



*One World, One Home, One Heart.*

# Urbanization and cardiovascular disease

Raising heart-healthy children in today's cities



**WORLD HEART  
FEDERATION®**

© World Heart Federation

### About the World Heart Federation

The World Heart Federation is dedicated to leading the global fight against heart disease and stroke with a focus on low- and middle-income countries via a united community of more than 200 member organizations. With its members, the World Heart Federation works to build global commitment to addressing cardiovascular health at the policy level, generates and exchanges ideas, shares best practice, advances scientific knowledge and promotes knowledge transfer to tackle cardiovascular disease – the world’s number one killer. It is a growing membership organization that brings together the strength of medical societies and heart foundations from more than 100 countries. Through our collective efforts we can help people all over the world to lead longer and better heart-healthy lives.

Visit: [www.worldheart.org](http://www.worldheart.org)

Join us: [www.facebook.com/worldheartfederation](https://www.facebook.com/worldheartfederation)

Follow us: [www.twitter.com/worldheartfed](https://www.twitter.com/worldheartfed)

### For citation purposes

Smith, S. et al., 2012. *Urbanization and cardiovascular disease: Raising heart-healthy children in today’s cities.* [pdf] Geneva: The World Heart Federation. Available at: <<http://www.worldheart.org/urbanization>>

### ©World Heart Federation 2012

All rights reserved. World Heart Federation publications are available online: [www.worldheart.org](http://www.worldheart.org)

Requests for permission to reproduce or translate this publication should be addressed to: [communications@worldheart.org](mailto:communications@worldheart.org)



**WORLD HEART  
FEDERATION®**

UNITING GLOBAL EFFORTS  
TO FIGHT HEART DISEASE  
AND STROKE



*Communities – and especially the urban poor – need to be brought into the decisions that affect their lives. Opportunities to put health at the heart of the urban policy agenda exist, and it is time for all sectors to work together toward innovative and effective solutions that mitigate health risks and increase health benefits.*

**Dr Margaret Chan, Director-General, World Health Organization (WHO)**

[WHO and UNHABITAT, 2010]

*It should be a major concern for all of us to know that malnutrition during the first 1000 days of life can leave a legacy of heart disease, diabetes and a shortening of the life span.*

**Sir George Alleyne, Director Emeritus, Pan American Health Organization (PAHO)**

*History is being written on the hearts of our children.*

**Professor K. Srinath Reddy, Chair, Scientific Policy and Initiatives Committee (2011-2012), World Heart Federation**

*Where people live affects their health and chances of leading flourishing lives... Communities and neighbourhoods that ensure access to basic goods, that are socially cohesive, that are designed to promote good physical and psychological well-being, and that are protective of the natural environment are essential for health equity.*

**Commission on Social Determinants of Health (CSDH)\***

[CSDH, 2008]

*\*The CSDH is a Commission established by the WHO in 2005 to respond to increasing concern about persisting and widening inequities in health.*

*Think about what that means for the health of our nation, the healthcare system, when healthy kids grow up to become healthy adults—adults who are less likely to suffer from illnesses like diabetes and heart disease or cancer that cost us billions of dollars a year.*

**First Lady Michelle Obama**

[Live United, 2011]



## **Acknowledgements**

*Urbanization and cardiovascular disease: Raising heart-healthy children in today's cities* was developed by the World Heart Federation, a non-governmental organization committed to leading the global fight against heart disease and stroke, with a focus on low- and middle-income countries. The report text was guided by a team of experts at the World Heart Federation, including: Professor Sidney C. Smith Jr, MD, President (2011–2012); Johanna Ralston, Chief Executive Officer; and Professor Kathryn Taubert, PhD, Chief Science Officer.

Editorial support was provided by the following members of the World Heart Federation team: Charanjit K. Jagait, PhD, Director of Communications & Advocacy; and Amy Collins, Advocacy & Policy Coordinator.

The megacities research was completed by Leela Barham to support the World Heart Federation in producing this report. Leela is an independent health economist: <http://leelabarhameconomicconsulting.blogspot.com/>

The World Heart Federation would like to give their appreciation to: HRIDAY – SHAN (Health Related Information Dissemination Amongst Youth – Student Health Action Network), the Chinese Society of Cardiology, and the Kenyan Cardiac Society for their time in researching country data and for their contributions to this report.

# Contents

<b>Foreword</b>	<b>3</b>
<b>Introduction</b>	<b>4</b>
<hr/>	
<b>Chapter One: Cardiovascular disease and urbanization</b>	<b>6</b>
1.1 Urban growth in the 21st Century	6
1.2 The relationship between urbanization and heart health	6
1.3 Cardiovascular disease burden	6
1.4 Why a global response is needed	8
<hr/>	
<b>Chapter Two: Addressing the burden</b>	<b>10</b>
2.1 Reasons for action: returns for individuals, society and the economy	10
2.2 Reasons for action: a child's right to health	10
2.3 Taking action: a whole-of-society response	11
<hr/>	
<b>Chapter Three: Tackling risk factors</b>	<b>12</b>
3.1 Physical inactivity	12
3.2 Under- and over-nutrition	14
3.3 Tobacco use	17
3.4 Rheumatic fever and rheumatic heart disease	19
<hr/>	
<b>Chapter Four: Cardiovascular health in today's megacities</b>	<b>22</b>
4.1 Megacity research	22
4.2 São Paulo	23
4.3 Shanghai	25
4.4 Mexico City	26
4.5 Buenos Aires	28
4.6 Mumbai	30
4.7 Tehran	32
4.8 Nairobi and slum settlements	34
<hr/>	
<b>Chapter Five: Conclusions and recommendations</b>	<b>38</b>
5.1 Conclusions	38
5.2 Recommendations	39
5.3 Summary	41
<hr/>	
<b>References</b>	<b>42</b>
<hr/>	





## Foreword

**Recent evidence suggests that the risk of developing cardiovascular disease (CVD) begins even before birth, during foetal development. This risk increases further during childhood, due to exposure to risk factors: unhealthy diet, physical inactivity, tobacco use and harmful use of alcohol [IOM, 2010].**

For many of today's children, this exposure is increased due to the negative impacts of urbanization. Children living in towns and cities, particularly in low- and middle-income countries (LMICs) face very real and growing health risks: crowded living conditions, air and water pollution, inadequate sanitation, limited green space and an overwhelming display of tobacco, alcohol and fast-food marketing, all disproportionately affecting certain populations and potentially imposing limitations on how they live, work, eat and sustain themselves.

Because the risk of CVD can be mitigated by changes to behaviour, there is a widespread perception that CVD – including heart disease and stroke – is a “lifestyle” disease. However, many of the challenges posed by urban environments cannot be addressed simply through individual lifestyle choices. For most of the world's people, and especially its children, where a person lives intrinsically affects their health and life options.

Action to address urban health risks is therefore essential, to protect the health of our children and the prospects of future generations. Efforts to prevent CVD and protect people from the risk factors that cause it are required throughout people's lives, from conception through to life end (a life-course approach).

With this publication, we aim to put children and communities first; to recognize the challenges city-living children face on a daily basis, to raise awareness of the constraints on them making heart-healthy choices, and to dispel the myth that CVD can be prevented through “simple” behaviour changes by individuals. We also aim to demonstrate that by taking action to curb children's exposure to CVD risk factors, particularly in urban settings, the health and socioeconomic burden caused by CVD worldwide can be dramatically reduced.

Like many of you reading this report – and more than half of the world's 7 billion approximate inhabitants – I live and work in an urban area. My hometown has provided me with increased access to social services, including health and education; the opportunity to buy fresh vegetables and fruit; and the chance to enrich my life through various cultural activities. Yet, these advantages must not mask the fact that individuals living in cities, particularly in LMICs, are likely to have limited options around heart-healthy behaviour. Around one-third of urban dwellers, amounting to nearly one billion people, live in urban slums, informal settings, or sidewalk tents [United Nations, 2010]. Individuals living in these conditions often face diets of low nutritional value, with limited health-services available. Those living in more luxurious residential settings may still be constrained in making healthy choices, with unsafe outdoor space leading to a more sedentary lifestyle or with the pressures of city-life driving harmful tobacco use or alcohol consumption. Such restrictions and influences constrain individuals in behaviours that predispose them to CVD; for them, there is no option to choose a healthier lifestyle.

A misconception that CVD is a lifestyle disease that primarily afflicts older, affluent populations has until now led to the virtual absence of vital investment in the prevention and treatment of CVD and other non-communicable diseases (NCDs). However, CVD is a public health emergency requiring an urgent response from all governments as recognized by the United Nations (UN), on 19 September 2011, when the Political Declaration from the UN High-Level Meeting (HLM) on NCDs was unanimously adopted. This is a significant milestone for the CVD community and the Declaration puts a clear emphasis on prevention through a “health in all policies” and life-course approach to health. The Declaration also highlights that this response should not come from the health sector alone but from a multi-sector collaboration; put into context, this means that the promotion of healthy diets, physical activity and tobacco-control initiatives must happen through cross-sector urban and development planning that includes transportation, agriculture, trade, finance and education with the engagement of all community stakeholders – at the local, regional and national level.

With this report, the World Heart Federation calls for urgent action to protect children's heart health in the world's most populous cities. We launch the S.P.A.C.E approach; a new guiding principle to make cities heart healthier for the children who live in them. We recognize that the approach may not be fully applicable or affordable for all nations currently experiencing the rapid urbanization of their populations, but it is hoped that this report encourages policy makers to take action in at least one, if not all, of its five elements: **S**takeholder collaboration, **P**lanning Cities, **A**ccess to healthcare, **C**hild-focused dialogue and **E**valuation. We are optimistic; as you will read in the coming pages, informed action by governments and other stakeholders can dramatically reduce the level of CVD risk, and we look forward to celebrating your efforts and successes.

At the World Heart Federation, we know that CVD is a global health emergency affecting all ages and socioeconomic clusters. We also know that healthy options made available in early life are the best preparation for a heart-healthy life. This report is the result of a literature review, undertaken as an observational exercise to provide a snapshot of trends in world heart health related to urban-living. It is not intended to be conclusive, and we look to our colleagues in academia to build on this research to provide a new evidence base in which to ground policy and practice change. Meanwhile, we hope that whether you are a policy maker, healthcare professional, urban planner, parent or any other stakeholder concerned with child health, you enjoy reading this report, and that it inspires you to take action now to ensure that children everywhere can live safe and healthy lives. As estimates suggest seven out of 10 people will live in cities by 2050 [London School of Economics and Deutsche Bank's Alfred Herrhausen Society, 2007], focusing on urban living is critical.

Professor Sidney C. Smith Jr, MD

World Heart Federation  
President (2011–2012)



# Introduction

**CVD is the number one cause of death globally [WHO, 2011(d)]. Contrary to common belief, the burden of morbidity and mortality from heart disease is not confined to affluent, high-income countries; with the exception of sub-Saharan Africa, CVD is the leading cause of death in the developing world [Gaziano, 2007].**

The majority of deaths due to CVD are precipitated by risk factors such as high blood pressure, high cholesterol, obesity, or the presence of diabetes, which can, to a large extent, be prevented or controlled through the consumption of a healthy diet, regular exercise and avoiding tobacco. The rise of CVD in LMICs has therefore been linked to progressive urbanization and the coinciding “globalization of unhealthy lifestyles, which are facilitated by urban life – tobacco use, unhealthy diets, physical inactivity and harmful use of alcohol” [WHO and UNHABITAT, 2010].

However, the use of the word “lifestyle” within discussions about urbanization and heart health can be problematic. It leads to the incorrect assumption that a healthy or unhealthy lifestyle is based upon the way in which a person *chooses* to live; their engagement in physical activity, their food choices, and their behavioural preferences. As highlighted by Stuckler, Basu and McKee a common fallacy exists that NCDs, including CVD, “stem from a moral failure—that weakness of will leads to obesity or sedentary lifestyles” [Stuckler, Basu and McKee, 2011].

Although urbanization brings with it many great lifestyle opportunities (including employment choices, educational prospects, social connections and political mobilization), inherent to city life are practical and logistical obstructions to adopting heart-healthy behaviours. Urban living can also remove the autonomy of individuals to make healthy choices, via dominant pressures and influences to adopt unhealthy ones [Stuckler,

Basu and McKee, 2011]. As such, urbanization poses serious health challenges.

Children are particularly vulnerable to the negative health aspects associated with city life, as they have the least independence from and are most manipulated by their living and built environment. The joint UN-HABITAT/WHO report entitled *Hidden Cities: Unmasking and Overcoming Health Inequities in Urban Settings* highlights that broad physical, economic and social determinants influence the health of city dwellers [WHO and UNHABITAT, 2010]. Children are likely to be deprived of choice across all determinants, and forced into non-heart-healthy lifestyles and circumstances.

Considering the built environment, in many cases, urbanization has occurred so rapidly that the development of a city’s infrastructure is lagging behind the movement of people into it. As a result, people reside in insubstantial housing conditions, ranging from slums to cardboard boxes at the side of a street. Children living in physical environments that lack green spaces, or are situated in unsafe areas characterized by high crime rates, will not have the choice to play and be active outside; consequently these children are forced to be sedentary in their lifestyle. As another example, children living in crowded environments may be at increased risk of rheumatic fever (RF), and its serious complication, rheumatic heart disease (RHD), which causes damage to the heart muscle and heart valves. By nature of their dependence, these children are subjected to their living environments, and are unable to make the “choice” to move elsewhere.

Considering economic determinants, the changing financial circumstances and life patterns for people moving from rural to urban environments can greatly impact heart health. Economic position may determine dietary intake, for example. At the far-end of the scale, families living in the poorest circumstances may face malnutrition, a critical component of CVD risk. Due to the concept of foetal

programming, infants born to women who experience malnutrition during pregnancy are at increased risk of CVD later in life [NCD Alliance, 2011(a)]. On the other side, excessive weight gain or maternal obesity during pregnancy has been associated with obesity in children, although evidence is inconsistent [IOM, 2010].

In the middle of the scale, children growing up in families of lower- and middle-economic status may have restricted options for their food intake; for example, if it is cheapest to purchase food from a street vendor or fast-food chain, a family on a limited budget may have no choice but to consume unhealthy food high in saturated or trans fat, sugar and salt. For lower- and middle-income families, limited access to healthcare for the treatment of CVD pre-cursors and the prevention of secondary disease may also fuel the CVD epidemic.

However even those living in more affluent circumstances are at CVD risk, due to overweight caused by poor diets for example, as influenced by their social environments. The globalization of the food trade has led to a change in dietary patterns and an increased intake of foods which are often energy dense with low-nutritional value [NCD Alliance, 2011(a)]. Children are driven to consume such foods, persuaded by industry marketing and convenience of food access, or because they lack the education and knowledge to know how to self-prepare healthier food options. This problem is further exacerbated by lack of physical activity resulting from changes in occupational and leisure activities, as well as security issues, each inherent to city living [WHO, 2008]. Such urban trends are fuelling levels of overweight and obesity that significantly impact on the heart health of city-living children [NCD Alliance, 2011(a)].

