesity are associated with higher complication rates, including increased incidence of atrial fibrillation, surgical wound infections, prolonged ventilation, and renal failure.
- People with severe obesity undergoing coronary artery bypass grafting (CABG) have higher long-term cardiovascular mortality, underscoring the need for preoperative risk optimization.

3 MANAGEMENT

- **Lifestyle interventions,** such as physical activity, can be hindered by physical limitations such as joint pain, obstructive sleep apnoea, and deconditioning, all of which can make regular exercise challenging.
- **Dietary modifications** can be complicated by conflicting recommendations, making it crucial for clinicians to provide clear, personalized guidance on sustainable weight management strategies. For example, a patient with diabetes, chronic kidney disease and heart disease will get recommendations to consume less carbohydrates, protein and fat, potentially creating confusion and reducing dietary options.
- **Cardiac rehabilitation programmes** are underutilized for weight management, despite their potential role in improving cardiovascular health. Only a small percentage of rehabilitation programmes include structured weight-loss components, yet long-term lifestyle interventions, particularly group-based approaches, have been shown to improve metabolic and functional outcomes in people with obesity.
- **Mood disorders,** particularly anxiety and depression, are common in individuals with obesity and cardiovascular disease, leading to poor adherence to treatment and worsening health outcomes.

4 OTHER

In some cases, treatments for CVDs and other health issues can contribute to obesity, usually as a side effect. For example:

- **Beta-blockers** are associated with metabolic effects that can lead to weight gain, potentially worsening insulin resistance, increasing fatigue, and reducing exercise tolerance. Metoprolol tartrate has been linked to weight gain, while carvedilol may have a more favourable metabolic profile, making drug selection an important consideration.
- **Depression** is linked to increased cardiovascular risk, and antidepressant therapy may further contribute to weight gain, creating a cycle that requires careful psychological and medical management.

PUBLIC HEALTH INTERVENTIONS TO ADDRESS OBESITY AND CVD

In addition to individual-focused interventions, public health interventions play a vital role in reducing the incidence and impact of obesity and CVD[1]. These include:

- **Community-focused interventions**—urban planning, the development of safe spaces for exercise, school-based programmes and enhancing access to nutritious foods—that can establish supportive environments that facilitate healthy behaviours.
- **System-level interventions**—policies that regulate food marketing and tax sugary drinks, subsidise healthy food options and integrate health promotion into urban planning—that can address structural barriers to health. Health-system level interventions to improve access to and quality of care are also important measures to reduce the burden of obesity and CVD[79,80].

Any policy to tackle obesity must address health disparities through prioritising underserved populations who face greater barriers to healthy living. This includes ensuring access to healthcare, targeting interventions in low-income communities and tailoring policies to cultural and social contexts. Equity-focused approaches by governments and local authorities can reduce the disproportionate burden of obesity and CVD on vulnerable groups[1,80].

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CITY-LEVEL APPROACHES

A city approach provides a cohesive framework where various interventions across health, urban planning, transportation and education, among others, can create healthier environments[81]. For example, healthy cities policies focus on designing environments that promote physical activity and access to nutritious food, while urban planning initiatives, such as creating walkable neighbourhoods, expanding cycling infrastructure and increasing green spaces, encourage active transportation and recreational physical activity. Additionally, zoning regulations can limit the density of fast-food outlets and create environments that are conducive to healthier living.

In the context of obesity and CVD, the WHO Healthy Cities movement, launched in 1986, has played an important role in coordinating improved health outcomes at the city level worldwide[82, 83]. The movement provides a strategic framework to address complex health challenges through encouraging local leaders to adopt policies aimed at improving health and well-being. This approach fosters collaboration across various sectors, such as health, education, housing and transportation, ensuring that policies are interconnected and work together. The Healthy Cities movement is aligned with global, regional and national political agendas, such as the UN Agenda 2030 and WHO strategies, such as "Health for All" and "Health 2020". Political statements and declarations from local leaders, including the 2016 Shanghai Mayors Consensus, have helped promote the movement.

NUTRITION AND FOOD-RELATED INTERVENTIONS

There are several regulatory, tax- and programme-based initiatives that governments can implement to reduce the incidence of obesity and CVD. For example, many governments have successfully imposed tax policies on sugary drinks and unhealthy foods, which discourage consumption while generating public revenue for health promotion[84]. Mandatory front-of-pack labelling to provide consumers with clear nutritional information and empower informed choices has also been shown to be effective[85].

