



**WORLD HEART
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Policy Snapshot: Cholesterol Control and Management in Brazil



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About this Policy Snapshot



Worldwide, there are about 17 million deaths due to cardiovascular disease (CVD) each year and at least two or three times as many non-fatal events. Raised cholesterol greatly increases the risks of stroke and heart disease, causing a large health burden across the world. The World Health Organization has identified control of cholesterol as part of a Total Risk Approach to the prevention of CVD as a public health priority.¹

The successful implementation of a Total Risk Approach to the prevention of CVD is key to achieving the World Health Organization's target of a 25 percent reduction in premature mortality from non-communicable diseases (NCDs) by 2025. Successfully addressing CVD prevention will have a major impact on health outcomes and reduce the associated economic burden.

This Snapshot describes the global policy environment and then puts a specific focus on Brazil, where it will be used to inform advocacy and implementation strategies for improved prevention and control of CVD. It includes an overview of guidelines and their adoption and implementation at both the national policy and healthcare provider levels.

It provides a comprehensive picture of the country's CVD burden, as well as of Brazil's policy landscape with regard to addressing prevention and management of cholesterol, focusing on relevant issues such as governance, financing, access and quality coverage.

¹ World Health Organization, *Prevention of Cardiovascular Disease: Guidelines for Assessment and Management of Cardiovascular Risk*, (Geneva, 2007) <www.afro.who.int/en/downloads/doc_download/2753-guidelines-for-assessment-and-management-of-cardiovascular-risk.html> [accessed 09 April 2015].

Introduction:

Raised Cholesterol as a Major Global Health Issue

The WHO strongly maintains the importance of “reducing the cardiovascular risk (controlling blood pressure, blood cholesterol, blood sugar and tobacco use) in people, including those with diabetes, who are at high risk of heart attack and stroke.”²

Each year, raised cholesterol causes an estimated 2.6 million deaths (4.5% of total) and 29.7 million disability adjusted life years (DALYS), or 2.0% of total DALYS worldwide.² Globally, a third of ischaemic heart disease is attributed to high cholesterol. Conversely, lowering serum cholesterol decreases the risk of heart disease. A 10% reduction in serum cholesterol in men aged 40 is estimated to result in a 50% reduction in heart disease within 5 years.² In 2008, the global prevalence of raised total cholesterol among adults (≥ 5.0 mmol/L) was 39% (37% for males and 40% for females).²

EACH YEAR RAISED CHOLESTEROL CAUSES AN ESTIMATED



2.6m
DEATHS
(4.5% TOTAL)

AND

OR

29.7m **2.0%**
DISABILITY ADJUSTED OF TOTAL DALYS
LIFE YEARS (DALYS) WORLDWIDE

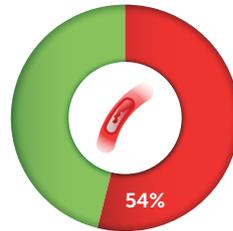
GLOBALLY
1/3 **ISCHAEMIC**
HEART DISEASE
IS ATTRIBUTED TO
HIGH CHOLESTEROL

10% REDUCTION IN SERUM
CHOLESTEROL IN MEN
AGED 40 IS ESTIMATED
TO RESULT IN A
50%
REDUCTION IN HEART DISEASE
WITHIN 5 YEARS

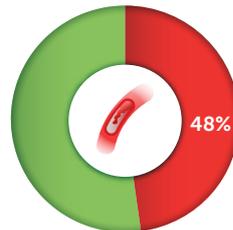
² World Health Organization *Global Atlas on Cardiovascular Disease Prevention and Control*, ed. Mendis S, Puska P, Norving B (Geneva, 2011).