In addition, smoking rates are increasing among youth in several regions of the world [NCD Alliance, 2011(a)]. Children born into many of the cities in LMICs will be exposed from the outset of life to marketing campaigns





that associate tobacco use with glamour, independence and sex appeal, therefore compromising their ability to make informed choices about it [NCD Alliance, 2011(a)]. A similar story is seen regarding the marketing of alcohol and subsequent alcohol consumption.

So, while it may seem relatively straightforward to “choose” to remain active, to eat healthily, and to be tobacco free, the choices children have are determined by their living conditions. As one summary of research from sub-Saharan Africa observes, both lower- and upper-income groups in urban settings are prone to CVD risk factors, “the former due to socioeconomic stressors, limited access to healthcare, and poor diet and the latter to obesity, excess food and alcohol consumption, and lack of exercise” [Wood, 2005].

For children, who are particularly impressionable, it is therefore vital that their living and built environment promotes and allows for heart-healthy behaviour. The links between city living and heart health consequently require urgent political attention, leading to the creation of policies to ensure that the opportunities cities provide for economic and social development are balanced with efforts to reduce their negative impact on the health of future generations. To reverse current trends, policies need to consider not just solutions to current urban-health difficulties,

but to ensure that health is prioritized during future development planning, to tackle health challenges before they are established within cities.

Examples of policies that can have a direct impact include: measures to increase the availability of nutritious, healthy food and reduce the prevalence of fast-food advertising; better planning so that green and outdoor spaces are readily available for exercise and recreation; and, restrictions on tobacco smoke and alcohol consumption. Many different groups must work together to develop these policies and improve the urban environment for our children: national and local governments and city planners need to consider health outcomes within city planning; business leaders and civil society can make it easier for children and their parents to make healthy choices; and schools, hospitals and other children’s services can provide information and education to create the right environment for a healthy life from the start.

It is recognized that many local and national governments are already tackling the health challenges of urbanization. However, in many cities the speed of urbanization has outpaced government capacity to build essential infrastructures to make life in cities healthy [WHO and UNHABITAT, 2010]. A whole-of-society approach is therefore required, with

commitment to action from all governmental sectors involved in urban planning and health, charities and not-for-profit organizations, civil society, and religious leaders. Industry also needs to be more socially responsible and to be held accountable for actions affecting urban health.

This publication is the first to focus on the specific needs of children, living within cities and at risk of CVD. It reveals the cross-cutting links between urban life, the dependency of children on their living environment, and precursors for poor heart health. It provides information about the CVD risk factors associated with city living and presents case studies of some of the world’s megacities (defined as a city or metropolitan area in which more than 10 million people live), with a focus on LMICs: it thus concludes that from Shanghai to Mumbai, and from Buenos Aires to Mexico City, more has to be done to ensure that children have the capacity to live healthily.

As a result, this publication draws attention to the need to prioritize action in the fight against CVD, for the benefit of both child health and effective urban development. It also aims to stimulate discussion on the steps that must be taken and by whom. By working together, we can overcome the health challenges presented by the world’s cities and prevent the increasing burden of CVD.



# Chapter One

## Cardiovascular disease and urbanization

### 1.1 Urban growth in the 21<sup>st</sup> Century

Recent decades have given rise to a new phenomenon: the birth of the megacity. Previously rural areas have become industrialized; where industrialization has been slower to occur, rural communities have frequently seen their population migrate to urban areas. These socio-demographic changes have led to the formation of densely populated metropolitan areas; our world now has 21 megacities, a number which is projected to grow [United Nations Department of Economic and Social Affairs, 2006]. According to recent projections, the world population will likely reach 9.3 billion by the middle of this century [United Nations Department of Economic and Social Affairs, 2011].

It is estimated that 75 per cent of this population – approximately 7 billion people, and the equivalent of the entire world population of today – will be living in cities by 2050 [London School of Economics and Deutsche Bank's Alfred Herrhausen Society, 2007] (Box 1).

Although urbanization offers numerous opportunities, the shift towards urban life also brings with it new and unique health challenges. Over the past decade, urbanization and health have become increasingly “hot topics” and studies investigating a link between city living and negative health outcomes have been completed, particularly by those in focused fields (e.g. environmental health, public health, and lifestyle-related behavioural health) [De Leeuw, 2001]. A considerable body of knowledge examining the relationship between urbanization and health therefore exists [De Leeuw, 2001].

In recognition of this fact, the WHO chose the theme of “urbanization and health” for World Health Day at the beginning of this decade. As Dr Jacob Kumaresan, Director of the WHO's Centre for Health Development

explained, “The world is rapidly urbanizing with significant changes in our living standards, lifestyles, social behaviour and health. While urban living continues to offer many opportunities, including potential access to better healthcare, today's urban environments can concentrate health risks and introduce new hazards” [WHO, 2010(b)].

Hazards particularly related to city life include water environment, pollution, accidents, violence and NCDs: CVD, cancers, chronic respiratory diseases and diabetes. CVD is a group of disorders/diseases of the heart and blood vessels, which can result in negative health events such as a heart attack or stroke (Table 1). The modifiable risk factors for CVD include smoking, hypertension, dyslipidemia, type 2 diabetes, obesity, poor dietary habits and physical inactivity. These may be exacerbated by city living and its decreased availability of safe, green space for exercise and recreation, increased pressures from mass marketing, and the availability of cheap but unhealthy food options.

### 1.2 The relationship between urbanization and heart health

The links between urbanization and heart health across a number of regions globally are well established in published literature. For example, a spatial analysis of urbanization, migration and CVD risk factors in China indicates that improved standards of living and life expectancy resulting from rapid rural-urban migration are countered by an increase in CVD risk factors [Adamo, et al., 2010].

A separate piece of research into the emergence of CVD during the urbanization of South African countries concludes that deaths caused by stroke amongst black South Africans are likely related to an increase in hypertension, obesity, and smoking habit [Vorster, 2002]. In addition, the authors suggest that future ischaemic

heart disease risk may be higher amongst affluent black South Africans as exposure to urban dietary trends occurs. For example, the globalization of Western diets increases the dietary intake of fat and animal protein, leading to increases in “bad” cholesterol levels of men and women, a risk factor for CVD [Vorster, 2002].

Another study considered the relationship between heart health and urban living for children aged 10–12 years. Varying degrees of urbanization of the environments of South-Asian schoolchildren were compared with the prevalence of coronary heart disease risk factors. The research concludes that urbanized lifestyle, particularly when combined with other factors like undernourishment, could be a major determinant of heart disease morbidity and mortality [Hakeem, Thomas and Badruddin, 2001].

The above examples are just a sample of published research, further illustrations of which are provided throughout this report. Such studies and literature are significant, as the findings provide the evidence base for the impact of urban settings on heart health. When considered in context of the burden of CVD, they unmask the importance of addressing CVD risk within urban planning to protect the health, economic stability and the sustainability of our future societies.

### 1.3 Cardiovascular disease burden

In 2004, an estimated 7.2 million deaths were due to coronary heart disease and 5.7 million were due to stroke [WHO, 2011(d)]. Over 80 per cent of these deaths took place in LMICs, and occurred almost equally in men and women [WHO, 2011(d)]. Looking forward, by 2030 almost 23.6 million people will die from CVD; it is therefore projected to remain the single leading cause of death globally [WHO, 2011(d)].

The global burden of CVD is substantial. The cost of disease to countries' healthcare



systems is incredibly high; in China for example, annual direct costs are estimated at more than U.S.\$40 billion or 4 per cent of gross national income [Gaziano, 2007]. A total 25 per cent of South African healthcare spending is devoted to the direct treatment of CVD [Gaziano, 2007]. Data from the United States of America show that CVD and stroke costs over U.S.\$286 billion in direct and indirect annual costs, more than the estimated cost of all cancers at U.S.\$228 billion [Roger, et al., 2011].

CVD is also responsible for 10 per cent of the disability adjusted life years (DALYs)\* lost in LMICs, and for 18 per cent of DALYs lost in high-income countries [WHO, 2004(a)]. The cost of CVD to families and society is therefore high and escalating, caused by both a loss of production (and consequently income) from the person with CVD, or from their caregivers who cease to work [Gaziano, 2007]. This economic loss is exacerbated in the developing world where CVD affects a high proportion of working-age adults [Gaziano, 2007]. For these reasons, CVD, alongside other NCDs, has been identified as one of the biggest threats to businesses and economies of the 21<sup>st</sup> century.

The CVD burden will be particularly felt by today's children and our future generations if action is not taken. Children face a double

blow from CVD as they are impacted both directly and indirectly. Congenital heart disease (CHD) and acquired heart disease both affect children, inflicting physical symptoms of disease which are particularly burdensome to children in LMICs. Many of these children die prematurely because of late diagnosis and/or lack of access to appropriate treatment [NCD Alliance, 2011(b)]. Those who survive may face a lifetime of disability caused by a disease which is not well-managed.

In addition to this, the life chances of children are affected by the morbidity, mortality and disability caused by CVD amongst adults. A child who loses a parent does not only have to endure the emotional impact of their death, but also faces an economic struggle living within a one- or no-parent family. Children may be increasingly called upon to help with physical labour or household chores, or be taken out of school at an earlier age to go to work. They may face the burden of caring for a family member disabled by CVD, or take on the role of parenting siblings. They may be burdened by food insecurity, particularly if a female family member is disabled by or lost to CVD, since it is women in LMICs who are often responsible for those jobs crucial to family well-being, for example preparing food [NCD Alliance, 2011(a)].

Children born into a family affected by NCDs, including CVD, may also face societal stigma and discrimination. As highlighted by the NCD Alliance<sup>†</sup>, a lack of awareness and misinformation can provoke NCD-related stigma in many countries [NCD Alliance, 2011(a)]. Girls and boys can suffer discrimination in education, and at an older age employment and marriageability, which in many countries represents the main roots to financial security [NCD Alliance, 2011(a)]. This stigma may discourage some families from revealing their children's health status, and thereby create a barrier to accessing healthcare and treatment [NCD Alliance, 2011(a)].

*\*Disability adjusted life years (DALYs) can also be considered as otherwise healthy life years lost to illness.*

*†The NCD Alliance is a formal alliance of four international federations including the – World Heart Federation, International Diabetes Federation, Union for International Cancer Control, and the International Union Against Tuberculosis and Lung Disease – representing the four main NCDs outlined in the WHO's 2008–2013 Action Plan for NCDs. It mobilizes its 2,000 strong network of partners and organizations to speak with a united voice at key international meetings.*

## 1.4 Why a global response is needed

Children have the right to a standard of living adequate for their physical and mental development, and a right to the enjoyment of the highest attainable standard of health [Office of the United Nations High Commissioner for Human Rights, 1990], but for many children these rights are not met. As this report has so far revealed, the urban living environments of children frequently hinder their health outcomes. Urbanization has the potential to bring with it many positive health benefits: improved access to healthcare facilities; health education and campaigns that can reach many more people in cities compared to remote areas; and increased access to healthy food options. However, appropriate governance is crucial if health benefits are to outweigh the health challenges inherent to modern city life.

As highlighted by the WHO, better housing and living conditions, food security, and access to services such as education, health and welfare are all examples of determinants of health that could be addressed through good urban governance [WHO, 2008]. However, the major drivers of ill-health within our cities are multi-sectoral, and therefore achieving healthy urbanization is a global and shared responsibility [WHO, 2008]. Actions *can* be taken to tackle the causes of children's ill-health, particularly CVD, within our cities; actions therefore *must* be taken, as discussed within the next chapter.



### Box 1

#### The increasing rate of urban living

- 10 per cent of the world's population lived in cities in 1900
- 50 per cent live in cities today
- 75 per cent will be living in cities in 2050

*Adapted from The Endless City, by the London School of Economics and Deutsche Bank's Alfred Herrhausen Society, 2007, Phaidon Press Ltd*

**Table 1**  
**Types of cardiovascular disease**

<b>Congenital heart disease</b>	This is a heart defect present at birth. While some cases of congenital heart disease can be caused by genetic factors or by adverse exposures during pregnancy, the cause of most cases is unknown. Examples include holes between chambers of the heart (such as atrial septal defect or ventricular septal defect), abnormal valves, and abnormal heart chambers
<b>Coronary heart disease and coronary artery disease</b>	A narrowing of the arteries supplying blood to the heart muscle due to a build up of plaque (fatty deposits) that can lead to a heart attack or ischaemic heart disease
<b>Deep vein thrombosis and pulmonary embolism</b>	Blood clots in the leg veins, which can dislodge and move to the heart and lungs
<b>Inflammatory heart disease</b>	Inflammation of the heart muscle (myocarditis), the membrane sac which surrounds the heart (pericarditis), or the inner lining of the heart (endocarditis). Inflammation may be caused by known toxic or infectious agents or by an unknown origin
<b>Ischaemic heart disease</b>	Heart disease caused by the lack of oxygen supply to the heart muscle due to narrowing of the coronary arteries
<b>Rheumatic heart disease</b>	Chronic condition resulting from preceding rheumatic fever (caused by streptococcal bacteria); damages the heart muscle and heart valves
<b>Stroke (cerebrovascular disease)</b>	The brain equivalent to a heart attack. Blood must flow to and through the brain for it to function. If this flow to a part of the brain is blocked or interrupted, that part of the brain is deprived of oxygen and nutrients and begins to die





# Chapter Two

## Addressing the burden

### 2.1 Reasons for action: returns for individuals, society and the economy

As the preceding chapter reveals, although urbanization brings with it many positive benefits for society, cities can have a significant negative impact on health. In the context of dramatic changes in rapid and unplanned urban development as we are experiencing now, the physical, economic and social environments of many urban dwellers, particularly children, are forcing them to lead non-heart-healthy lives.

Better housing and living conditions, food security and access to food of nutritional value, improved access to healthcare, safe space for physical activity, education about physical well-being and healthy living; these are just a few of many health determinants that could be addressed through action taken by governments and wider society to promote heart health. Such actions would be incredibly beneficial to both individuals and society: increased productivity of families; reduced healthcare costs; and alleviation of the social and emotional challenges associated with CVD, are just some of the benefits to be gained.

As the WHO Commission on Macroeconomics and Health in 2001 pointed out, investments in urban health can also create major returns for the economy [WHO, 2008]. For today's children and our future generations, action taken now could make the difference between a lifetime of well-being and a lifetime of poverty.

### 2.2 Reasons for action: a child's right to health

There is also a wider, rights-based motive for action against CVD in cities. In 1948, the United Nations produced the *Universal Declaration of Human Rights* [United Nations, 1948]. Article 25 stipulates that everyone has the right to a standard of living, adequate for the health and well-being of himself and of his family, including food, clothing, housing,

medical care and necessary social services, and the right to security in the event of sickness. Motherhood and childhood are entitled to special care and assistance. A rights treaty entitled the *Convention on the Rights of the Child* subsequently came into force in 1990, stipulating a child's right to the highest attainable level of health [Office of the United Nations High Commissioner for Human Rights, 1990] (Box 2).

The Declaration is not legally binding, but its acceptance by all countries around the world gives moral weight to the principle that children should have their right to a standard of living adequate for health and well-being recognized [UNICEF, 2011]. The Convention outlines legal obligations for those countries who endorse it; as such, it makes governments accountable for the respect for, protection of and realization of the rights of children in their country [UNICEF, 2011].