Other positive interventions are programmes to eliminate food deserts and improve access to affordable, healthy food—including subsidies for grocery stores in underserved areas, mobile markets, support for community gardens[86]—and school meal programmes with strict nutritional standards to ensure that children develop healthy eating habits early in life[87,88].

THE WHO HEALTHY CITIES MOVEMENT, LAUNCHED IN 1986, HAS PLAYED AN IMPORTANT ROLE IN COORDINATING IMPROVED HEALTH OUTCOMES AT THE CITY LEVEL WORLDWIDE

BEHAVIOURAL AND EDUCATIONAL INTERVENTIONS

Public health campaigns that aim to change behaviours can include media campaigns to raise awareness about the importance of healthy diets and physical activity[88,89], school-based programmes to promote lifelong habits through education on nutrition and fitness, and workplace wellness initiatives to incentivise employees to adopt healthier lifestyles [88,90]. Integrating these efforts into primary care settings ensures that prevention becomes a routine aspect of healthcare delivery[1,80].

POLICY INTEGRATION AND CROSS-SECTOR COLLABORATION INTERVENTIONS

Addressing obesity and CVD requires integrating health objectives into policies across sectors such as transportation, urban planning, education and agriculture. Multisectoral collaboration ensures that health considerations are embedded into non-health policies, maximising their impact on population health[1,84,85,91]. For example, subsidies for fruits and vegetables can make healthy foods more affordable, while agriculture policies can promote the production of nutrient-rich crops. Urban design that makes community areas walkable and easy to transit using bicycles, and green spaces for exercise and leisure can help people be more active.

The Amsterdam Healthy Weight Approach is an example of a whole-systems approach, and involves multiple municipal sectors including public health, spatial planning, sport, education, economic affairs, youth, poverty reduction, welfare, and neighbourhood work, as well as community, public and private partners. From 2012 to 2021, the initiative resulted in a reduction of childhood obesity prevalence from 21% to 18.7%[107].

FROM 2021 TO 2022

THE AMSTERDAM HEALTHY WEIGHT INITIATIVE RESULTED IN A REDUCTION OF CHILDHOOD OBESITY PREVALANCE FROM 21% TO 18.7%

54%

OF 50 SURVEYED COUNTRIES REPORTED THAT OUT-OF-POCKET PAYMENTS WERE THE MAIN SOURCE OF FUNDING FOR OBESITY TREATMENT

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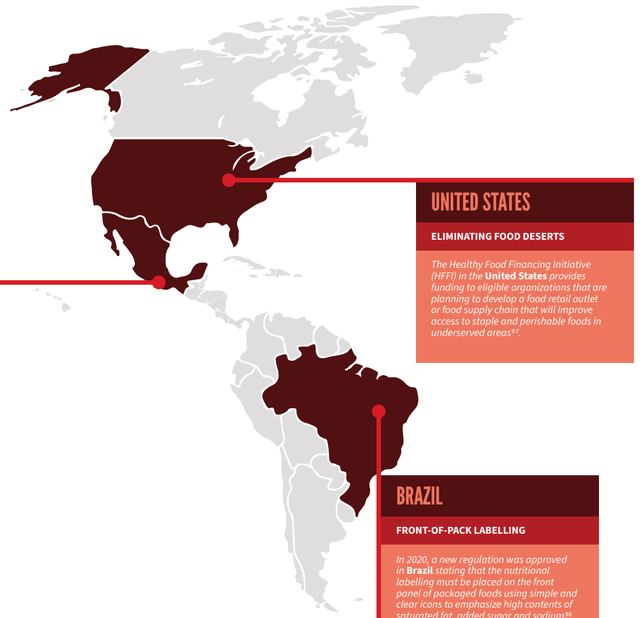
HEALTH SYSTEM INTERVENTIONS

Interventions to support health systems to provide affordable, available and sustainable health services to prevent, treat and manage obesity are essential. The 2023 "WHO Health service delivery framework for prevention and management of obesity" provides countries with guidance on how to integrate and organise obesity prevention and management services throughout the health system, with a focus on applying a primary, chronic and integrated care approach. This includes recommendations for the services to be provided at different care levels, and how these can best be integrated within services for other long-term conditions[55].

Key interventions include ensuring that appropriate guidance and training in obesity management is available for health professionals and reimbursement to patients for obesity-related health services. A 2021 report from the World Obesity Federation found that 54% of 50 surveyed countries reported that out-of-pocket payments were the main source of funding for obesity treatment, while 31% reported that no guidelines for adult or childhood obesity treatment were available in their country[92].