Raised cholesterol does not affect all global regions to the same extent. World Health Organization data from 1980 to 2008 shows that mean total cholesterol globally remained high and relatively static during this period, falling by less than 0.1 mmol/L per decade in both men and women. *Elevated total cholesterol was most prevalent in the European Region (54% for both sexes), followed by the Americas Region (48% for both sexes). The African Region and the South-East Asia Region recorded the lowest prevalence percentages (23% and 30%, respectively). Globally, the prevalence of raised total cholesterol increases with the income level of the country. In 2011 around 25% of adults experienced raised total cholesterol in low-income countries, while over 50% of adults experienced raised total cholesterol in high-income countries.²

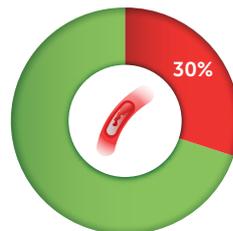
ELEVATED TOTAL CHOLESTEROL



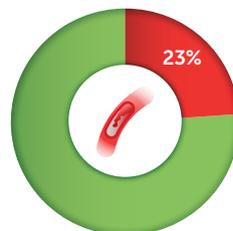
EUROPEAN REGION
(54% FOR BOTH SEXES)



AMERICAS REGION
(48% FOR BOTH SEXES)



SOUTH-EAST ASIA REGION
(30% FOR BOTH SEXES)



AFRICAN REGION
(23% FOR BOTH SEXES)

Global commitments to control cholesterol

The United Nations General Assembly made its strongest NCD commitment to date on 19 September 2011, when it adopted Resolution 66/2 on the *Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-Communicable Diseases (NCDs)*. The Resolution called on the World Health Organization (WHO) to:

1. **Develop a comprehensive global monitoring framework (GMF) that includes a set of indicators, applicable across multi-sectorial, regional and country settings, which could monitor trends and assess progress made in the implementation of national NCD strategies and plans**
2. **Prepare recommendations for a set of voluntary global targets for the prevention and control of NCDs.**³

Responding to this, the WHO developed the GMF to enable global tracking of progress in the prevention and control of four major NCDs – cardiovascular disease (CVD), cancer, chronic lung disease and diabetes – and their key risk factors. The GMF comprises nine voluntary global targets and 25 indicators. Collectively, the nine targets seek to:

1. **Combat global mortality from the four main NCDs**
2. **Accelerate action against the leading risk factors for NCDs**
3. **Strengthen national health system responses.**

In May 2012, the World Health Assembly formally adopted the GMF's mortality target: a 25% reduction in premature mortality from NCDs by 2025 (also known as the “25x25” strategy).⁴

The GMF seeks to drive progress in prevention and control of NCDs and to promote advocacy, raise awareness, reinforce political commitments and stimulate global action to confront these chronic conditions.

While it does not include a specific target on raised cholesterol, the GMF does include an important indicator to measure its control:

“Age-standardized prevalence of raised total cholesterol among persons aged 18+ years (defined as total cholesterol ≥ 5.0 mmol/L or 190 mg/dL); and mean total cholesterol.”



³ World Health Assembly 66, *Follow-up to the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases*, (Geneva, 2013) <apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R10-en.pdf> [accessed 16 November 2014].

⁴ World Health Organization, *Global Monitoring Framework and Targets for the Prevention and Control of Non-communicable Diseases*, (Geneva, 2013) <www.who.int/nmh/global_monitoring_framework/en/> [accessed 12 November 2014].

Cholesterol-lowering medications and cardiovascular disease (CVD)

According to the WHO, lowering total serum cholesterol levels is an appropriate strategy for reducing the global burden of CVD. To this end – beyond recommended dietary interventions – statins are safe, widely available and highly effective cholesterol-lowering medications. Modeling studies suggest that lowering total serum as part of an overall risk approach can be an especially cost-effective approach in low- and middle-income countries.⁶ Nevertheless, on a global level, effective medication coverage for control of high cholesterol remains lamentably poor.⁵

However, some progress has been made in the availability of cholesterol-lowering drugs, such as simvastatin and lovastatin. Over the past decade, the global availability of simvastatin has increased significantly, with over 100 manufacturers, including many in China and India. WHO added the drug to its list of essential medicines in 2007. In some regions, treatment with simvastatin (40 mg) and with lovastatin (20 mg) costs less than US \$30 and US \$3 per year, respectively. Improved adherence to statins, as well as broader screening and prescribing, may have been facilitated by these global changes.⁵

Complications of global cholesterol research

Monitoring, measuring and comparing results between countries, and reporting on high total serum cholesterol, can be complicated by a number of factors. Many studies rely heavily on self-reported information – from the diagnosis of high total serum cholesterol to the use of cholesterol-lowering medication – which can compromise data reliability. According to researchers, most surveys that address cholesterol measurement and treatment fail to differentiate between prescribed and over-the-counter medications or between statin and non-statin medication, which makes it difficult to isolate treatment protocols. Researchers also acknowledge that coverage estimates are highly sensitive to the definition of disease state and treatment goals.⁵