Moreover, the health of children is central to the Millennium Development Goals (MDGs) contained in the UN Millennium Declaration and endorsed by 189 countries in the year 2000 (Box 3). Given all we know about CVD as the leading cause of morbidity and mortality worldwide, and how much of its later presentation is determined in the first 1000 days of life, heart-healthy living in cities is therefore necessary to achieving the MDGs.

If action is not taken to improve the heart healthiness of our cities, the price will be high: individuals, their families, and societies will continue to suffer the physical, emotional and financial consequences of CVD, and countries will be prevented from attaining the MDGs and realizing their economic and human potential [WHO and UNHABITAT, 2010]. If action is taken however, significant benefits will be seen: the burden of CVD will be prevented/reduced considerably, creating a healthier society containing happy and fulfilled individuals who are able to reach their productive potential (Box 4).



### Box 2 Summary of the Convention on the Rights of the Child, Article 24

The child has the right to the highest attainable standard of health, incorporating access to preventative healthcare services and to treatment of illness. States will take action to: diminish child mortality; ensure the provision of healthcare, particularly primary healthcare; and provide nutritious food and drinking water. Pre-natal and post-natal healthcare will also be provided to mothers, and parents and children will be informed and educated on health and nutrition. The needs of developing countries will be particularly accounted for, with the aim of achieving the full realization of children's rights globally.

*Adapted from the Convention on the Rights of the Child, 1990. Accessible via the Office of the United Nations High Commissioner for Human Rights: <http://www2.ohchr.org/english/law/crc.htm>*

### 2.3 Taking action: a whole-of-society response

The WHO document *Our Cities, Our Health, Our Future* details the interventions that need to occur to achieve healthy cities [WHO, 2008]. These include: improving the living environments for children residing in substandard housing; promoting and facilitating good nutrition and physical activity; community action to prevent substance abuse (including tobacco consumption and alcohol abuse); and ensuring access to essential healthcare services. Since CVDs are largely preventable, measures to decrease risk factors coupled with improved access to healthcare could save millions of lives.

However, although many governments are already taking action, finite resource means that in many cases the burden of CVD is outpacing actions implemented to tackle it. Lack of awareness and overstretched health services mean that many people with CVD in LMICs remain undiagnosed or cannot access the treatment they need. As the WHO explains, “bold steps” and a “scale-up” of action is needed to achieve better housing and health services for the one billion adults and children who live in slums or informal settlements today, and to avoid an additional billion people living in such conditions in the next 25 years [WHO, 2008].

Such an expansion of action is beyond the realms of the health-sector alone, and calls on cross-sector policy makers as well as civil society and industry to address all of the drivers of ill-health in urban environments, including agriculture, urban planning, trade, and other stakeholders. The collaborative process necessary for effective action is complex, but is broadly encompassed within the S.P.A.C.E approach: **Stakeholder collaboration**, **Planning cities**, **Access to healthcare**, **Child-focused dialogue**, and **Evaluation**.

- **Stakeholder collaboration:** Children rely upon multiple agents within society for their well-being including family, peers, education systems and religious institutions. Interventions to improve child health need to engage the whole of government, the private sector and civil society: by working together, a “health in all policies” approach can be achieved (whereby child-health benefits are considered and integrated into any new or existing policies and projects). In bridging the gap between societal sectors, it is more likely that sustainable health outcomes will be achieved [WHO, 2010(a)].

- **Planning cities:** As cities increase in size, paramount to sustainable urban planning is the maintenance and expansion of safe and smoke-free green spaces – such as parks and playgrounds – to ensure suitable areas for children’s recreational activity. Such actions do not necessarily require additional funding, but do depend on the commitment of governments or industry to redirect resources to priority interventions [WHO, 2010(a)].

- **Access to healthcare:** Cities have significant advantages over rural areas for access to healthcare. Since a significant proportion of CVD death and illness can be prevented with appropriate treatment, investment in paediatric diagnostic tools, quality improvements in medical centres, and increased access to affordable, quality essential medicines will greatly improve CVD outcomes [World Heart Federation, 2010].

- **Child-focused dialogue:** Although various international and national laws recognize the importance of the rights of the child to healthcare, current dialogue on CVD focuses too heavily on adults. Communication focusing on and increasing awareness of child CVD risk factors will assist stakeholders to address child needs specifically [NCD Alliance, 2011(b)].

- **Evaluation:** In order to tackle CVD risk factors within a given city, it is critical to understand their causes. The Community Health Environment Scan Survey (CHES) is an empirical assessment tool that evaluates the availability and accessibility of healthy lifestyle options [Wong, et al., 2011]. It reveals how a built environment encourages/discourages healthy eating, physical activity and tobacco use. This tool can help in identifying opportunities for change and appropriate interventions [Wong, et al., 2011]; the use of such tools or other methods of evaluation should therefore be considered by policy makers before policies are devised. The impact of interventions must also be evaluated, so that their success can be monitored and adaptations made or resources reallocated if necessary.

The specific risk factors that need to be addressed via such interventions (physical inactivity, unhealthy diets, tobacco and alcohol use, and RF) and the potential roles of various stakeholders in addressing each of these are further explored in chapter three.



#### Box 3 The Millennium Development Goals

##### Goal 1

Eradicate Extreme Poverty and Hunger

##### Goal 2

Achieve Universal Primary Education

##### Goal 3

Promote Gender Equality and Empower Women

##### Goal 4

Reduce Child Mortality

##### Goal 5

Improve Maternal Health

##### Goal 6

Combat HIV/AIDS, Malaria and Other Diseases

##### Goal 7

Ensure Environmental Sustainability

##### Goal 8

Develop a Global Partnership for Development

#### Box 4 The future of urbanization: a price or a promise?

Urbanization can bring a price or a promise for society. The price: avoidable suffering caused by CVD, costing both economic and human potential. The promise: prevention of CVD, allowing city dwellers to reach their full potential. The future has yet to be realized, so the choice is ours. Together we must ensure that the cities of tomorrow are healthy places for all individuals. We all have a role to play in making this a reality.

*Adapted from Hidden Cities: Unmasking and Overcoming Health Inequities in Urban Settings, by the WHO and UN-HABITAT, 2010. Accessible at: [http://www.hiddencities.org/downloads/WHO\\_UN-HABITAT\\_Hidden\\_Cities\\_Web.pdf](http://www.hiddencities.org/downloads/WHO_UN-HABITAT_Hidden_Cities_Web.pdf)*



# Chapter Three

## Tackling risk factors

### 3.1 Physical inactivity

Physical activity promotes a child's physical and mental well-being and general quality of life. It promotes healthy growth and development, prevents disease and unhealthy weight gain, and also improves social connectedness and societal well-being. Related to NCDs particularly, physical activity reduces the risk of CVD, some cancers and type 2 diabetes [WHO, 2009].

In recognition of the health benefits of physical activity, the WHO's *Global Strategy on Diet, Physical Activity and Health* states that children and youth aged 5–17 years should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily [WHO, 2011(a,b)], with amounts of physical activity greater than 60 minutes providing additional health benefits.

Despite this guidance and the known benefits of exercise, physical activity levels are declining worldwide. Recent global estimates indicate that 60 per cent of the world's population is exposed to health risks due to inactivity, and each year it contributes to over three million preventable deaths [GAPA and ISPAH, 2011]: to put this into context, that's more than 5,000 times the number of deaths caused each year by plane crashes (calculated from 2008 data) [Flight Global, 2009]. In fact, physical inactivity causes six per cent of deaths globally [World Heart Federation, 2011(a)], making it the fourth leading risk factor for global mortality ahead of unsafe sex, under-nutrition and alcohol misuse [World Heart Federation, 2011(b)].

Specific to CVD, physical inactivity is related (directly and indirectly) to risk factors such as high blood pressure, high cholesterol and obesity. Substantial scientific evidence supports the importance of physical inactivity as a risk factor for CVD independent of poor diet, smoking and alcohol misuse [GAPA and ISPAH, 2011]; lack of exercise alone causes more than one in four cases of heart disease

[World Heart Federation, 2011(b)]. A recent study published in *Acta Paediatrica* [Tanha, et al., 2011] highlights the specific relationship between a lack of physical activity in young children to increased CVD risk; the cross-sectional study of 223 children revealed that low amounts of moderate to vigorous physical activity were related to higher risk factor scores for CVD in children aged 8–11 years.

While physical inactivity is more prevalent in high- and middle-income countries, even in LMICs more and more people are becoming physically inactive. Urbanization, bringing with it growing dependence on motorized transport and an increase in sedentary work, reduces levels of physical activity around the world [World Heart Federation, 2011(b)]. The speed with which urbanization is occurring is also a contributing factor to inactivity; as mentioned previously within this report, much of the urbanization occurring in the developing world is haphazard, with people flocking to cities faster than governments can plan for them. As a result, many city dwellers compete for limited space, leading to crowded, unplanned living environments that do not allow for the creation and maintenance of open and green spaces conducive to physical activity and therefore cardiovascular health.

Children living in cities may be particularly limited with regards to their engagement in sufficient physical activity, due to both the built urban environment in which they reside and the sedentary habits and behaviours which have developed in this context. Development patterns, such as very heavy traffic, lack of sidewalks, and busy streets, discourage daily physical activity such as walking and biking to school [Sallis and Glanz, 2006]. Children from lower-economic backgrounds may be even more hindered in their ability to exercise, being less able to afford and access exercise programmes and sports facilities [WHO

Europe, 2006]. Additionally, cultural and economic circumstances can lead to children being taken out of school at a young age to work, therefore leading them to miss out on physical education. They may live in conditions that are unsafe, or areas with crime problems, creating a barrier to active living [WHO Europe, 2006].

In addition to the above, multiple social barriers exist. The increasing prevalence of technological leisure pursuits encourage children to become sedentary: one study by the United Nations Educational, Scientific and Cultural Organization (UNESCO) reveals that 93 per cent of students who have regular access to television watch it for an average of three hours a day, which represents at least 50 per cent more time than that spent on any other out of school activity [Goebel, n.d.]. Here at the World Heart Federation, team members have visited slums (Box 5) in which it is more common for residents to own a television set or computer than a properly functioning toilet; the implication is that social trends and priorities are those that endorse an increasingly inactive lifestyle.

Strategies to promote physical activity therefore need to address environmental, physical and economic barriers. The health sector is well-positioned to take a lead role in reducing levels of physical inactivity, by promoting exercise for all citizens [WHO Europe, 2006] and providing advice to individuals as part of wider healthcare initiatives. However, as identified by the WHO, approaches focused on individual behaviour have limited success; modifications to physical and social environments to enable activity are more likely to be successful [WHO Europe, 2006], by making physical activity an easier choice.

Although there are many actions that families could take to become more active, such as walking or cycling to school, this is not an option for them unless traffic-calming





**Box 5**  
**Sedentary slums**

*The images of the slums I have visited in India and South Africa will remain with me forever. Noisy, crowded and bustling living conditions, that spread vertically as well as horizontally. In many areas it was difficult to walk around: environments felt unsafe, characterized by piles of litter, waste from latrines, and dark alleys. Coupled with the sheer density of living quarters, I did not have much room for manoeuvre.*

*The children I met in the slums were chatty and excitable. However they were not running and playing like most of the children I've met at home in Geneva. In the slums I've visited, there is simply not room for children to run around, let alone to play in safety.*

*Not all slums are like this. I have seen images of slums in which room has been made for basketball courts, and heard of slums where football is an everyday activity. However, many slums exist in which exercise is near to impossible.*

*It is vital that action is taken to ensure that all children have access to safe spaces in which to be active. Strategies to encourage physical activity within urban environments must therefore consider slums. CVD does not discriminate by age or affluence; it is vital that interventions do not either.*

**Johanna Ralston, Chief Executive Officer,  
World Heart Federation**



measures or changes to city infrastructures (to incorporate cycle lanes or wide paths, for example) are adopted [WHO Europe, 2006]. Bogota, the capital of Colombia, is an excellent example of measures that can be taken to make cities more conducive to physical activity (Box 6). Assisting urban dwellers with physical activity therefore requires a whole-of-society approach, considered in the wider context of creating safer, greener and more activity-friendly cities [WHO Europe, 2006]. This approach is reinforced by *The Toronto Charter for Physical Activity* which makes a strong case for action in four key areas consistent with the WHO Global Strategy for Diet and Physical Activity: 1) national policy; 2) policies and regulations; 3) programmes and environments; and 4) partnerships [GAPA and ISPAH, 2011].

Cross-sector partnerships that involve different departments and levels of government, businesses, community groups, schools, the media and the health system are most likely to lead to action plans that reach large numbers of people and provide direction, support and coordination for physical activities [World Heart Federation, 2011(b)]. Action plans should incorporate: public education to raise awareness of the importance of physical activity and provide encouragement; changes to urban environments that make it easier for people to choose to be active in their neighbourhoods; and physical activity programmes in communities, schools and workplaces [World Heart Federation, 2011(b)].

Although there is no one single solution to eradicating physical inactivity, a



**Box 6**  
**Bogota – the sustainable city**

The capital of Colombia, Bogota, is a world-renowned sustainable city, with sustainable transport as key to its worldwide fame. The city's transformation started in 1976 with the creation of "ciclovias," a network of bike paths that are open on Sundays and holidays, between 06:00–14:00 hours.

On these days, 121 km of the main avenues and streets are closed to cars and invaded by two million bikers, skaters, joggers and walkers. Today, in a city where over 900,000 cars circulate on a daily basis, Bogota has a network of 329 km of bike paths that allow nearly 182,000 people to circulate every day.

Adapted from Sonia Edith Parra's post, published on *Sustainable Cities Net*, 2007  
<http://www.sustainablecitiesnet.com/uncategorized/sustainable-city-bogota-colombia/>

comprehensive, multi-strategy and multi-stakeholder approach will make a significant contribution to promoting exercise and therefore health [GAPA and ISPAH, 2011].

### 3.2 Under- and over-nutrition

Societal changes associated with economic growth, modernization and globalization are driving transformations in nutrition habits across the world. In turn, these habits are driving a phenomenon of under- and over-nutrition, often co-existing within the same country, city and even the same family.

In some areas, children are growing up in conditions of extreme food insecurity, leading to undernourishment. The risk of CVD in children who are malnourished is caused by the body triggering the processing and storage of fats as a protective measure, creating a predisposition to overweight and obesity. The risk is also present in infants born at a low birth weight to undernourished mothers, in whom the body fights to secure rapid weight gain. Pre-natal malnutrition, similarly, predisposes the unborn child to high blood pressure and heart disease later in life [World Heart Federation, 2011(f)].

The Institute of Medicine of the National Academies Press (IOM) report *Promoting Cardiovascular Health in the Developing World: A Critical Challenge to Achieve Global Health* highlights the emerging evidence linking under-nutrition in early life to increased CVD risk later in life [IOM, 2010]. This correlation was echoed in the *European Heart Journal* by a study investigating women who had been exposed at different degrees to the 1944–1945 Dutch famine when aged 0–21 years [Van Abeelen, et al., 2011]. Among those who experienced the famine between ages 10–17 years, CHD risk was significantly higher among severely exposed women compared with unexposed women. The results reveal that exposure to under-nutrition during infancy, childhood and adolescence may affect cardiovascular health in adult life.