EXAMPLES OF POLICIES AND INTERVENTIONS TO ADDRESS OBESITY AND CARDIOVASCULAR DISEASE

POLICY & INTERVENTION MAP



MEXICO

TAXATION ON UNHEALTHY FOODS AND SUGARY DRINKS

In 2014, **Mexico** *introduced a sugar-sweetened beverage tax of 1 peso per liter, equivalent to about 10% of the price of sugary drinks[95].*

UNITED STATES

ELIMINATING FOOD DESERTS

The Healthy Food Financing Initiative (HFFI) in the **United States** *provides funding to eligible organizations that are planning to develop a food retail outlet or food supply chain that will improve access to staple and perishable foods in underserved areas[97].*

BRAZIL

FRONT-OF-PACK LABELLING

In 2020, a new regulation was approved in **Brazil** *stating that the nutritional labelling must be placed on the front panel of packaged foods using simple and clear icons to emphasize high contents of saturated fat, added sugar and sodium[96].*

KEY

COUNTRY

POLICY / INTERVENTION

Example

EUROPEAN UNION

PROMOTE SUSTAINABLE FOOD SYSTEMS

The European Union *(EU) 'Farm to Fork' strategy, a part of the European Green Deal, aims to promote sustainable food systems, while ensuring availability of sufficient nutritious, safe and sustainable food within EU countries[103]*

FINLAND

SCHOOL MEAL PROGRAMMES

Finland *school meal programme, providing free balanced and healthy school meals to each child and young person attending pre-primary, primary, lower secondary and upper secondary education[98].*

UK

ZONING REGULATIONS

In 2015, the Gateshead council in the **UK** *implemented a comprehensive restriction preventing the opening of any new fast food establishments with the aim of reducing childhood obesity to less than 10% by 2025 from 22.6% in 2015.("No new fast-food outlets allowed! Evaluating the effect of planning policy on the local food environment in the North East of England)[99].*

RWANDA

REDUCING HEALTH DISPARITIES

The **Rwandan** *Community Based Health Insurance promotes access to medical care at affordable cost for underserved communities. Through this system, individuals are able to receive primary medical care, including services for the prevention and management of CVD and obesity, from health centres or health posts across the country[106].*

JAPAN

SCHOOL-BASED PROGRAMMES

In 2005, **Japan** *implemented a nationally mandated food education programme called Shokuiko, teaching students about balanced nutrition, food origins and healthy eating habits. Schools provide nutritionally balanced meals, and students are actively involved in food preparation and meal planning to instill lifelong healthy eating habits[100].*

INDIA

PUBLIC HEALTH CAMPAIGNS

The "Eat Right India" campaign launched in 2018 by the Food Safety and Standards Authority of **India** *(FSSAI), designed to promote healthy eating and raise awareness about the importance of balanced diets to prevent obesity. It uses mass media, including TV, radio and digital platforms, to spread messages on nutrition, food safety and the dangers of overeating[94].*

NEW ZEALAND

ADDRESS CHRONIC DISEASES

The Mana Tū project, co-designed with Māori and Pasifika communities to address chronic diseases, such as diabetes and CVD, was implemented in **New Zealand** *from 2017 to 2020. Through the project, communities received support and guidance around different areas closely related to effective disease management, including nutrition. Thanks to this project, the amount of fruit and vegetables consumed by participants increased, alongside a10% average increase in physical activity[105].*

GLOBAL INITIATIVES TO ADDRESS OBESITY AND CVD

ROBUST GLOBAL STRATEGIES SUPPORT NATIONAL AND LOCAL EFFORTS TO REDUCE OBESITY AND CVD, AS THEY HELP IN DEFINING SPECIFIC OBJECTIVES AND GOALS FOR ADDRESSING OBESITY AND PROVIDE GUIDANCE ON EFFECTIVE SOLUTIONS TO CURB ITS GROWING PREVALENCE.

This is a short summary of key intersecting and complementary global initiatives aimed at combating obesity and CVD.

1. GLOBAL ACTION PLAN FOR THE PREVENTION AND CONTROL OF NONCOMMUNICABLE DISEASES (2013–2020 EXTENDED UNTIL 2030)

Overview: WHO's "Global Action Plan" provides a roadmap for countries to develop and implement national strategies to prevent and manage NCDs, including obesity, with the aim of reducing premature deaths from NCDs by 25% by 2025. The Plan includes specific targets and key actions across various areas, with a focus on reducing risk factors such as unhealthy diets, physical inactivity, tobacco use, and harmful use of alcohol. The monitoring framework developed to track progress in reducing the burden of NCDs includes a set of indicators linked to 9 voluntary targets.