Furthermore, differences in how health systems implement the use of cholesterol-lowering medications are not well understood. Comparing individual studies is difficult because definitions of high blood cholesterol levels can vary, and population-wide data is unavailable in many cases.⁵

As an “intermediate risk factor” of CVD (along with overweight/obesity, elevated blood glucose and high blood pressure), raised cholesterol can be addressed via secondary prevention measures (e.g. use of medicines to control cholesterol and/or changes in diet or physical activity). While interventions on intermediate risk factors may be more effective (and more cost-effective) than waiting to treat fully developed NCDs, this approach may be less effective (and less cost-effective) than primary prevention measures or creating favorable policy environments to decrease vulnerability to disease. For these reasons, the need to address social determinants of NCDs has been emphasised in the GMF.⁷

⁵ Roth G A, et al. 'High total serum cholesterol, medication coverage and therapeutic control: an analysis of national health examination survey data from eight countries', in *Bulletin of the World Health Organization*, 89:92-101 (Geneva, 2011).

⁶ Lim S S, et al., 'Prevention of cardiovascular disease in high-risk individuals in low-income and middle-income countries: health effects and costs', in *Lancet*, 370:2054-62 (2007) <www.ncbi.nlm.nih.gov/pubmed/18063025> [accessed 10 April 2015].

⁷ Bloom D E, Cafiero E T, Jané-Llopis E, Abrahams-Gessel S, Bloom L R, Fathima S, Feigl A B, Gaziano T, Mowafi M, Pandya A, Prettner K, Rosenberg L, Seligman B, Stein A Z & Weinstein, C. (2011). *The Global Economic Burden of Noncommunicable Diseases*. Geneva, World Economic Forum (Geneva, 2011) <www3.weforum.org/docs/WEF_Harvard_HE_GlobalEconomicBurdenNonCommunicableDiseases_2011.pdf> [accessed 16 November 2014].

Global Cholesterol Policy Landscape

World Health Organization (WHO) guidelines on Non-Communicable Disease

The 25x25 NCD strategy is incorporated into WHO's Global NCD Action Plan 2013-2020 (GAP).⁸ Of the nine voluntary national targets, two are overarching: to reduce mortality from the four major conditions; and to halt the rise in incidence of diabetes and obesity. The remaining seven are specific, including reducing alcohol consumption, increasing physical activity, reducing dietary salt intake and smoking, improving blood pressure control, and enhancing treatment related to major NCDs.³ The GAP takes a comprehensive view, recognizing the social, economic, and political determinants of these diseases, including their common risk factors (e.g. raised cholesterol).⁹ Overall, the 25x25 strategy seeks to reduce preventable mortality, with an emphasis on the four major conditions, which account for 87% of all deaths from NCDs.¹⁰



A **25%** relative reduction in risk of premature mortality from cardiovascular diseases, cancer, diabetes, or chronic respiratory diseases.



At least **10%** relative reduction in the harmful use of alcohol, as appropriate, within the national context.



A **10%** relative reduction in prevalence of insufficient physical activity.



A **30%** relative reduction in mean population intake of salt/sodium.



A **30%** relative reduction in prevalence of current tobacco use in persons aged 15+ years.



A **25%** relative reduction in the prevalence of raised blood pressure or contain the prevalence of raised blood pressure, according to national circumstances.



Halt the rise in diabetes and obesity.



At least **50%** of eligible people receive drug therapy and counselling (including glycaemic control) to prevent heart attacks and strokes.



An **80%** availability of the affordable basic technologies and essential medicines, including generics, required to treat major noncommunicable diseases in both public and private facilities.

Cholesterol-related guidelines endorsed by UN agencies

Under a mandate from Member States, WHO developed a *Global Strategy on Diet, Physical Activity and Health*, which was endorsed by the May 2004 World Health Assembly (WHA57.17).¹¹ The strategy presents a range of global policy options to address two of the major common risks factors of NCDs: unhealthy diet and physical inactivity.