In other instances and settings, the CVD burden is being driven by food consumption at the opposite end of the scale. Diets high in saturated fat, trans fat, sugar and salt are linked to four of the world's top ten leading risk factors causing death: high blood pressure, high blood glucose, overweight and obesity, and high cholesterol [World Heart Federation, 2011(c)]. Unfortunately urbanization is causing people to move away from producing and cooking their own food and turning to prepared and heavily processed “convenience” foods that are often high in sugar, salt, and saturated and trans fat, leading to an increase in CVD risk factors.

For example, in the United States, childhood obesity is an “epidemic,” with obesity prevalence among children and adolescents having almost tripled since 1980 [CDC, 2011]. The United Kingdom holds the shameful title of fattest country in Europe, with Government figures alarmingly revealing

that more than one-third (33.6 per cent) of children are overweight or obese by the end of their primary schooling (aged 10–11 years), and predicting that a quarter (25 per cent) of all children will be obese by 2050 if action is not taken [Panjwani and Haigh, 2011].

However, the notion that overweight and obesity are issues for rich people living in developed countries is inaccurate; globally, poor communities are often the ones hurt most by unhealthy diets [World Heart Federation, 2011(c)]. The WHO recognizes that overweight and obesity are now on the rise in LMICs, particularly in urban settings: close to 35 million overweight children are living in developing countries and 8 million in developed countries [WHO, 2011(c)].

This may be because fat and sugar have become the cheapest and easiest way to get calories, more accessible than fruit and vegetables and often even cheaper than traditional staples like grains, beans or lentils [World Heart Federation, 2011(c)]. For many people in LMICs, including children, diets comprise of cheap food purchased from street cafes or vendors, which is commonly prepared in convenient but unhealthy ways such as being fried or salted. For instance, palm oil high in saturated and trans fats predominates street food cooking. Transitioning from this unhealthy tropical oil to healthier oils such as olive or canola oils could significantly improve the heart healthiness of street food; however, the relatively low price of palm oil and comparative expense of healthier oils creates a barrier to this transition occurring [IOM, 2010].

Such economic obstructions to healthy eating are compounded by marketing influences on individuals' food choices. LMICs form the largest growing markets and are therefore fertile ground for aggressive marketing of unhealthy foods such as soft drinks and fast foods [World Heart Federation, 2011(c)]. The food and soft drink industry is lucrative and powerful, and manufacturers invest heavily in marketing, with sales often aimed particularly at parents and children [Panjwani and Haigh, 2011].

Unhealthy foods packaged in bright colours or sold with an accompanying toy, television adverts with modern imagery; children subjected to such campaigns lack the capacity to be able to make an informed choice and so are swayed towards unhealthy food consumption.

Even families with intentions to be healthy may be unable to adopt better diets, instead being manipulated by the marketing sway of powerful industries to choose unhealthy food options. A survey conducted by the Children's Food Campaign compared soft drink products across a range of brands with their marketing messages, and found that in several cases companies are using misleading marketing to sell more unhealthy products [Panjwani and Haigh, 2011]. For example, one orange

“juice” drink sold in the United Kingdom features large pictures of oranges on its packaging, alongside a prominent claim that the drink contains “nothing artificial at all.” The report concludes that this marketing is misleading, diverting the customer's attention away from the fact that less than one-eighth of the product is fruit, and that it has significant added sugar [Panjwani and Haigh, 2011]. An additional sales driver for parents is cost. Even in developed countries, often the packaged and healthier food options are cheaper and more accessible than organic or local products.

As a result of the above factors, worldwide, one in 10 school-aged children are estimated to be overweight [Lobstein, Baur and Uauy, 2004]. In 2010 the number of overweight children under the age of five was estimated to be nearly 43 million [WHO, 2011(c)]. There is strong evidence that the epidemic of childhood obesity, if left unchecked, will lead in turn to an epidemic of premature CVD [McCrinkle, 2007].

These findings highlight the importance of addressing both underweight and overweight to stem the rise of CVD risk in cities. Policies regulating food prices, production, processing and distribution can make healthy foods cheaper and more accessible [World Heart Federation, 2011(c)]. Health professionals can emphasize the importance of cardiovascular health within the nutrition initiatives currently implemented as part of many maternal and child-health programmes [World Heart Federation, 2011(c); IOM, 2010], as well as school-health programmes. Community campaigns can educate children, parents, teachers and community leaders about the impact of diet on health [World Heart Federation, 2011(c)].

Boxes 7–9 provide examples of initiatives that have been successfully implemented to address unhealthy diets, in children, in diverse settings. However a wider, multi-stakeholder approach to change conditions that promote unhealthy food choices is required. Governments need to lead obesity prevention [Gortmaker, et al., 2011] through the regulation and restriction of the marketing and promotion of unhealthy foods, especially to children, while also considering innovative solutions to encourage healthy eating. The Hungarian government is leading the way with the introduction, on 1 September 2011, of a range of taxes on unhealthy food (including crisps, salted nuts, chocolates, sweets, ice-creams and energy drinks) to “push people into eating more healthily” [Holt, 2011]. The Danish government followed with the introduction of a “fat tax” – a surcharge on foods with more than 2.3 per cent saturated fats – which went into effect on 1 October 2011. The taxes have been welcomed by the Hungarian National Heart Foundation [Holt, 2011], the Danish Society of Cardiology and the Danish Heart Foundation, and may pave the way for a global food tax similar in concept to that seen with tobacco.



### Box 7 Eat for Goals!

*Eat for Goals!* was created to encourage young people to be more conscious of living an active lifestyle and eating healthily. The campaign is the result of collaboration between the Union of European Football Associations (UEFA), the World Heart Federation and the European Commission.

The campaign brings together a multi-ethnic group of 13 internationally renowned male and female football players to share their favourite recipes. These recipes are combined in a book aimed to educate youth and their families on the interdependency between a balanced healthy diet and physical and mental performance. The *Eat for Goals!* recipe book invites children to cook and eat like their champions.

As part of the campaign, UEFA committed to donating one Euro from the sale of each book to support the World Heart Federation's programmes to encourage children to be physically active. The book is currently available in 10 languages.

For more information, visit:  
[www.worldheart.org/eatforgoals](http://www.worldheart.org/eatforgoals)



### Box 8 Home-Grown School Feeding and Health Programme

The World Heart Federation is supporting the Nigerian Heart Foundation advocacy in favour of a national rollout of the Home-Grown School Feeding and Health Programme (HGSFHP), piloted successfully by the Osun State Government (OSG) and sustained for five years. The programme provides a main meal for children in kindergarten and early primary school at a cost of 55 cents per pupil per day. Addressing problems of poverty, high drop-out rates and over- and under-nutrition, school feeding programmes have helped maintain enrolment, reduce absenteeism, and provided tools for and knowledge of healthy living among children that will stay with them through adulthood.

For more information, visit: <http://www.schoolsandhealth.org/Pages/HGSF.aspx> and <http://www.nigerianheart.org/>



[www.childrensfoodcampaign.org.uk](http://www.childrensfoodcampaign.org.uk)  
Children's Food Campaign

### Box 9 The Children's Food Campaign: Keep kids cooking! Advocating for life-skills in schools

In the United Kingdom, the Children's Food Campaign is fighting to keep cooking lessons on the school curriculum, and aims to ensure children are taught skills to prepare basic healthy meals [*Children's Food Campaign, 2011(a)*].

In 2008, the then-UK Government announced that "every pupil would receive at least 24 hours of hands-on cookery classes during the first three years of secondary school" [*Children's Food Campaign, 2011(a)*]. However, the current Government is conducting a review of the National Curriculum, and the Children's Food Campaign is concerned that this initiative to encourage healthy life-skills may be lost.

In response, the Campaign launched an "online action" tool to assist people to respond to the Government's school curriculum consultation, and to send an email to their local Member of Parliament (MP).

With the added support from 10 top-celebrity chefs including Jamie Oliver, Raymond Blanc, Ainsley Harriott and Gary Rhodes [*Children's Food Campaign, 2011(b)*], and 22 health charities and medical organizations including the British Medical Association [*Children's Food Campaign, 2011(c)*], the campaign has attracted widespread support.

For more information, visit: [http://www.sustainweb.org/childrensfoodcampaign/keep\\_kids\\_cooking/](http://www.sustainweb.org/childrensfoodcampaign/keep_kids_cooking/)



### 3.3 Tobacco use

The connection between urbanization and smoking is documented. For example, 40 years ago research noted that city dwellers are more frequently smokers than are rural dwellers [Schneiderman and Levin, 1972]. More than 20 years ago, Levine *et al.* proposed that individuals living in fast-paced cities may be more prone to cigarette smoking [Levine, *et al.*, 1989]. Work completed in the Cape Peninsula, South Africa, 15 years ago concluded that those who spent larger proportions of their lives in urban settings tended to have unhealthier lifestyles compared with their less urbanized counterparts; smoking patterns were influenced by the degree of urbanization in women [Steyn, *et al.*, 1997].

Today, as noted by the NCD Alliance [NCD Alliance, 2011(c)], tobacco use is so commonplace “that it is easy to overlook how extraordinarily dangerous it is to human health and well-being”. Yet it is dangerous: there are more than 4000 chemicals in tobacco smoke, of which at least 250 are known to be harmful [WHO, 2011(e)]. A smoker or passive smoker inhales these chemicals and poisons, which then cause damage to the body’s cells and systems, including the heart and circulatory system. Smoking thereby causes serious CVD, including coronary heart disease and stroke.

Tobacco use has been described as one of the biggest public health threats the world has ever faced [WHO, 2011(e)]. In recent years the dangers of tobacco use have become widely recognized, yet 15,000 people continue to die every day from tobacco-related causes [World Lung Foundation, *n.d.*]. It is estimated that half of all people who smoke tobacco will die as a consequence of smoking, and that most smokers will lose between 10–15 quality life years before they die [QUIT, *n.d.*]. The burden of ill-health from tobacco use is particularly high in LMICs where nearly 80 per cent of the world’s one billion smokers live, as the annual death toll from tobacco use rises: it is expected to rise to more than eight million by 2030 [WHO, 2011(e)]. As stated by the WHO, “tobacco users who die prematurely deprive their families of income, raise the cost of healthcare and hinder economic development” [WHO, 2011(e)].

However, you do not have to be a smoker to experience the negative health impacts of tobacco; it kills more than 600,000 non-smokers exposed to second-hand smoke every year [WHO, 2011(e)]. The WHO defines second-hand smoke as “the smoke that fills restaurants, offices or other enclosed spaces when people burn tobacco products such as cigarettes, bidis and water pipes” [WHO, 2011(e)]. Those breathing second-hand smoke are subjected to the same harmful chemicals as people who choose to smoke, and thus the same negative health impacts including serious cardiovascular and respiratory diseases, such as coronary heart disease and lung cancer; there is



no safe level of exposure to second-hand tobacco smoke [WHO, 2011(e)]. Children in cities may be particularly susceptible to second-hand smoke, given the number of people smoking within cities combined with crowded living environments. The increasing dependency on motorized transport may also put children at risk; it is not uncommon to see adults smoking in cars despite having children travelling with them, for example.

By virtue of their dependence on adults, children are powerless to take control of their own environments and may be forced to breathe smoke-filled air. According to the WHO, almost half of the world’s children regularly breathe air polluted by tobacco smoke, with shocking consequences: in 2004, children accounted for more than a quarter (28 per cent) of the deaths attributable to second-hand smoke [WHO, 2011(e)]. In infants, second-hand smoke causes sudden death: [WHO, 2011(e)] infants of mothers who smoke are five times more likely to die of cot death than babies of non-smokers [ASH, 1999]. In pregnant women, second-hand smoke causes low birth weight [WHO, 2011(e)].

It is not just second-hand smoke that is problematic for children; first-hand smoke is a growing challenge. Typing “children smoking” into *Google Images* results in a series of photos of young people from all corners of the world lighting up [Google, 2011]. The same search term in *YouTube* reveals numerous videos of children smoking cigarettes [YouTube, 2011], with a video of a two-year old child named Ardi featuring first: he hit the headlines in 2010 when he was filmed smoking cigarettes in the Indonesian island of Sumatra [Daily Mail, 2010].

Data from the Global Youth Tobacco Survey (GYTS) [Global Youth Tobacco Survey Collaborative Group, 2002] suggests that nearly 25 per cent of students who smoke, smoked their first cigarette before the age

of 10 years, and that if the smoking patterns seen in the developed world continue, a lifetime of tobacco use will result in the deaths of 250 million children and young people alive today, most of them in LMICs.

There are a number of reasons why children may try smoking. They may be influenced by other family members, for example siblings and parents: if a child’s parents smoke they are three times more likely to smoke themselves [Cancer Research UK, *n.d.*]. Over 40 per cent of children currently have at least one smoking parent [WHO, 2011(e)].

Research has also shown that adverts may encourage children to start smoking. As discussed by Biener and Siegel [Biener and Siegel, 2000] tobacco marketing activities may influence youth attitudes towards smoking, their susceptibility to trying cigarettes, the rates of young people who start to smoke, and smoking progression including brand awareness and preference. The GYTS [Global Youth Tobacco Survey Collaborative Group, 2002] revealed that youth exposure to advertising is commonplace: more than three-quarters (78.3 per cent) of students (primarily between the ages of 13–15 years) surveyed had, during the preceding month, seen pro-cigarette advertising on billboards; the vast majority (73 per cent) had seen adverts in newspapers or magazines; and four out of five (79.7 per cent) had been exposed to adverts at sporting or other events. One in 10 students reported they had been offered free cigarettes by a representative of a tobacco company (median 10.6 per cent).

As noted by the NCD Alliance, girls are among the new targets of tobacco companies, particularly in LMICs, where use among females is still low and the tobacco industry has identified an untapped market to exploit [NCD Alliance, 2011(a); WHO, 2003]. Through marketing campaigns that associate tobacco use with beauty, femininity and sex appeal, and through the availability of more affordable tobacco products, the tobacco industry compromises girls’ and young women’s ability to make informed choices about tobacco use [NCD Alliance, 2011(a)]. By the same token, aggressive marketing campaigns that associate tobacco use with independence and wealth may influence the decision of boys and young men to smoke.

Accompanying the increasing knowledge-base related to the dangers of tobacco use, and awareness of the reasons behind individuals smoking, is the public health response to the tobacco epidemic. One of the greatest success stories in the fight against CVD (though it is a continuing battle) was the development of the WHO’s Framework Convention on Tobacco Control (FCTC). This treaty, which has been embraced by more than 170 parties covering 87 per cent of the world’s population, is the world’s first public health treaty, and addresses issues around fighting tobacco

including restricting sales and advertising and making public places smoke-free. It also provides instruction for reducing the demand for tobacco via education and public-awareness campaigns.

Although the FCTC has done much to change perceptions around tobacco, there is still much to be done, which is why the World Heart Federation continues to campaign for the full implementation of the FCTC globally in parallel to educating people on the links between tobacco use, second-hand smoke exposure and increased CVD risk. There are many actions that can be taken to help protect children and youth particularly.