A progress report submitted to the UN High-Level Meeting on NCDs in 2018 highlighted insufficient and uneven progress in the fight against NCDs. Thus, the "Global Action Plan" was extended until 2030 through World Health Assembly resolution 72.11. The target for a 25% reduction in premature deaths from NCDs by 2025 remains; however, the SDG 3.4 target—to reduce by one-third premature deaths from NCDs—is generally considered the new benchmark.

Relevant target(s): Target 7 – "Halt the rise in diabetes and obesity"

Relevant indicators:

- Indicator 13: Prevalence of overweight and obesity in adolescents (overweight and obesity are respectively defined as a BMI-for-age >1 and BMI-for-age >2 standard deviation above the WHO Growth Reference median for age and sex).
- Indicator 14: Age-standardized prevalence of overweight and obesity in persons aged 18+ years (defined as BMI ≥ 25 kg/ m^2 for overweight and BMI ≥ 30 kg/m^2 for obesity).

2. ACCELERATION PLAN TO STOP OBESITY (2022)

Overview: WHO's "Acceleration Plan to Stop Obesity" is designed to stimulate and support multisectoral actions at the national level based on evidence-informed policies. It takes a systematic approach to addressing obesity through helping countries to navigate the complexities of implementation challenges and delivering results. This includes through a consolidated set of policy recommendations shown to be effective, affordable, adaptable, and scalable to deliver positive outcomes for people with obesity.

Notable policies: Among the recommendations are policies to support:

- Protection of individuals from the harmful advertising of unhealthy foods.
- Taxes on unhealthy foods and reformulation of food products.
- Promotion of physical activity and nutritional education in schools.
- Greater integration of obesity prevention and treatment into primary healthcare services, especially in LMICs where resources are limited.

  Additionally, the plan urges Member States to draft national roadmaps through a process that brings together diverse stakeholders.

Frontrunner countries: ***Countries to have adopted the WHO-recommended policies include Argentina, Bahrain, Barbados, Botswana, Brazil, Brunei, Chile, Egypt, Eswatini, Iran (Islamic Republic of Iran), Ireland, Jordan, Kazakhstan, Kuwait, Malaysia, Mauritius,Mexico, Morocco, Oman, Panama, Peru, Philippines, Portugal, Qatar, Saudi Arabia, Seychelles, Slovenia, South Africa, Spain, Thailand, Tonga, Trinidad and Tobago, Türkiye, United Kingdom of Great Britain and Northern Ireland, and Uruguay.***

3. THE GLOBAL STRATEGY ON DIET, PHYSICAL ACTIVITY AND HEALTH (2024)

Overview: WHO's "Global Strategy on Diet, Physical Activity and Health" aims to reduce the global burden of NCDs, including CVD and obesity, through improved diet and physical activity. This strategy provides clear objectives and actions to mitigate the risk factors contributing to these diseases.

Objectives: The Global Strategy lists four main objectives:

1. Reduce the risk factors for NCDs that stem from unhealthy diets and physical inactivity by means of essential public health action and health-promoting and disease preventing measures.
2. Increase the overall awareness and understanding of the influences of diet and physical activity on health and of the positive impact of preventive interventions.
3. Encourage the development, strengthening and implementation of global, regional, national and community policies and action plans to improve diets and increase physical activity that are sustainable, comprehensive, and actively engage all sectors, including civil society, the private sector and the media.
4. Monitor scientific data and key influences on diet and physical activity, support research in a broad spectrum of relevant areas, including evaluation of interventions, and strengthen the human resources needed in this domain to enhance and sustain health.

While the strategy is a useful tool for designing and implementing national policies aimed at reducing the burden of NCDs, it does not provide a set of targets that countries can refer to when measuring progress.


© World Obesity

4. THE WHO GLOBAL ACTION PLAN ON PHYSICAL ACTIVITY (2018–2030)

Overview: The Plan responds to global calls for stronger action and coordination to reverse physical inactivity trends, a major contributor to NCDs, and sets out a system-wide, multisectoral framework for promoting physical activity through urban design, education, health systems, transport, sports, and community engagement. It complements the WHO "Global Action Plan on NCDs 2013–2020".

Goal: 15% relative reduction in the global prevalence of physical inactivity among adults and adolescents by 2030, using 2016 as a baseline.