The Strategy specifies roles for WHO Member States, UN agencies, civil society and the private sector in reducing the incidence of NCDs. It also addresses the role of NCD prevention in: health services; food and agriculture policies; fiscal policies; surveillance systems; regulatory policies; consumer education and communications including marketing, school policies, health claims and nutrition labeling. Among specific recommendations on addressing unhealthy diet, it suggests limiting intake of sugars, fats and salt in foods, while increasing the consumption of fruits, vegetables, legumes, whole grains and nuts.¹¹

Complementing the links between healthy diet and the reduction of NCD risk, *the WHO Global Recommendations on Physical Activity for Health* (2010) note that there is a direct relationship between physical activity and metabolic health and that engaging in physical activity significantly lowers the risk of CVD and other NCDs.¹² These WHO guidelines can be leveraged and applied to the control of intermediate risk factors, such as obesity and cholesterol control.

For instance, the WHO report *Interventions on Diet and Physical Activity: What Works (What Works, 2009)* provides a summary of tested diet and physical activity interventions that aim to reduce the risk of NCDs.¹³ This systematic review categorized cholesterol screening programmes that provide clients with results and follow-up education (ideally in person) as “moderately effective” interventions (interventions that were: ‘sufficiently robust to warrant consideration for application in specific settings or groups and met some, if not all [...] planned objectives’).¹³

³ World Health Assembly 66, *Follow-up to the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases*, (Geneva, 2013) <apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R10-en.pdf> [accessed 16 November 2014].

⁸ World Health Organization, *Global Action Plan for the Prevention and Control of Non-Communicable Diseases 2013-2020* (Geneva, 2013) <http://apps.who.int/iris/bitstream/10665/94384/1/9789241506236_eng.pdf?ua=1> [accessed 24 March 2015].

⁹ World Health Organization, *Vienna Declaration on Nutrition and Non-communicable Diseases in the Context of Health 2020*, WHO Ministerial Conference on Nutrition and Noncommunicable Diseases in the Context of Health (Vienna, 2013) <www.euro.who.int/en/media-centre/events/events/2013/07/vienna-conference-on-nutrition-and-noncommunicable-diseases/documentation/vienna-declaration-on-nutrition-and-noncommunicable-diseases-in-the-context-of-health-2020> [accessed 12 November 2014].

¹⁰ Pearce N, et al., ‘The road to 25x25: how can the five-target strategy reach its goal?’ in *The Lancet Global Health*, 2:3 126-128 (2014) <www.thelancet.com/journals/langlo/issue/vol2no3/PIIS2214-109X(14)X7014-2> [accessed 09 April 2015].

¹¹ World Health Assembly 59, *Implementation of Resolutions (Progress Reports)* (Geneva, 2006) <www.who.int/nmh/wha/59/dpas/en/> [accessed 24 November 2014].

¹² World Health Organization, *Global Recommendations on Physical Activity for Health* (Geneva, 2010).

¹³ World Health Organization, *Interventions on Diet and Physical Activity: What Works* (Geneva, 2009) <www.who.int/dietphysicalactivity/whatworks/en/> [accessed 24 November 2014].

Selected international, regional and country guidelines

This section maps out examples of cholesterol guidelines that are currently in use. Comparing cholesterol guidelines from around the world can be problematic, as guidelines differ according to many factors: scope (international, regional, country); definitions; content; and priorities.

For example, most cholesterol guidelines adjust intensity of LDL-lowering therapy (and LDL-C goals) to absolute, short-term risk as determined by major risk factors and age. For

primary prevention, several categories of risk are defined, typically divided into three categories of 10-year risk: high, intermediate, and low. However, the parameters of these categories vary across organizations, as seen in the table below. It is worth noting that the widely used AHA/ACC guidelines do not share the common defining categories; details of their approach are discussed below.

This table compares three different definition parameters currently used by major providers of cholesterol control and diagnosis guidelines:¹⁴

Cholesterol risk guidelines		Definition			
Guideline example	Guideline provider	'Very high risk'	'High risk'	'Intermediate risk'	'Low risk'
International	International Atherosclerosis Society (IAS), 2013	-	≥ 45% (Absolute risk for ASCVD)	15-30% 'Moderate' (Absolute risk for ASCVD) 30-44% 'Moderately high' (Absolute risk for ASCVD)	< 15% (Absolute risk for ASCVD)
Regional	European Atherosclerosis Society and the European Society of Cardiology (EAS/ESC), 2011	> 10% (10-year risk for fatal CVD)	5-10% (10-year risk for fatal CVD)	≥ 1- 5% (10-year risk for fatal CVD)	< 1% (10-year risk for fatal CVD)
National	Brazilian National Guidelines	-	> 20% (10-year risk for CHD)	10-19% (10-year risk for CHD)	< 10% (10-year risk for CHD)