For example, mass-media campaigns and educational initiatives could help to tackle industry tactics, by highlighting to young people the dangers of tobacco use, and assisting them to make an informed decision not to use it (an example of one such initiative is provided in Box 10). Such campaigns could also convince young people already using tobacco to stop [WHO, 2011(e)]. Media and educational drives could also persuade adults to stop smoking, creating a positive influence on children, or at the very least educate adults about the dangers of passive smoking and thus help to protect children from second-hand smoke.

As highlighted by the WHO, hard-hitting anti-tobacco advertisements and graphic pack warnings – especially those that include pictures – also reduce the number of children who begin smoking and increase the number of smokers who quit [WHO, 2011(e)]. Governments can thus take action to mandate the inclusion of such images on tobacco packaging, to help protect children. Government bans on tobacco advertising, promotion and sponsorship can also reduce tobacco consumption [WHO, 2011(e)]. Australia is leading the way by introducing legislation mandating that all tobacco products are sold in plain packaging (Box 11). However, tobacco taxes are recognized as the most effective way to reduce tobacco use, especially among young people. A tax that increases tobacco prices by 10 per cent decreases tobacco consumption by up to 8 per cent in LMICs [WHO, 2011(e)].

Children who smoke are particularly at risk of ill-health caused by tobacco use; they are more susceptible to the immediate health consequences of smoking (coughs, increased phlegm, wheeziness and shortness of breath) [Cancer Research UK, n.d.] but if they continue to smoke are also more at risk of tobacco's long-term impact, including CVD. Children living in cities in LMICs may be particularly susceptible, as they live in an environment where access to tobacco is easy, and risk of exposure to persuasive advertising and marketing techniques is great. Action must therefore be taken to tackle this peril to youth heart health, and to advance the move towards a tobacco-free world.



### Box 10

#### Mobilizing Youth for Tobacco Related Initiatives

The Mobilizing Youth for Tobacco Related Initiatives (MYTRI) in India are successful school-based tobacco-use prevention programmes, aiming to build awareness and advocacy in the field of tobacco control in order to change behaviour. The overarching project was conducted in collaboration between the Health Related Information Dissemination Amongst Youth – Student Health Action Network (HRIDAY-SHAN), a Non-Governmental Organization (NGO) working in tobacco control in India, and the University of Texas in the United States. It consisted of multiple phases and initiatives, commencing with a baseline survey on students' knowledge, beliefs and practices related to current and future tobacco use. This was followed by numerous activities designed to change their behaviours, such as training to become peer leaders, parent postcards and school posters.

The impact of MYTRI was assessed through a series of surveys conducted after each year of intervention. The intervention programme, extending over two years, covered male and female students in the 6<sup>th</sup> to 10<sup>th</sup> grade in secondary schools, aged between 10–16 years.

Data were collected for prevalence, psycho-social determinants of tobacco use, and associations with tobacco advertising. There were significant reductions in tobacco use in the intervention group over the two years. During the course of the project, overall tobacco use decreased by 17 per cent in the intervention group, and intention to smoke decreased by 11 per cent [HRIDAY, n.d.]. The study found a strong correlation between exposure to tobacco advertising and higher use of tobacco. Some of the strongest risk factors identified were social susceptibility to and social norms about tobacco use.

The school- and community-based health education programmes of HRIDAY-SHAN and the University of Texas have been successful in raising awareness of healthy lifestyle practices among Indian youth. Through the HRIDAY-SHAN programme, schools have become portals of health education for neighbourhood communities. The programme has been listed as a "Best Practice Model" and recommended for global replication by the World Health Organization [HRIDAY, 2006].

Adapted from MYTRI: India's First Successful School-Based Tobacco Use Prevention Model. For further information, visit: <http://www.hriday-shan.org/hriday/research.html>



### Box 11

#### New Australian legislation on tobacco packaging

On 1 July 2012, a new legislation will become effective in Australia mandating that all tobacco products are sold in plain packaging [World Heart Federation, 2011(e)].

The Australian House of Representatives set a global precedent by passing this law, it is the first country in the world to make this commitment. The law requires all tobacco products to be sold in drab green packaging with plain-font brand name only. The packaging cannot include any colour or design that could add appeal; no trademarks, logos, descriptors, or promotional information. In addition, under the new law, health warnings will be updated and increased from 30 per cent to 75 per cent of the pack front [Action on Smoking and Health, 2011].

The goal of this new legislation is to: stop use of packs as promotion and advertising; increase effectiveness of health warnings; prevent use of misleading and deceptive packaging to create false beliefs of different strength and quality of tobacco; reduce youth smoking and decrease youth uptake; and remove positive association with cigarette brands.

Adapted from *Tobacco Facts: Plain Packaging of Tobacco Products*, a factsheet from ASH: Action on Smoking and Health. Visit: [www.ashaust.org.au](http://www.ashaust.org.au)

### 3.4 Rheumatic fever and rheumatic heart disease

Urbanization, changes in lifestyle and diet, tobacco use and physical inactivity are recognized risk factors for the increasing rates of CVD. These alone are very alarming. However, we must not forget about the children and young people in LMICs that suffer from rheumatic heart disease (RHD). Although this condition is almost eliminated in high-income countries, it is still the most common heart disease amongst children and young people in LMICs.

RHD is a complication of rheumatic fever (RF). RF is an inflammatory disease that can develop after a child has suffered from a throat infection with *Streptococcus* bacteria, often referred to as strep throat. An inflammation of the heart muscle and heart valves (carditis) occurs in 30–45 per cent of RF patients and leads to RHD, in which a person's heart valves become permanently damaged [Guilherme, Ramasawmy and Kalil, 2007]. Estimations show that 233,000 patients die from this disease in LMICs each year [Guilherme, Ramasawmy and Kalil, 2007]. The incidence of RHD is at least 15.6 million cases. The highest documented prevalence is amongst children living in LMICs, with the highest rate seen in sub-Saharan Africa [Guilherme, Ramasawmy and Kalil, 2007]. Those with carditis as part of the initial episode are at greater risk of developing recurrences and of sustaining further cardiac injury.

Major risk factors for RF include poverty, overcrowding, and limited access to medical services [Marijon, et al., 2007]. Fast rates of urbanization have resulted in the large volume migration of families from the countryside to cities, which in LMICs are often ill-equipped to deal with their mass arrival. The result is vast areas with unsubstantial housing and lack of essential facilities, leaving young residents particularly prone to developing strep throat, and potentially, in turn, RF and then RHD.

If the strep throat is diagnosed and properly treated, RF can be prevented. If it is not prevented, but caught early, regular long-term penicillin treatment can prevent RF from becoming RHD, and can halt disease progression in people whose heart valves are already damaged by the disease [WHO, 2011(d)]. Although city environments could facilitate prevention awareness campaigns and easier distribution of penicillin treatment to those who need it; the reality is that a vast number of children live in substandard housing with a lack of education regarding preventative measures, and shortages in access to medicine. The control of RHD in urban areas may therefore be limited. In severe cases of RHD, surgery may be necessary to repair the heart's valves; however for children in low-economic urban environments, access to health services is often limited.

Early detection of RHD is vital to prevent progression to valve disease in young adult life; detection traditionally occurs by listening for murmurs by stethoscope. A recent systematic echocardiographic screening programme in schools in Cambodia and Mozambique found a 10-fold detection rate by echocardiography, in comparison to clinical examination only [Marijon, *et al.*, 2008]. This would make it possible to identify children at risk of developing severe rheumatic valve disease for whom secondary prevention with penicillin prophylaxis may be effective. Roll-out of echocardiography for symptomatic children in cities may therefore reduce cases of severe rheumatic valve disease; however this would require monetary investment and service coordination from governments.

It is saddening to see that in LMICs, RHD remains a major cause of morbidity and premature death and imposes a substantial burden on healthcare systems with limited budgets. It is essential that decision-makers and healthcare professionals work together to implement screening programmes in poorer segments of urban areas to prevent more deaths from RHD, and treat those in early stages. Boxes 12 and 13 provide information about two successful RHD control initiatives.

### **Box 12** **RHD Net**

RHDnet is a website developed by the World Heart Federation specifically to support RHD control around the world. It has been developed primarily for use by clinicians, health practitioners and policy-makers working in LMICs, where the disease is still common. The portal aims to promote RHD control through best practice, including registration of people with disease. Via the website, healthcare professionals and other stakeholders can access education and training materials, best-practice guidelines and information from RHD management programmes around the world.

A dedicated section of the website contains general information about acute RF and RHD for individuals with disease, their families, and community groups interested in RHD prevention and control. A series of videos also provide information about RHD in South Africa and the Pacific.

RHDnet is the first dedicated, global network that attempts to connect and support clinicians and others interested in RF and RHD control. A members' discussion forum has been developed to link clinicians and specialists around the world and facilitate communication on various aspects of RF and RHD control including secondary prophylaxis, the use of echocardiography and issues around cardiac surgery.

For further information visit: [www.worldheart.org](http://www.worldheart.org)



### **Box 13** **African initiative for rheumatic heart disease control**

Together with the WHO, the World Heart Federation has co-funded RHD prevention and treatment projects in many countries, including Benin, Brazil, Cuba, Romania, Vietnam and Vanuatu. The World Heart Federation's RHD programmes aim to reduce the incidence of RF and the prevalence of RHD through a transferable model for secondary prevention and practical support. This includes:

- Providing programme support and technical assistance to local Governments to establish comprehensive and sustainable RHD control programmes.
- Developing best-practice resources and training materials. These materials are designed to instruct key public health staff about how to establish and maintain RHD-control programmes based on secondary prevention of acute RF.
- Maintaining an online RHD resource network that provides tools and training materials that can be used worldwide for rheumatic disease control (Box 12).

For further information visit: [www.worldheart.org](http://www.worldheart.org)







# Chapter Four

## Cardiovascular health in today's megacities

### 4.1 Megacity research

#### 4.1.1 Research aims

The prior chapters of this report have highlighted that children in today's megacities face significant barriers to living heart healthy. The World Heart Federation initiated research in response to perceptions that a relationship exists between rates of urbanization and CVD and that due to forecasts for continued urbanization, future generations may be particularly at risk of poor heart health. The World Heart Federation was interested in a number of topics including:

- Overall urbanization trends, with a particular focus on LMICs
- The impact of urbanization on behaviours that may lead to CVD risk factors, for example diets high in saturated or trans fat leading to obesity
- The heart healthy (and non-heart-healthy) behaviours of children living in cities, particularly as a result of environmental influences or constraints
- The political response to urbanization, particularly to support heart healthiness

A hypothesis was devised, that “the social determinants associated with families – especially those with children – living in urban areas place them at greater risk of heart disease and stroke, compared to those living in rural areas, and this public health problem will worsen over time unless action is taken now.”

Based upon this hypothesis, objectives of the research were to:

- Quantify the health and socioeconomic burden of CVD in a sample of countries/ megacities
- Identify determinants of the burden, with an emphasis on the impact of urbanization (e.g. a lack of safe spaces for children to engage in physical activity leading to inactive lifestyles and associated CVD risk factors)
- Forecast the future burden of CVD in urban areas, if action is not taken to prevent poor heart health

- Provide examples of best practice, where public health interventions have addressed CVD risk factors in urban areas

The World Heart Federation commissioned a rapid literature review in a selection of today's megacities. The findings and analysis of this review are presented within this chapter, as case studies, to reveal evidence about the actions of people living in selected megacities and the potential influence of these on heart health.

#### 4.1.2 Methodology

As a first stage in the research process, an initial rapid evidence review was completed. The search strategy to obtain relevant literature involved the use of a comprehensive list of search terms, inserted into the electronic databases *Pub Med* and *Google Scholar*. The literature search terms included: Urbanisation/urbanization; urban health; megacities; heart health; heart disease; cardiovascular disease; prevalence; economic; cost; burden; cost of illness; children; young people; youth; adolescents; smoking; smoke-free policy; no smoking policy; tobacco consumption; physical inactivity; exercise; obesity; overweight; fruit and vegetable consumption; nutrition; diet; lifestyle behaviours; weight; blood pressure; hypertension; heart rate; cholesterol; lipids; and public transportation. Searches were limited to the appearance of key words in the literature title or abstract.

Only English-language literature published in the last five years were reviewed (although some of these contained data which was older). The initial search results were summarized, and a sub-set of megacities were selected for further analysis. The World Heart Federation wanted to focus on cities in Asia, Central America, South America, the Middle East and Africa, to allow for multi-region representation. However, the final selection of cities was determined by the availability

of data, and due to a lack of literature from Africa, it was excluded. The Nairobi case study was therefore produced outside of the wider research methodology, with the support of the Kenyan Cardiac Society.

#### 4.1.3 Study limitations and recommendations for the future

From the outset, it was recognized that this would be an exploratory study, to stimulate thought and dialogue around the topic of child heart health linked to megacity living. It was accepted early on in the process that further research would be necessary to facilitate a full understanding of the issues, but that this initial activity would provide a useful stepping stone for further studies to explore the determinants of heart health particularly within megacity environments.

The methodological limitations related to this research included:

- Only English-language literature was reviewed. Evaluation of literature in local-language would be useful in future research to help identify country and regional trends in urbanization and heart-disease prevalence, to help inform healthcare-service facilitation and the establishment of interventions specific to local need.
- Although this research revealed a multitude of quantitative analysis (statistics on smoking for example) completed by others, no “new” statistical analysis could be completed on the data within the published literature, since not all the necessary data was identified, and the methods of data collection varied according to each researcher/author. It was therefore not possible to reach new quantitative conclusions, and the original objective to “forecast the future burden of CVD in urban areas” could not be met.
- As such, the World Heart Federation calls for improved monitoring and reporting of CVD incidence and prevalence at a city level, regionally and globally, to allow



country-comparisons of data and more effective analysis of trends in future research.

- Given time availability and resources, it was considered a pragmatic approach to complete this research via a rapid literature review and desk-top analysis. However, future research surveying those who live, work and play in these cities, and those who provide healthcare and education in urban areas, would give invaluable first-hand, real-life insights into the impact and constraints of an urban environment on behaviour and resulting CVD risk factors. It is also noted that researchers investigating lifestyle behaviours of children strongly recommend studying local factors, believing that this will “allow a focus on the specific problems, save resources, and enhance existing specific efforts” [ILSI Argentina, 2008].

This study therefore should be seen as a starting point for exploring the relationship between urbanization and CVD risk to children in megacities, and not a definitive view. However, we hope that the information contained within this report spurs more action to explore the issues (Box 14).

In the next sections, the megacity case studies are presented to provide an overview of the characteristics of these metropolises, and give an insight into the opportunities and challenges city living presents to ensuring the heart healthiness of our future generation.



#### **Box 14** **Setting the scene**

*The report content is exploratory, and the World Heart Federation recognizes that further research is necessary to facilitate a full understanding of the issues. However, we hope that it provides a useful stepping stone for further studies to explore the determinants of heart health particularly within urban environments.*

**Professor Kathryn Taubert, PhD,**  
**Chief Science Officer,**  
**World Heart Federation**



## **4.2 São Paulo**

### **4.2.1 An introduction**

São Paulo is one of Brazil’s two megacities, the other being the greater metropolitan area of Rio de Janeiro, and is situated in the southeast of Brazil. With a population of 19.96 million people [Central Intelligence Agency, 2011] São Paulo is the largest city in the western and southern hemisphere. Its population is expected to rise to 21.65 million by 2025 [United Nations Department of Economic and Social Affairs, 2009].