Objectives: The Plan includes four strategic objectives, supported by 20 evidence-based policy actions including:

1. Create active societies, supported by four policy actions to shift social norms and attitudes towards.
2. Create active environments, supported by five policy actions to build safe and accessible infrastructure.
3. Create active people, supported by six policy actions to expand access to programmes and opportunities.
4. Create active systems, supported by five policy actions to strengthen governance, partnerships, data systems.

5 UNITED NATIONS DECADE OF ACTION ON NUTRITION (2016–2025)

Overview: The UN launched this global initiative to address malnutrition in all its forms, including undernutrition, micronutrient deficiencies, and overnutrition, with a focus on promoting healthy diets to improve public health. It is part of the broader UN strategy to achieve the Sustainable Development Goals (SDGs), particularly SDG 2 (End hunger, achieve food security, improve nutrition, and promote sustainable agriculture) and SDG 3 (Ensure healthy lives and promote well-being for all at all ages).

Main areas: Action during the Nutrition Decade is based on 6 thematic areas:

1. Sustainable, resilient food systems for healthy diets.
2. Aligned health systems providing universal coverage of essential nutrition actions.
3. Social protection and nutrition education.
4. Trade and investment for improved nutrition.
5. Safe and supportive environments for nutrition at all ages.
6. Strengthened governance and accountability for nutrition.

While these actions are not accompanied by specific targets, they serve as useful guidance for governments aiming to implement policies and strategies to improve nutrition, which in turn will have an impact on CVD prevalence and mortality.

6 UPCOMING: WHO TECHNICAL PACKAGE TO STOP OBESITY

On World Obesity Day 2025 (March 4), WHO announced the launch of a new "Technical Package to Stop Obesity" that extends beyond the WHO "Acceleration Plan to Stop Obesity". As per the announcement, "the technical package provides a practical how-to approach of proven interventions selected by countries according to their own priorities and tailored to a local context". These interventions focus on:

- Adapting environments to enable a healthy lifestyle.
- Creating knowledge, motivation, and skills for healthy behaviours.
- Transforming the health system to respond to the obesity crisis.

At the time of writing, the Technical Package has not been released. Further details can be found via the links below:

- Webinar recording to launch the WHO Technical Package to Stop Obesity (March 4, 2025): *https://www.who.int/news-room/events/detail/2025/03/04/default-calendar/webinar-to-launch-the-who-technical-package-to-stop-obesity*
- Presentation from webinar to launch the WHO Technical Package to Stop Obesity (March 4, 2025): *https://cdn.who.int/media/docs/default-source/nutrition-and-food-safety/events/2025/webinar-to-launch-the-who-technical-package-to-stop-obesity-presentation.pdf?sfvrsn=c8f45210_3*

KEY RECOMMENDATIONS

ALL COUNTRIES AND STAKEHOLDERS MUST URGENTLY WORK TOGETHER TO ACCELERATE EFFORTS TO REDUCE THE MORTALITY AND MORBIDITY BURDEN OF OBESITY AND CVDS THROUGH THE IMPLEMENTATION OF EVIDENCE-INFORMED PUBLIC HEALTH AND CLINICAL INTERVENTIONS.

WHF RECOMMENDS THE FOLLOWING KEY ACTIONS:

PUBLIC HEALTH INTERVENTIONS

1. All countries should implement evidence-based, cost-effective public health measures to address obesity and CVD, and prioritize comprehensive, integrated and equity-focused policies guided by national data on how determinants vary across population groups. Implementation should draw on global frameworks and tools, including WHO's "Acceleration Plan to Stop Obesity", the "Global Action Plan for the prevention and control of noncommunicable diseases", and "The Global Strategy on Diet, Physical Activity and Health". Priority actions include national obesity roadmaps with defined targets, multisectoral policies addressing the broad scope of obesity determinants, and ensuring greater integration of obesity prevention and treatment into primary healthcare services.

2. Public health campaigns and policies must counteract the stigmatization of obesity, including through the use of person-first language, recognizing that stigma is a hindrance to tackling obesity and CVD. This includes acknowledging the broad determinants of obesity and implementing legislation to address discrimination of people with obesity and overweight. To achieve best results, the design of campaigns and policy initiatives should involve people living with obesity and CVD.

CLINICAL INTERVENTIONS

1. Cardiovascular guidelines should incorporate obesity-specific recommendations to ensure CVD management is adequately adapted for people living with obesity. This includes equipping health professionals with the knowledge, guidance and tools necessary to optimally prevent, manage and treat obesity.