In 2013, the American Heart Association and American College of Cardiology released four new CVD prevention guidelines related to: cholesterol, lifestyle, obesity and risk assessment.¹⁵ The guidelines utilize a risk assessment calculator that takes into account factors such as age, gender, race, history of smoking, blood pressure, diabetes, as well as blood cholesterol levels in determining overall risk. The guidelines recommend statin therapy for the following groups:

- **Those without CVD who are 40 to 75 years old and have a 7.5% or higher risk for having a heart attack or stroke within 10 years**
- **Those with a history of a CVD event (heart attack, stroke, stable or unstable angina, peripheral artery disease, transient ischaemic attack, coronary or other arterial revascularization, etc.)**
- **Individuals 21 and older who have a very high level of LDL cholesterol (190 mg/dL or higher); and**
- **Individuals with Type 1 or Type 2 diabetes who are 40 to 75 years old.¹⁵**

¹⁴ International Atherosclerosis Society, *An International Atherosclerosis Society Position Paper: Global Recommendations for the Management of Dyslipidemia* (2013) <www.athero.org/download/IASPPGuidelines_FullReport_2.pdf> [accessed 10 April 2015, all relevant guidelines are referenced in this report].

¹⁵ ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (2013) <circ.ahajournals.org/content/129/25_suppl_2/S1.full.pdf+html> [accessed 17 November 2014].

The Burden of CVD in Brazil

Brazil: a brief overview

The World Bank classifies Brazil as an upper middle income country. Brazil is the seventh largest economy in the world and is currently the largest in Latin America.¹⁶ Brazil is among the top five emerging economies as distinguished by a significant influence on regional and global affairs. According to the UNDP Human Development Index (HDI), which measures development by combining indicators of life expectancy, education attainment and income, Brazil ranks as a high HDI country.¹⁷

According to the Brazilian Department of Health, there is a highly variable distribution of income among the country's five regions. In the South, 19.94% of the population earns less than half of the minimum salary (380 Brazilian reais, or US \$190), while the South-East reports that 21.39% of the population earns less than half of the minimum salary. In contrast, the Middle-West reports 27.88%; the North reports 46.19%; and Brazil's most impoverished North-East region reports 56.53% earning less than half of the minimum salary.¹⁸

Brazil, along with most Latin American countries, is experiencing a demographic and epidemiological transition as a consequence of urbanization, improvements to health care, changing lifestyles and globalization. In some regions of Brazil, this transition is creating a double burden of high rates of both communicable diseases and NCDs in less developed regions (e.g. North-East), alongside reduced burden of communicable diseases, but increasing burden of NCDs in more developed regions (e.g. South). The double burden exists particularly among the poor, who

have disproportionately high rates of both NCDs and communicable diseases.¹⁹ The overall national mortality burden, including premature deaths attributable to CVD, also unduly affects the poor. For example, in Porto Alegre, premature deaths attributable to CVDs (defined as CVD-related death in individuals aged 45–64 years), was 163% higher in neighbourhoods in the lowest socio-economical quartile than in those in the highest.²⁰



¹⁶ The World Bank, *World Development Indicators: Brazil* (2013) <data.worldbank.org/country/brazil> [accessed 14 November 2014].

¹⁷ United Nations Development Programme, *International Human Development Indicators* (2014) <hdr.undp.org/en/countries> [accessed 14 November 2014].

¹⁸ Santos H L B S & Rosario N, 'Access to medication: key to achieving treatment goals', in *Bulletin of the World Health Organization*, 81:417-496 <www.who.int/bulletin/volumes/86/6/08-051284/en/> [accessed 21 November 2014].

¹⁹ The World Bank, *Addressing the Challenge of Non-Communicable Disease in Brazil*, Report No. 32576-BR, Brazil Country Management Unit, Human Development Sector Management Unit, Latin America and the Caribbean Region (2005) <openknowledge.worldbank.org/bitstream/handle/10986/8334/325760BR.pdf?sequence=1> [accessed 17 November 2014].