In 2007, São Paulo had an average of 9,000 people for every kilometre squared [City Mayor Statistics, 2007]. It has been characterized as being one of the places with the most compact living environments globally. The population density is more than twice that of Paris and three times that of Los Angeles [City Mayor Statistics, 2007]. In 2007, those aged under 20 years made up approximately one-third of the São Paulo population [Urban Age, n.d.].

In Brazil, in 2010, the country’s urban population equalled 87 per cent of the total population. The rate of urbanization is estimated to be 1.1 per cent between 2010–2015 [Central Intelligence Agency, 2011]. Despite São Paulo being Brazil’s wealthiest city, one-third of the city’s population lives in favelas (slums) and informal land subdivisions [Cities Alliance, 2009]. São Paulo is therefore described as “a city of contrasts”, an example of an economic development model that has left part of its population excluded from the country’s rising wealth boom [Cities Alliance, 2009].

## 4.2.2 São Paulo and cardiovascular disease

Over time, Brazil has witnessed a decline in the mortality rate from both heart disease and stroke; from 68.2 to 40.9 per 100,000 inhabitants for stroke, and 208.2 to 126.1 per 100,000 inhabitants for total cardiovascular mortality, between 1982–2002 [Andre, et al., 2006]. São Paulo has seen a similar declining trend in CVD mortality. Between 1980–2005, there was a 45 per cent decrease in death risk from circulatory diseases (ischaemic heart disease and cerebrovascular disease) in São Paulo [de Padua Mansur, et al., 2009].

This steady decline in CVD mortality may in part be attributable to an increase in prevention efforts, such as the “*Promotion of an Active Lifestyle: A project in São Paulo*”. This project encourages physical activity amongst various segments of the city’s population including students, workers, and those aged 60 years and over. Farias et al compared CVD mortality in São Paulo by age and gender between the period of 1996–1998 versus 2003–2005, and found a significant reduction in CVD mortality. They discuss how health promotion measures such as the São Paulo project can partly explain a reduction in morbidity for CVD, with a subsequent impact on mortality [Farias, et al., 2009].

Despite the decline in CVD mortality, the socioeconomic burden of CVD in Brazil remains high. Overall, heart disease accounted for 9 DALYs lost per 1,000 population in 2003, and stroke led to 11 DALYs lost per 1,000 population [WHO, 2004(b)]. In addition to the human burden, the financial cost of CVD must be considered. For example, the cost of stroke includes a variety of medical treatments, including the costly intensive care unit hospitalization estimated at a cost of 646.43 Brazilian real per treatment [Araujo, et al., 2010].

## 4.2.3 São Paulo and non-heart-healthy behaviours

### 4.2.3.1 Diet, nutrition and physical activity

Across Brazil, between 1974–2003, the consumption of fruit and vegetables fell short of the recommended amounts [Ribeiro Figueiredo, et al., 2008]. In 2006, less than half of adults living in Brazil’s urban areas claimed to regularly consume fruit (44.1 per cent) or vegetables (43.8 per cent), in comparison to just over a quarter (26.8 per cent) of adults living in São Paulo itself [Jaime, et al., 2009].

Food choices made by adults living in Brazil are largely influenced by their age, level of education and gender [Jaime, et al., 2009]. Those in the older age bracket (45–65+ years), and with greater years of education, have a tendency to consume more fruit and vegetables. On average, women also tend to eat more fruit and vegetables than men. According to Bezerra and Sichieri, the prevalence of out-of-home eating in Brazil between 2002–2003 was 35.1 per cent. The Southeast region, where São Paulo is situated, showed the highest frequency of out-of-home eating (38.8 per cent). The food groups consumed out of the home in the

Southeast region included foods associated with an increased risk for CVD: soft drinks (14.1 per cent), sweets (10.2 per cent), fast foods (9.2 per cent) and deep-fried and baked snacks (10.6 per cent). It was observed that the urban area, when compared to the rural area, showed a higher frequency of out-of-home eating, and a more frequent consumption of these foods groups [Bezerra and Sichieri, 2010].

These consumption patterns are likely to have an influence on the levels of obesity found amongst children in São Paulo. In 2005, approximately 9 per cent of children aged 13–14 years living in São Jose de Rio Preto in São Paulo were classed as obese and 12 per cent as overweight [Do Pilar Carneiro Bertolace, et al., 2008]. In addition, compared to other cities in Brazil, São Paulo has one of the highest numbers of overweight people in those aged between 25–49 years [Farias, et al., 2009]. Other studies conducted in different municipalities revealed that the prevalence of overweight in younger Brazilians ranged from 8.4–19 per cent and obesity ranged from 3.1–18 per cent [Silva, et al., 2010]. Researchers suggest that this “*may serve as a warning for the Brazilian governmental agencies that need to plan efficient policies to fight overweight and obesity because within a few years Brazilian children and adolescents might reach the WHO reference values, which are associated with disorders and health risks*” [Silva, et al., 2010] (Box 15 gives further information on the WHO reference values).

In addition to food patterns, levels of inactivity are also high in Brazilian cities. It is worrying to see that in the state of São Paulo between 2001–2002, a high number of adults aged between 18–59 years, were not sufficiently active; 16.6 per cent of men, and 7.3 per cent of women. During the same period, 65.4 per cent of leisure time was filled with activities which cannot be considered as physical activity [Zanchetta, et al., 2010]. Women with the highest prevalence of physical inactivity during leisure time were aged under 29 years [Zanchetta, et al., 2010].

One contributing factor to this lack of exercise may be Sao Paulo’s congestion issues. As highlighted by Downie, it is not uncommon for people from São Paulo to do their make-up in the car, watch DVDs, or even read, as the city’s traffic jams force them to spend a major proportion of their lives sitting in the car [Downie, 2008]. With this kind of congestion, sedentary behaviour has become a common occurrence and a major influence in the risk of CVD.

### 4.2.3.2 Tobacco use

Levels of tobacco use in Brazil are declining. In 1989, the total prevalence of smoking was 34.8 per cent. In 2001, a survey of individuals aged between 12–65 years residing in the 107 largest cities of Brazil revealed the prevalence of daily smoking was lower, at 17.4 per cent [Leitão Filho, et al., 2009]. Among students specifically, lifetime tobacco use decreased from 33.7 per cent in 1997

to 21.8 per cent in 2004 [Leitão Filho, et al., 2009]. A similar trend has been seen in the city of São Paulo, witnessing a decline from 41.8 per cent of men smoking in 1987 to 25.5 per cent in 2002, and from 30.6 per cent in women to 19.8 per cent in the same time period [Marcopito, et al., 2007]. This historical drop may be attributed to a range of activities, including restrictions on tobacco advertising, national campaigns against tobacco, and laws to constrict cigarette consumption in public premises [Marcopito, et al., 2007].

Nonetheless, a concerning trend is arising in São Paulo, where the average age of smoking initiation amongst youth is 14 years [Sanchez, et al., 2010]. Sanchez et al found that the main reasons for adolescents smoking in São Paulo include influence from smokers in their household, absence of any religion and for girls, in particular, the influence from family relations [Sanchez, et al., 2010]. The price of cigarettes is not likely to deter adolescents from smoking, as Brazil has one of the lowest tobacco prices in the world, and relatively easy access to cigarettes for young people [Leitão Filho, et al., 2009].

São Paulo has recognized the need to increase its prevention efforts. Health education practices are central to preventing heart disease. For example, the “*Healthy Lifestyle Multiplier Students*” programme trains older students to act as peer educators for younger students, to influence each others’ cultural development and psychosocial growth. Zanetta, Nobre and Lancarotte write that the initiative involved the collaboration of students and teachers, and focuses specifically on physical activity, healthy diet, and the health effects of cigarette and alcohol consumption [Zanetta, Nobre and Lancarotte, 2008]. Also, São Paulo broadcasts specific TV channels providing health promotion and information. Although the impact of such interventions is still to be documented, they provide examples of the types of initiatives feasible in the scope of vast expanding urban areas.

## 4.2.4 Conclusion

The above statistics reveal trends on the nutrition patterns, smoking habits and physical activity levels of those living in São Paulo. The reviewed literature illustrates that CVD mortality in São Paulo is declining, with effective prevention initiatives implemented. However, there is still much to do to tackle CVD, and it is concerning to see the limited physical activity undertaken and lack of balanced diets consumed by those in São Paulo. In addition, the young age at which people start smoking is a public health concern, and could lead to an increase in CVD deaths.

Current efforts to help prevent CVD mortality and morbidity in São Paulo are promising. However, there is a lack of evaluation and periodic updates of knowledge on key behaviours, particularly those of children. As such, there is still work to be done to assess the most efficient and cost-effective means by which to promote healthy lifestyles.



### Box 15

#### WHO reference values for body mass index (BMI) and height

Between 1997–2003, the WHO undertook the Multicentre Growth Reference Study (MGRS) to generate new curves for assessing the growth and development of children. The MGRS combined a longitudinal follow-up from birth to 24 months and a cross-sectional survey of children aged 18–71 months. Primary growth data and related information were gathered from 8,440 healthy breastfed infants and young children from widely diverse ethnic backgrounds and cultural settings (Brazil, Ghana, India, Norway, Oman and USA). The MGRS developed the following standards (also referred to as reference values) to assess physical growth in children:

- Weight-for-length (45 to 110 cm) and weight-for-height (65 to 120 cm)
- Length-for-age (0 to 24 months) and height-for-age (2 to 5 years)
- Weight-for-age
- Body mass index-for-age

The growth standards depict normal early childhood growth under optimal environmental conditions and can be used to assess children everywhere, regardless of ethnicity, socioeconomic status and type of feeding.

Adapted from the World Health Organization Department of Nutrition for Health and Development's *WHO child growth standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development*, 2006. For further information, visit the *Programmes and Projects* tab of the World Health Organization website: [www.who.int](http://www.who.int)



### 4.3 Shanghai

#### 4.3.1 An introduction

Shanghai is located in the eastern region of China. In 2010, an estimated 16 million people lived in Shanghai, and the population is expected to rise to over 20 million by 2025 [United Nations Department of Economic and Social Affairs, 2009]. In 2007, over 13,000 people lived on every kilometre squared [City Mayor Statistics, 2007]. This is almost 100 times as dense as China as a whole, where approximately 140 people live per kilometre squared [Trading Economics, 2012]. In 2006, just under 7 per cent of land was classed as green space in Shanghai [Urban Age, n.d.]. In 2001, across China, the slum to urban population was 38 per cent, with the slum population expected to grow at 2 per cent each year [UN-HABITAT, 2001(b)]. In 2000 over 20 per cent of the population were aged between 0–19 years [Urban Age, n.d.].

#### 4.3.2 Shanghai and cardiovascular disease

CVD accounts for one-third of total mortality in China and the number is predicted to double by 2020 [Xiao and Chen, 2010]. In 2002, over 1.6 million people died from stroke in China and over 700,000 died from heart disease [WHO, 2004(b)]. In 2003, the burden in DALYs lost was 12 per 1,000 population for stroke and 4 per 1,000 population for heart disease [WHO, 2004(b)].

Based on ageing and population growth figures alone, China is predicted to experience 7.8 million excess coronary heart disease events (a 69 per cent increase) and 3.4

million more deaths due to coronary heart disease (a 64 per cent increase) during the period of 2020–2029, compared to the period 2000–2009 [Moran, et al., 2008]. Although the same research predicted that the majority of coronary heart disease deaths will occur in persons aged 65 years or older, the authors recognize that the growing annual burden of coronary heart disease death and disability will weigh on adults aged less than 65 years [Moran, et al., 2008].

The prevalence of heart disease has been increasing in China, partly as a result of a worsening profile of risk factors including increased prevalence of hypertension, smoking and obesity levels [Wu, et al., 2008]. A number of these CVD risk factors are worse in urban areas. For example, in 2002, the prevalence of hypertension was higher in urban areas [Wu, et al., 2008]. Recommendations to tackle risk factors including hypertension have highlighted the need for cooperation across policy makers, healthcare specialists, primary practitioners and the general population. This suggests the need for a holistic approach, involving a variety of stakeholders.

Estimates suggest that CVD is costing China U.S.\$16 billion every year [Ru, 2009]. As highlighted by Wei et al, in light of demographic shifts towards an older and more urbanized population, and the limited available treatment and prevention strategies, the high cost of cardiovascular care (stroke care specifically as researched by Wei et al.) is projected to rise in China [Wei, et al., 2010].

### 4.3.3 Shanghai and non-heart-healthy behaviours

#### 4.3.3.1 Diet, nutrition and physical activity

A study investigating the patterns and correlates of physical activity in women from urban Shanghai found that while only a third (35.5 per cent) of study participants engaged in regular exercise, two-thirds met current recommendations for lifestyle activity via participation in behaviours such as walking and cycling to/from work and housework [Jurj, et al., 2007]. These findings highlight the importance of non-exercise activities as part of physical activity to reduce CVD risk. It was also found that women who exercised during adolescence were more likely to engage in physical exercise during adulthood [Jurj, et al., 2007].

The implication is that future generations will be increasingly inactive; as discussed earlier, built environments restrict the ability of youth to participate in lifestyle activity such as walking to school, and since over half (57.1 per cent) of school-based children living in Shanghai do not engage in enough physical activity [Wang, Shao and Hou, 2008], this may initiate sedentary trends for adulthood. For example, more than 5 per cent of children spend greater than four hours watching TV, or playing video games during school days and at weekends [Wang, Shao and Hou, et al., 2008]. Further to this, cycling commuters have been in a steady decline since 2003, due to the increase in car ownership and the elimination of bike lanes on major roads. Similar to the situation seen in São Paulo, children may therefore be increasingly likely to spend their time in traffic jams and being sedentary. To help overcome the decline in physical activity of commuters, in 2008, Shanghai introduced a bike-sharing programme to encourage people to get back on their bikes; the initiative was launched to coincide with World Car Free Day that year [Bike Shanghai, 2008].

A lack of exercise could be contributing to the increasing obesity levels seen in Shanghai; a study published in 2008 showed high prevalence of overweight and obesity in Shanghai metropolis populations aged 25–95 years [Hou, et al., 2008]. Overweight or obesity in men is found to be more prevalent in the megacity of Shanghai, at 32.9 per cent, in comparison to other Chinese cities, where this figure ranges between 22–32 per cent [Lee, et al., 2008]. A separate study found that 11.5 per cent of children in Shanghai were obese and 14.7 per cent were overweight [Wang, Shao and Hou, 2008].

#### 4.3.3.2 Tobacco use

In 2003, 58.9 per cent of men in China smoked, and 3.6 per cent of women [WHO, 2004(b)]. Estimates suggest that China, with 350 million smokers, is the country with the highest number of smokers in the world. An increase in the intensity of smoking has been witnessed, with a rise in the proportion of people smoking more than 20 cigarettes daily [Qian, et al., 2010]. Smokers are also starting younger, with average age of take up decreasing from 32.1 years in 1998 to 27



years in 2003 for women, and from 23.9 years to 21.5 years for men [Qian, et al., 2010]. Efforts to address the tobacco problem in China are complicated by the fact that China Tobacco is the largest tobacco company in the world [China Tobacco, n.d] and the Chinese government gains significant revenue from the growth, manufacturing and sales of tobacco in China and around the world.