2. Health professional education and health system strengthening initiatives for obesity and CVD should focus on promoting person-centred, integrated care and where possible be responsive to disparities in obesity risk, prevalence and access to care.

3. Governments should increase efforts to expand the availability and affordability of obesity medications, such GLP-1RAs, including through:
   - Ensuring they are covered under public health insurance plans to make them affordable and available for a broader population of persons with obesity and related conditions like Type 2 diabetes in alignment with clinical practice guidelines.
   - Undertaking cost-reduction initiatives via negotiation with pharmaceutical companies to reduce the cost of GLP-1RAs, or incentivising generic alternatives once patents expire. Governments can also explore bulk purchasing options to reduce drug prices for citizens.

4. Governments should increase efforts to expand the public awareness, availability and accessibility of specialized lifestyle modification programmes, including those targeting children and adolescents. Examples of these specialized programmes include nutritional, physical activity, weight loss, and cardiac rehabilitation programmes.

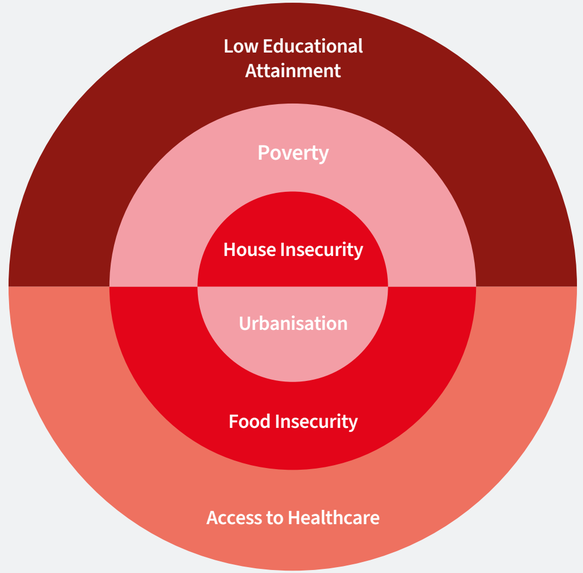
RECOMMENDATIONS TO IMPROVE RESEARCH AND DATA

Governments, academia, the private sector and others must collaborate to enhance research and data collection efforts to improve the response to obesity and CVD. Required actions include, but are not limited to:

- Increase investment and enhance collaboration in research to, among other areas, improve recommendations for the optimal management and treatment of obesity in people with CVD. This can help address challenges from the shortcomings of existing CVD diagnostics and treatment in people with obesity and achieve greater consensus on the definition and diagnostic criteria for obesity to better support decisions at the clinical and health system levels.
- Improve global and regional data collection to better inform global levels and trends of obesity and attributable mortality/morbidity. Existing estimates result from complex statistical models (see Online Appendix), yet there are important gaps in the data that inform these models, particularly in certain geographies where limited data result in high levels of uncertainty in the final estimates. This has clear implications on the capacity of critical stakeholders to implement strategies aimed at reducing the burden of obesity and CVD and to prepare the health system response.
- Address limitations in data on the major drivers of obesity. These hinder disease mitigation efforts—particularly due to the lack of harmonized and comparable data on factors such as education, occupation, and income—and our understanding of whether the obesity epidemic is impacting different population subgroups equally and at the same pace.

- Prioritise dissemination and implementation of research that explores the local socio-economic, cultural, and environmental factors influencing obesity, especially in LMICs.
- Prioritise research that examines the impact of social determinants of health (e.g., poverty, low educational attainment, housing insecurity, urbanization, food insecurity, access to healthcare) on obesity and cardiometabolic risk.
- Support training and career development for the next generation of researchers and clinicians with interest in obesity research across the lifespan.
- Support research to develop and test strategies in the effectiveness of early childhood and school-based obesity prevention programmes, and support the scale-up of such strategies when proven effective in specific settings.

PRIORITISE RESEARCH THAT EXAMINES THE IMPACT OF SOCIAL DETERMINANTS OF HEALTH (E.G., POVERTY, LOW EDUCATIONAL ATTAINMENT, HOUSING INSECURITY, URBANIZATION, FOOD INSECURITY, ACCESS TO HEALTHCARE) ON OBESITY AND CARDIOMETABOLIC RISK.



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WORLD HEART FEDERATION
32, rue de Malatrex, 1201 Geneva, Switzerland
(+41) 22 807 03 20
info@worldheart.org
www.worldheart.org

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