²⁰ Schmidt M, et al., 'Chronic diseases in Brazil: Burden and current challenges' in *Lancet*, 377(9781):1949-61. (2011).

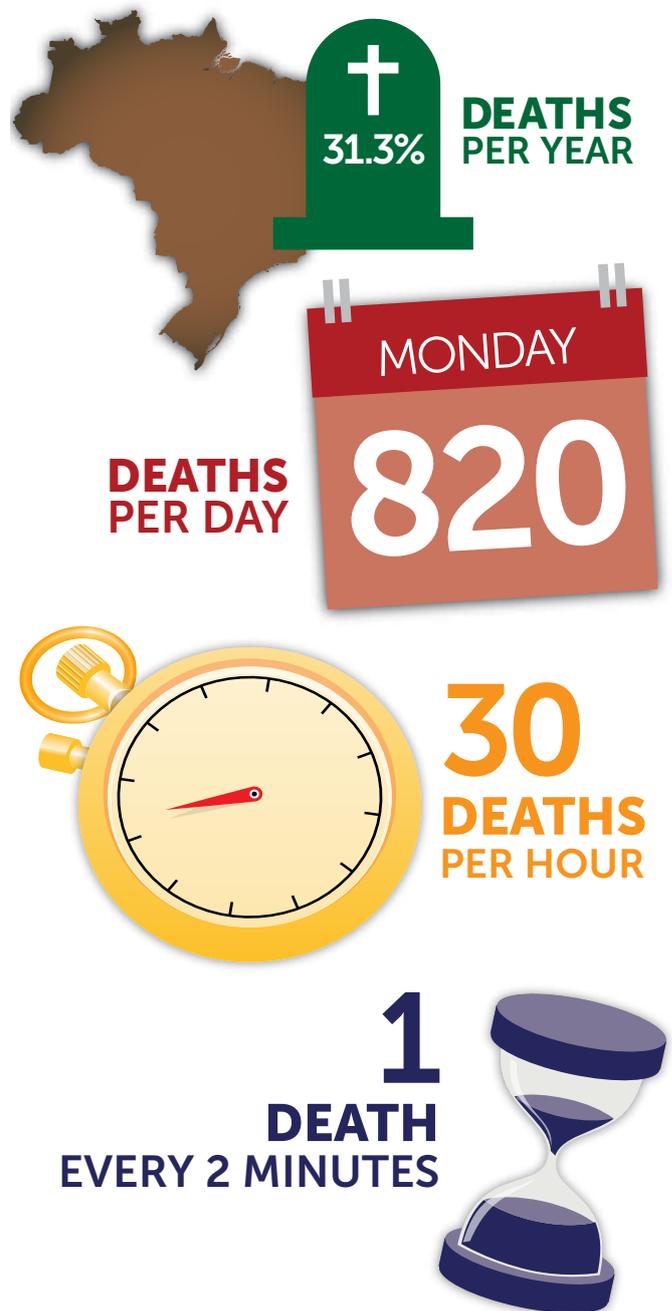
CVD mortality and morbidity in Brazil

Brazil's national burden of CVD

According to the Brazilian Ministry of Health's *NCDs Action Plan 2011-2022 (Plano de Ações Estratégicas para o Enfrentamento das Doenças Crônicas Não Transmissíveis (DCNT) no Brasil 2011-2022)*, NCDs account for 72% of mortality in Brazil, with an 31.3% of all deaths attributable to cardiovascular diseases (CVD). An estimated 300,000 Brazilians die annually due to CVDs, such as myocardial infarction, stroke, heart and kidney failure, and sudden death. This translates to 820 deaths a day, 30 deaths per hour, or one death every two minutes.²¹ The prevalence of CVD varies according to the Brazilian regions, with the South and South-East, for example, recording the highest percentages of CVD deaths (33.5% and 34.9%, respectively).²²

In Brazil, the morbidity and mortality rates of all NCDs are highest in the poorest populations. But although the crude NCD mortality rates increased 5% between 1996 and 2007, age-standardised mortality decreased by 20%. These declines, which were primarily for CVDs and chronic respiratory diseases, coincided with the successful implementation of health policies that resulted in decreased smoking and the expansion of access to primary health care.²⁰ While the Brazilian population remains at high risk of CVD, it is encouraging that where interventions have been implemented there are clear and measurable signs of success.²⁰

DEATHS ATTRIBUTABLE TO CVD



²⁰ Schmidt M, et al., 'Chronic diseases in Brazil: Burden and current challenges' in *Lancet*, 377(9781):1949-61. (2011).