Current smoking levels and intention to smoke are higher among young women, aged between 14–24 years and living in urban areas compared to rural areas. One-fifth of young women have experimented with smoking, which has led researchers to suggest that “this level of experimentation is an ominous harbinger for a potentially devastating tobacco-related disease epidemic within a previously unaffected population” [Ho, et al., 2010].

From 1993–2003, China did witness a decline in the prevalence of smoking, with a reduction of nearly 11 per cent in men and just under 2 per cent in women [Qian, et al., 2010]. This trend of falling prevalence may be attributed to a variety of factors, including smoking-cessation efforts, improved education, and restrictions on smoking particularly in urban areas. There is a concern amongst experts however that policy implementation on tobacco control has been slow to progress in China [Qian, et al., 2010]. Research suggests that tackling smoking in China has the potential to reduce total mortality by 10 per cent for men and 3.5 per cent for women [Xue-jun and Huan-zhong, 2007].

#### 4.3.4 Conclusion

The reviewed literature presents a worrying picture of rapidly rising levels of CVD deaths in China. These levels are not just attributed to China’s ageing and population growth, but are also largely due to the worsening trends in many risk factors. The health of China’s future generation must be addressed via improved access to healthcare, restrictions on tobacco advertising and more playgrounds to tackle the predicted rise in CVD deaths.

### 4.4 Mexico City

#### 4.4.1 An introduction

Mexico City is located in the central Valley of Mexico, close to the heart of Mexico. In 2010 it had an estimated population of about 19.5 million which is predicted to grow to 20.7 million by 2025 [United Nations Department of Economic and Social Affairs, 2009]. In 2005, just over one-quarter of the population was aged 19 years or under [Urban Age, n.d.].

Mexico City is densely populated; in 2007 it had an average density of 8,400 people per kilometre squared [City Mayor Statistics, 2007], whereas in 2010 Mexico as a whole had an average of 57 people per square kilometre [Instituto Nacional de Estadística Y Geografía, 2010]. In 2000, just 7.5 per cent of the land in the metropolitan area of Mexico City was classed as recreational [Urban Age, n.d.]. Across the country as a whole, in 2001, the slum to urban population was 20 per cent [UN-HABITAT, 2001(a)]. The lack of available public spaces, and increased levels of crime and insecurity in urban spaces create significant barriers to physical activity, as discussed below.

#### 4.4.2 Mexico City and cardiovascular disease

In 2002, a total of 51,454 people died across Mexico due to heart disease and 26,478 from stroke [WHO, 2004(b)]. Within the capital, research from 1998–2004 found that approximately 2 per cent of men, aged between 35–84 years, had ischaemic heart disease, and just over 1 per cent suffered from a stroke [Kuri-Morales, et al., 2009]. This compared to approximately 1 per cent for both ischaemic heart disease and stroke for women of the same age range [Kuri-Morales, et al., 2009]. The disease burden for heart disease is estimated at 6 DALYs lost per 1,000 population across Mexico as a whole, and for stroke 4 DALYs lost per 1,000 population in 2003 [WHO, 2004(b)].

Across Mexico, there has been a sharp increase in the prevalence of cardiovascular risk factors including hypertension (high blood pressure), the prevalence of which rose from 23.8 per cent in 1993 to 43.2 per cent in 2006 [Villalpando, et al., 2010]. A total 10.6 per cent of adolescents in Mexico City have hypertension, and 10 per cent have pre-hypertension (elevated blood pressure, that is higher than normal but not to the point that it is classified as high blood pressure) [Juárez-Rojas, 2008]. Obesity was more common in hypertensive adolescents [Juárez-Rojas, et al., 2008].

We did not find estimates of the cost of heart disease and/or stroke alone, however research suggests that expenditure on type 2 diabetes, CVD and obesity represents 7 per cent of national expenditure in health and 0.4 per cent of gross domestic product [Villalpando, et al., 2010]. It is expected that this expenditure will rise in the near future, partly due to ageing but also because of the growing prevalence of overweight, obesity



and type 2 diabetes in Mexico [Villalpando, *et al.*, 2010].

#### 4.4.3 Mexico City and non-heart-healthy behaviours

##### 4.4.3.1 Diet, nutrition and physical activity

Within Mexico City both under- and over-nutrition among children can be witnessed. In 2006, 10 per cent of Mexican schoolchildren, aged between 5–11 years, had chronic malnutrition, and the prevalence of overweight and obesity was 25 per cent [Flores, *et al.*, 2009]. Research suggests frequent consumption of junk food amongst some children: between 64.8–76.4 per cent of schoolchildren in Mexico City reported eating junk food every day [Romieu, *et al.*, 2009]. Among those aged 5–11 years and living in Mexico City, 28.4 per cent were at risk of over-consuming carbohydrates and 19.9 per cent at risk of excessive intake of fat [Flores, *et al.*, 2009].

Fried food consumption tends to be more common among younger people and among men. However, men and women aged between 35–84 years in Mexico City reported eating fruit and vegetables around four days a week [Kuri-Morales, *et al.*, 2009]. A total 30.4 per cent of adults were at risk of over-consuming carbohydrates, and 11.1 per cent of over-consuming fats in Mexico City in 2006 [Barquera, *et al.*, 2009].

The overall rise in levels of overweight across Mexico has been identified as a public health challenge which must be “... put into the forefront of health and nutrition policy in Mexico” [Neufeld, *et al.*, 2008]. Bonvecchio *et al.* investigated trends of overweight and obesity in Mexican children aged 2–18 years from 1988 to 2006. The highest prevalence of unhealthy weight in school-age children was observed in the Mexico City region [Bonvecchio, *et al.*, 2009]. This is a serious concern given the links between overweight and obesity in childhood with continuing overweight and obesity in adulthood. Bonvecchio *et al.* discuss the importance of understanding the reasons for the onset of overweight and obesity in Mexican children from around the age of 5 years in order to inform and help implement primary-prevention programmes [Bonvecchio, *et al.*, 2009].

There is also evidence of differential trends within different parts of Mexico. For example, one study observed that the annual increase in the prevalence of overweight and obesity in young women living in poverty in Mexico was double that which was reported at a national level in Mexico [Neufeld, *et al.*, 2008]. This highlights the need to understand the impact of specific geographic and socioeconomic circumstances on tendency towards CVD risk factors such as obesity, including differences between urban and rural populations and factors affecting the behaviour of people living in poor and slum areas of megacities.

An additional contributing factor to rising obesity levels in Mexico City could be lack of physical activity. A study in 2005–2006 found that children in the 4<sup>th</sup> and 5<sup>th</sup> grade at school in Mexico City have only one class of physical education (PE) lasting approximately 40 minutes a week [Jennings-Aburto, *et al.*, 2009]; lower than national and international recommendations. During breaks in the school day, physical activity is limited by overcrowding of school play spaces [Jennings-Aburto, *et al.*, 2009]. Children also have few adult role models for physical activity: 71 per cent of men and 82 per cent of women in Mexico City said they did not undertake any recreational physical activity [Kuri-Morales, *et al.*, 2009].

##### 4.4.3.2 Tobacco use

Smoking rates are high in Mexico City; in 2003, 36.5 per cent of men and 14.3 per cent of women in Mexico smoked [WHO, 2004(b)]. Within Mexico City itself, only one in five men aged between 35–84 years had never smoked regularly, and 43 per cent were current smokers [Kuri-Morales, *et al.*, 2009]. For women, approximately three out of five had never smoked, and 19 per cent were current smokers [Kuri-Morales, *et al.*, 2009]. A more recent study of smoking prevalence among men and women aged between 25–64 years shows a slightly lower rate of current smoking among men but a slight increase among women in the capital [Champagne, *et al.*, 2010].

In Mexico, 27 per cent of adolescents aged between 13–15 years smoked [*International Resource Center, 2011*]. There is also evidence that the number of young people smoking is increasing. In 2003–2004, 20.2 per cent of schoolchildren aged 12–15 years in Mexico City smoked [*Valdés-Salgado, et al., 2009*]. By 2006–2007, this had risen to 27.8 per cent [*Valdés-Salgado, et al., 2009*]. Research also suggests that a relatively large proportion of adolescents in Mexico City are susceptible to taking up smoking: 29 per cent of young males and 27.8 per cent of young females (2006–2007 figures) [*Valdés-Salgado, et al., 2009*].

Recently, public policy efforts on tobacco control have led to the successful implementation of Mexico City's 100 per cent smoke-free law. The City law was approved in 2008; industry tactics subsequently disrupted its implementation and led to the passage of a federal law that required designated smoking areas [*Crosbie, Sebríe and Glantz, 2011*]. However, strong advocacy efforts led to the Supreme Court ruling in favour of the City law in 2009, allowing it to overrule the federal law to "protect the fundamental right of health for all citizens" [*Crosbie, Sebríe and Glantz, 2011*]. The success of this advocacy programme could be used as a model for advocacy initiatives to overcome industry tactics in other cities [*Crosbie, Sebríe and Glantz, 2011*].

#### 4.4.4 Conclusion

The evidence from Mexico City shows that children are at considerable risk of developing CVD later in life due to exposure to many of the known risk factors. Rising rates of overweight and obesity, due to a combination of over- and under-nutrition, together with a lack of physical activity and rising rates of tobacco use are storing up serious problems for the future.

Local and national authorities in Mexico City face the challenge of tackling behaviours and exposure to negative risk factors that are likely to increase rates of CVD in the coming years. Changes in the city's environmental, transport, planning and education policies, combined with effective information campaigns to ensure all residents are aware of the risks they face, would help to reduce the risk factors and limit the future increase in CVD rates. Information and education campaigns could also help adults to set a more positive example for younger generations.

### 4.5 Buenos Aires

#### 4.5.1 An introduction

Buenos Aires is situated on the western shore of Argentina, on the south-eastern coast of the South American continent.

In 2010, Buenos Aires was home to an estimated 13.07 million people [*United Nations Department of Economic and Social Affairs, 2009*] just under one-third of the total







population of Argentina [World Bank, 2010]. The UN estimates that Buenos Aires will have in the order of 13.7 million residents by 2025 [United Nations Department of Economic and Social Affairs, 2009]. In 2007, residents were sharing the city's space at a density of 4,950 people for every kilometre squared [City Mayor Statistics, 2007].

In 2005, those aged between 0–19 years accounted for just under a quarter of the megacity's population [Urban Age, n.d.]. The city housing is diverse; across the country as a whole in 2001, the slum to urban population was estimated at 33 per cent, and the slum population was growing at a rate of 2 per cent a year [UN-HABITAT, 2001(a)].

#### 4.5.2 Buenos Aires and cardiovascular disease

Close to one-third of deaths in men and women aged over 20 years (29.8 per cent and 31.8 per cent respectively) in Buenos Aires in 2003 were related to CVD [Diez Roux, et al., 2007]. Nationally, the CVD associated mortality and morbidity amounts to a significant burden, estimated by the WHO as accounting for 6 DALYs lost per 1,000 population for heart disease, with the same figure for DALYs lost to stroke [WHO, 2004(b)]. CVD also causes a significant financial burden, with the cost of hospital admissions for coronary heart disease and stroke totalling over I\$1 billion in 2007 (international dollars, 2007 conversion rate, 1.55 Argentinean peso = 1 I\$) [Rubinstein, et al., 2010]. This is not just a societal burden

but one to individuals, since in 2009 close to 60 per cent of the cost of healthcare in Argentina was from individuals' out of pocket payments [World Bank, 2009].

The CVD morbidity and mortality seen in Buenos Aires does have a marked spatial pattern, with the most disadvantaged parts of the city seeing CVD death rates between 22–36 per cent higher than the most advantaged areas [Diez Roux, et al., 2007]. The implication is that CVD will have a particularly major impact on families living in disadvantaged urban environments, since it is the people living within these poorer areas that are most likely to lack the resources to seek appropriate healthcare. The findings also suggest that children born into disadvantaged environments may be at increased risk of CVD, if strategies to tackle CVD rates are not implemented. Such efforts should therefore consider targeting specific areas to account for the observed relationship between where people live, their socioeconomic status and their physical well-being.

#### 4.5.3 Buenos Aires and non-heart-healthy behaviours

##### 4.5.3.1 Diet, nutrition and physical activity

As described earlier in this report, urbanization has led to a change in dietary patterns, with trends commonly revealing an increased intake of energy-dense food high in saturated fat, sugar and salt [NCD Alliance, 2011(a)] and low in nutritional values. These trends were also observed

in the literature reviewed for Buenos Aires, with research into the eating habits of elementary schoolchildren finding that children from low socioeconomic groups drink around four sweetened beverages a day, but eat only two portions of fruit and vegetables a day [Hirschler, et al., 2009]. Similarly, research based upon information collected from 80 public schools in Buenos Aires and its outskirts found that 5th-grade students consume 16.6 per cent more calories and 19.1 per cent more fat than their recommended daily allowance, but consume 65.3 per cent less fibre than recommended [ILSI Argentina, 2008]. The research also found that 17 per cent of children surveyed consumed an inadequate amount of fruit. On average, the surveyed children consumed cookies, candies, and sweetened beverages more than three times a week [ILSI Argentina, 2008].

In addition, children in Buenos Aires may eat large quantities of meat, since Argentina has the world's highest beef consumption rate in the world, at 68 kilograms per person a year [CNN, 2010]. Argentineans eat about 50 per cent more beef than the average American [Reel, 2006]; beef is a part of every day life, tradition and diet in Argentina. This may contribute to CVD risk, since meat is high in saturated and trans fats, which raise the blood cholesterol level, which may in turn clog up the arteries. Positively, 2011 did see a decline in the average Argentinian's beef consumption by nearly 22 per cent, mainly due to its increasing cost [Garlow, 2011].

In addition to dietary CVD risk, research has also revealed tendencies towards sedentary lifestyles in Buenos Aires, with 11 per cent of children becoming frequently tired when in physical activity classes at school [ILSI Argentina, 2008]. Few children take part in sports after school, with one in five (20 per cent) attending soccer classes, but only one in twenty (5 per cent) practicing other sports [ILSI Argentina, 2008]. During school breaks, nearly half of the children in Buenos Aires (46.3 per cent) remained seated most of the time, with only 25 per cent playing or running most of their break time [ILSI Argentina, 2008]. A separate piece of research revealed that elementary schoolchildren in Buenos Aires in 2007 watched around three hours of television a day [Hirschler, et al., 2009].



As seen in previous chapters, the city's traffic problem may also be encouraging sedentary lifestyles. Historically, the port of Buenos Aires lacked the resources, both economic and political, to build the circular highway systems common to most urban centres; the result was heavy traffic and gridlocked roads [World Port Source, n.d.]. The Metropolitan Railroad constructed in 1979 eased the traffic problems somewhat [World Port Source, n.d.], however it is still common for commuters, including children, to spend a significant amount of time sitting in traffic.