²¹ Institute for Health Metrics and Evaluation, *Global Burden of Disease Study: Brazil* (2010) <www.healthdata.org/sites/default/files/files/country_profiles/GBD/lhme_gbd_country_report_brazil.pdf> [accessed 24 November 2014].

²² Marsola A P Z C & Cesarino E J, 'Factors Related to Adherence with Treatment of Dyslipidemic Patients on Continuous Use of Oral Lipid-Lowering Drugs' in *Health*, 6:1694-1699 (2014) <<http://dx.doi.org/10.4236/health.2014.614201>> [accessed 21 November 2014].

Statistical data 1990-2010: ischaemic heart disease and stroke

According to the Brazilian *NCDs Action Plan*, 40% of cardiovascular disease-related deaths in Latin America occur during an individual's most productive years.²¹ Worryingly, there are a high number of deaths due to heart disease among those under 60 years of age in Brazil. According to the results of the *2010 Global Burden of Disease (GBD) Study*, CVD ranks among the most significant causes of premature mortality in the country (measured in terms of years of life lost, YLLs). Ischaemic heart disease and stroke were, respectively, the second and third most common causes of premature death in Brazil in 2010. Ischaemic heart disease accounted for 9.1% of premature mortality, while stroke accounted for 7.3% of premature mortality. Interpersonal violence was the only cause of premature mortality found to be more prevalent (accounting for 9.9% of total premature mortality).²¹

The percentage of total premature death from cardiovascular diseases in Brazil between 1990 and 2010 rose from 15.4% to 20.9%. This included increases in premature deaths attributed to hypertensive heart disease, ischaemic heart disease, cardiomyopathy and stroke. During the 20-year time span, premature death attributed to ischaemic heart disease increased by 27%.²¹

In 2010, ischaemic heart disease accounted for the largest burden of disease among all diseases, as measured by death and disability (disability-adjusted life years or DALYs). From 1990 to 2010, the burden of disease attributed to ischaemic heart disease rose by about 30%. Stroke was the fourth largest contributor to the disease burden in 2010.²¹

Statistical data 1990-2010: hypertension and diabetes

Hypertension and diabetes are the main causes of hospitalisation in the Brazilian public health system, and are both linked with many chronic diseases and health issues including, but not limited to chronic renal disease and maternal health. Among cardiovascular diseases, hypertensive heart disease has seen the greatest percentage increase, rising by 53% between 1990 and 2010.²¹ A 2011 national telephone survey (VIGITEL survey) on health risks found that 23.3% of the adult population had received a previous clinical diagnosis of hypertension. The prevalence of diabetes and hypertension is rising in tandem with that of excess weight; these increases are associated with harmful changes of diet and physical activity.²⁰

²⁰ Schmidt M, et al., 'Chronic diseases in Brazil: Burden and current challenges' in *Lancet*, 377(9781):1949-61. (2011).

²¹ Institute for Health Metrics and Evaluation, *Global Burden of Disease Study: Brazil (2010)* <www.healthdata.org/sites/default/files/files/country_profiles/GBD/ihme_gbd_country_report_brazil.pdf> [accessed 24 November 2014].

CVD risk factors in Brazil

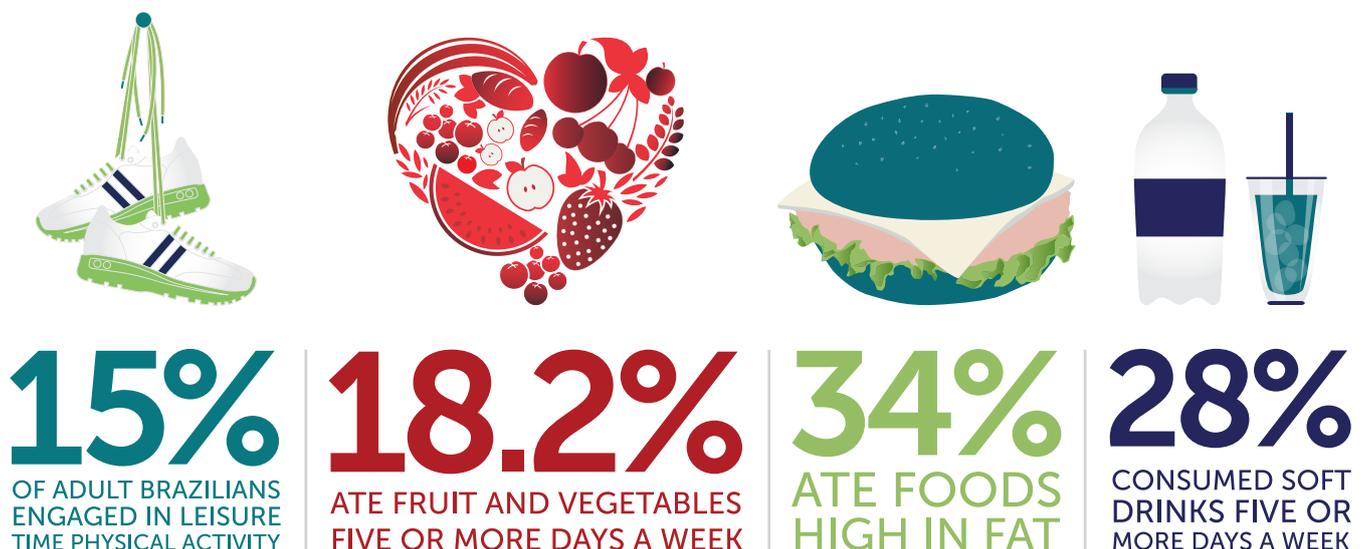
According to data from the Brazilian Society of Cardiology (BSC), 40% of Brazilians have total cholesterol (TC) \geq 200 mg/dl and 13% had TC \geq 240 mg/dl.²² Data from 1980 to 2008 indicates little change in the mean total cholesterol levels during the time period. Underprivileged urban populations from developing countries have a proven increased prevalence of obesity and other risk factors for CVD. In Brazil, as in other countries of the region, low-income segments of the population are the most affected, especially with respect to premature deaths attributable to CVD.

According to the GBD, the leading risk factor in 2010 for Brazil was diet, accounting for over 11% of total disease burden.²¹ A variety of additional risk factors linked to CVD were ranked among the top nine risk factors for the overall disease burden: high total cholesterol; high blood pressure; harmful use of alcohol; high body-mass index; smoking; high fasting plasma glucose; and physical inactivity. Of these, high total cholesterol, which is strongly linked to CVD, accounted for over 2% of the

disease burden in 2010. Among the other risk factors, high blood pressure, high body-mass index, and smoking are particularly significant because they individually accounted for over 6% of the total disease burden and have strong links to CVD. The burden of disease and CVD linked to physical inactivity is also of note, with over 3% of the total disease burden in the country attributed to this one risk factor.²¹

A national telephone survey conducted in 2011 (VIGITEL survey), 15% of adult Brazilians engaged in leisure time physical activity, 18.2% ate fruit and vegetables five or more days a week, 34% ate foods high in fat and 28% consumed soft drinks five or more days a week.²³ These risk factors are linked with the continuing high prevalence of overweight and obesity, which reaches 48% and 14% of adults respectively.²³

A NATIONAL TELEPHONE SURVEY CONDUCTED IN 2011 (VIGITEL SURVEY)



²¹ Institute for Health Metrics and Evaluation, *Global Burden of Disease Study: Brazil* (2010) <www.healthdata.org/sites/default/files/files/country_profiles/GBD/ihme_gbd_country_report_brazil.pdf> [accessed 24 November 2014].

²² Marsola A P Z C & Cesarino E J, 'Factors Related to Adherence with Treatment of Dyslipidemic Patients on Continuous Use of Oral Lipid-Lowering Drugs' in *Health*, 6:1694-1699 (2014) <<http://dx.doi.org/10.4236/health.2014.614201>> [accessed 21 November 2014].

²³ Brasil Ministério da Saúde, 'Strategic Action Plan for NCDs: Brazil 2011-2022', PAHO (2011) <www.paho.org/hq/index.php?option=com_docman&task=doc_download&gid=28147> [accessed 09 April 2015].