The pattern of drinking sweet drinks, limited amounts of fresh fruit and vegetables intake, and a movement towards sedentary lifestyles is leading to a high proportion of children being overweight in Buenos Aires. A total, 18.5 and 16.1 per cent of elementary schoolchildren (aged 8.9–10.9 years) surveyed by Hirschler et al in 2007 were classified as obese and overweight, respectively [Hirschler, et al., 2009].

The literature reviewed also uncovered research which revealed spatial patterning between risk factors and CVD in Buenos Aires. For example, BMI and obesity are inversely associated with education and income in women (i.e. women with lower-incomes are more likely to have a high BMI and be obese) [Fleischer, et al., 2008]. This is relevant to child heart health, since research also found that maternal overweight is an important predictive variable for children being overweight in Buenos Aires [Hirschler, et al., 2009].

Such patterns may be linked both to the behaviours of residents in urban areas, and limited access to healthcare for those in lower-income groups. This suggests that tackling CVD in Buenos Aires needs to consider wider determinants of health. Given the significant influence of mothers over their children's choices, inferences can also be devised that child heart health strategies should target the behaviour of women as well as children, equipping whole families to be able to eat healthily and make informed choices to avoid sedentary activities.

#### 4.5.3.5 Tobacco use

In an exploration of urban smoking across seven Latin American cities, the second-highest smoking prevalence rate was found in Buenos Aires (38.6 per cent) [Champagne, et al., 2010]. By inference, the smoking rate among young people in the city is likely to be high, since data reveals that just over a quarter (25.8 per cent) of youth across Argentina smoke [Müller and Wehbe, 2008]. They face a high risk of premature death or disease caused by CVD, especially if they make few attempts to quit or maintain abstinence, as commonly seen in Latin America [Champagne, et al., 2010].

Some options to attempt to reduce smoking prevalence (or at least mitigate its growth rate) include smoke-free policies (implemented at sub-national level in Argentina) [Champagne, et al., 2010]. However, such policies face a fight against global marketing campaigns that may be a causative factor in the rise of smoking rates in young people not just in Buenos Aires but in other cities also. Although Argentina signed the WHO FCTC in September 2003 [WHO, 2011(f)], it has not yet ratified the Convention, indicating the importance of tobacco sales to the country's economy and the power of the tobacco industry lobbying efforts.

#### 4.5.4 Conclusion

The above statistics reveal trends related to the behaviour of children living in Buenos Aires and modifiable risk factors for CVD (such as physical activity and overweight and obesity) and overall CVD rates. The literature suggests that not only is CVD a challenge for Buenos Aires now (although the full extent of CVD prevalence today was not captured by the sources reviewed), but that morbidity and mortality caused by CVD will continue to be a public health issue in the future, if the behaviours of the city's children are not tackled.

Programmes are needed to change patterns of smoking and overconsumption of unhealthy food in children now, so that they don't

continue into adulthood. Strategies may need to look at specific areas within the city, especially areas which house disadvantaged communities, to address both the wider determinants of health (such as income and education) and also to help target those areas with the greatest need (proxied by highest CVD mortality rates).

## 4.6 Mumbai

### 4.6.1 An introduction

Mumbai (formerly known as Bombay) is the financial capital of India, located on the west coast on the shores of the Arabian Sea. In 2010, the total population was an estimated 20 million, which is predicted to continue growing and reach more than 25 million by 2025 [United Nations Department of Economic and Social Affairs, 2009]. In 2007, the city was the most densely populated in the world, with 29,650 people per kilometre squared [City Mayor Statistics, 2007]. In 2001, recreational land represented just 4 per cent of the total land area [Urban Age, n.d.] clearly raising the question of whether there is sufficient space to allow physical activity in Mumbai.

A total 55.3 per cent of the city's population are male, and slightly more than one-third (36.3 per cent) are aged 19 years or younger [Urban Age, n.d.]. Across India as a whole in 2001, the slum to urban population was estimated at 55 per cent, and the slum population was growing at 2 per cent a year [UN-HABITAT, 2001(a)].

### 4.6.2 Mumbai and cardiovascular disease

Over the past decades, cardiovascular illness has exploded in India, with the country seeing a rapid rise in the prevalence of coronary heart disease [Ajay and Prabhakaran, 2010]. Between the years 1960–2000 the estimated prevalence of coronary heart disease among those aged over 20 years increased six-fold in urban areas, and two-fold in rural areas [Ajay and Prabhakaran, 2010]. The overall prevalence is estimated to be between 8–10 per cent in urban areas, and 3–4 per cent in rural areas [Ajay and Prabhakaran, 2010]. CVD is predicted to become the main cause of death across India, accounting for 36 per cent of deaths by 2030 [World Bank, 2011]. The increase in CVD (especially coronary heart disease) in India has been described by experts as an "epidemic" [Ajay and Prabhakaran, 2010; Gupta, Prakash and Gupta, 2005]. Overall, heart disease accounted for 20 DALYs lost per 1,000 population in 2003, and stroke 10 DALYs lost per 1,000 population [WHO, 2004(b)].

It has been estimated that between 7–10 per cent of schoolchildren in India suffer from hypertension and 15–16 per cent have high cholesterol levels [Pandey, 2010]. A study of men and women aged 35–69 years in Mumbai showed that on average 20 per cent had a medical history of hypertension, rising to 26 per cent based on measurement of blood pressure [Daniel, et al., 2011].



In terms of numbers, estimates suggest the number of people in India with hypertension will almost double, from 118.2 million in 2000 to 213.5 million by 2025 [World Bank, 2011]. Research suggests that rising trends and burden of hypertension, diabetes and metabolic syndrome are linked to urbanization, as shown by the urban-rural difference in risk factors seen across India [Ajay and Prabhakaran, 2010].

The cost of treatment for CVD will rise considerably in coming years, given the projected increase in the number of people affected. In 2005, it was estimated that if all coronary heart disease patients were on pharmaceutical treatment, the cost would be INR (Indian rupee) 160 billion, or £2.1 billion a year, a figure which doesn't even account for costs outside of drug costs [Gupta, Prakash and Gupta, 2005]. However, appropriate treatment for all is unlikely given the high proportion of out-of-pocket costs for individuals to bear when seeking healthcare in India. In 2004, out-of-pocket payments for hospital treatment for CVD claimed 30 per cent of annual household expenditures [Rao, Bhatnagar and Murphy, 2011]. It is likely that the financial burden of CVD will worst affect the economically vulnerable [Rao, Bhatnagar and Murphy, 2011].

The WHO has estimated that the burden of premature deaths due to heart disease, stroke and diabetes caused a loss of U.S.\$9 billion in national income in 2005 [Ajay and Prabhakaran, 2010]. This could

increase dramatically to a cumulative loss of U.S.\$237 billion between 2005–2015 [Ajay and Prabhakaran, 2010]. It has further been estimated that the expected welfare benefits from a 1 per cent a year reduction in CVD mortality across India from 2000–2030, would lead to a gain equal to about three times the national GDP in 2000 [World Bank, 2011]. This highlights the significant opportunities for economic benefits from CVD prevention in India.

#### 4.6.3 Mumbai and non-heart-healthy behaviours

##### 4.6.3.1 Diet, nutrition and physical activity

Changes in lifestyle, wealth, and the availability of "Western-style" foods have had a dramatic impact on the diets of children in India. A recent survey of schoolchildren showed that more than one-third eat pizza and drink colas, and almost one-quarter eat burgers once or more in a week. The same survey found consistent overconsumption of carbonated drinks by more than 7 times the recommended level [Pandey, 2010]. At the same time, more than two-thirds (68 per cent) of schoolchildren led a sedentary lifestyle [Pandey, 2010].

Street foods, such as aloo tikki, kachori and chole bhature, are very popular in India. They are also almost always fried and therefore high in saturated and trans fats, which may increase cholesterol, placing individuals at greater risk of heart disease. A report in the journal *Nutrition and Food Science* concludes that Indian snacks are very

energy dense (148–603kcal/100g) and trans fat varies from 0.1–19.8g/100g [Agrawal, et al., 2008]. Coupled with inactivity, high consumption of such energy-dense foods can lead to overweight.

Between 1998–2006, across India as a whole, the prevalence of overweight/obesity among women aged 15–49 years increased substantially, from 10.6 to 14.8 per cent [Balarajan and Villamor, 2009]. In urban areas, the prevalence in 2006 was 28.9 per cent compared to 8.6 per cent in rural areas [Balarajan and Villamor, 2009]. In a study of men and women aged 35–69 years old in Mumbai, 46 per cent of the 743 surveyed were classed as obese [Daniel, et al., 2011]. Migration to urban areas in India may be associated with increases in obesity [Ebrahim, et al., 2010], and this drives increases in other risk factors for health.

Mumbai has particularly high rates of obesity in children, with the second highest number of overweight/obese schoolchildren among Indian cities. A recent study found that a total 30.4 per cent of schoolchildren in private schools, and 7.9 per cent in government schools were obese [Pandey, 2010]. Importantly, whilst there are concerns about the rise in obesity, at the same time there remain concerns about under-nutrition in India too [Pednekar, et al., 2008].

##### 4.6.3.2 Tobacco use

In 2003, 34.6 per cent of men and 3.4 per cent of women aged 18 years and over



smoked across India [WHO, 2004(b)]. Among adolescents, 12.9 per cent of those aged 13–15 years reported being current smokers in 2000–2003, and 21.9 per cent were past smokers [Shah, et al., 2008].

Oral smokeless tobacco is the dominant form of tobacco use in India. A major category of commercially manufactured oral smokeless tobacco in India is termed *gutkha*. Over the past decade, the rate of growth of *gutkha* use has overtaken that of smoking forms of tobacco [WHO, 2006], which may impact rates of smoking related CVD.

India has prepared a tobacco action plan and there are regulations in place to: reduce exposure to smoking, prohibit tobacco advertising, prohibit the sale of tobacco to minors, and to regulate the contents of tobacco products that are on sale. Research shows that counter advertising may have a protective effect on young people (both boys and girls aged 13–15 years) in India, although more research is needed to determine which types of counter advertising are most effective in particular groups [Shah, et al., 2008]. Counter advertising may also work as an aid to smoking cessation, suggesting that the use of mass media may be a way to help young people who do smoke to quit.

#### 4.6.4 Conclusion

Rapid urbanization, combined with migration from rural to urban areas, has had a significant impact on the population and lifestyles of people in Mumbai. Children in

particular are subject to new influences, and are exposed to “Western-style” fast food, street food high in saturated fat and salt, tobacco marketing, and other influences which are likely to increase rates of CVD among future generations. Rates of obesity and overweight are rising rapidly in the city (although there is also a serious problem with under-nutrition across India). At the same time, there is little land available for recreation and few children take part in regular physical activity.

All current studies predict a sharp increase in rates of CVD and the costs associated with them. Coordinated action is needed by local and national government to promote the consumption of healthy foods, increase physical activity and reduce or prevent smoking. Otherwise, a significant increase in CVDs is likely in Mumbai in the coming years.

Researchers have argued that given the size of the public health challenge, legislation and regulatory approaches are required [Ajay and Prabhakaran, 2010]. This includes regulation of food production, pricing and labelling; effective enforcement of regulation of tobacco production, sale, and advertising; or regulation to enable physical activity (such as a conducive transport policy which favours urban cycle lanes; walking paths with curbs on private vehicular transport; facilities for leisure time and exercise in community playgrounds; and emphasizing the importance of physical activity in the school curriculum) [Ajay and Prabhakaran, 2010].

## 4.7 Tehran

### 4.7.1 An introduction

Tehran is the capital of the Islamic People’s Republic of Iran. The city is located between the Alborz Mountains to the north and the central desert to the south. There are more than seven million people living in Tehran, equating to approximately one-tenth of Iran’s population as a whole [Central Intelligence Agency, 2011]. With a population lower than 10 million, Tehran does not yet meet the definition of a megacity, but is included in this series to illustrate the challenges faced by rapidly growing cities, as compared to those cities that have already reached megacity status.

Although Tehran is not yet classified as a megacity, in 2007 its population density was 10,550 per square kilometre, positioning it at number 16 within a list of largest cities in the world ranked by population density [City Mayor Statistics, 2007]. Iran’s urban population is 71 per cent of the total [Central Intelligence Agency, 2011]. Across Iran as a whole, the slum to urban population in 2001 was 44 per cent, with the slum population estimated to be growing at 2 per cent per year [UN-HABITAT, 2001(a)].

### 4.7.2 Tehran and cardiovascular disease

In 2002, nearly 82,000 people died from heart disease across Iran, and just under 32,000 people died from stroke [WHO, 2004 (b)]. The burden of disease caused by CVD in terms of DALYs lost was 17 per 1,000 population for heart disease and 8 per 1,000 for stroke [WHO, 2004(b)].

Research has raised questions about the relatively high rates of stroke in the Middle East: a study in Iran’s Mashhad region found a much higher incidence of stroke in younger people than is seen in most western countries [Azarpazhooh, et al., 2010]. Although this research did not focus specifically on Tehran, it suggests that Iran – and Tehran as the largest city – would have a higher incidence of stroke. This once again highlights the importance of local research to understand – and better prevent – the burden of stroke.

Researchers have also found that high blood pressure, a risk factor for CVD, is “common” in Tehran. In a 2009 study, almost a quarter (24 per cent) of children in Tehran, aged 7–11 years, were found to have hypertension [Mohkam, et al., 2011], with researchers concluding that hypertension is a common problem in school-aged children. They recommend the introduction of “precise prevention strategies, which can be instituted at the local and national level, and modification in children’s life style” [Mohkam, et al., 2011].

### 4.7.3 Tehran and non-heart-healthy behaviours

#### 4.7.3.1 Diet, nutrition and physical activity

There has been a substantial overall increase in adult obesity in Tehran since the



beginning of this century. A study measuring obesity prevalence between years 1999–2001 found that almost 16 per cent of men were obese; by 2006–2008, this had risen to 21 per cent [Hosseinpanah, et al., 2009]. For women, the corresponding figures were 31.5 per cent in the first time phase, rising to 38.6 per cent in 2006–2008 [Hosseinpanah, et al., 2009]. The authors discuss how this increase may be attributed to changes in lifestyle and a nutritional shift linked to industrialization and the substitution of high fat, refined carbohydrate and low fibre diets. In addition, it may be due to changes in occupation, transport systems, and both work and leisure activities, leading to lower levels of physical activity [Hosseinpanah, et al., 2009].

The picture is equally worrying for children. In one study, slightly under 5 per cent of girls (aged 3–18 years) in Tehran were classified as obese [Ziaee, et al., 2009]. A separate study completed in 2009 found that 12 per cent of primary schoolchildren (aged 7–11 years) in Tehran were classed as overweight [Mohkam, et al., 2011]. Another study in 2010 showed that more than one in four (28.2 per cent) of schoolchildren aged 6–8 years in Tehran were overweight or obese [Mohammadpour-Ahranjani, 2010]. The first study of the weight of all children at school-entry in Iran and in the Eastern Mediterranean region was published in 2010 and also revealed high rates of overweight children; in 2007, 13.5 per cent of the children were overweight and 3.5 per cent were obese, with the highest prevalence

in Tehran [Ziaoddini, et al., 2010]. Although these studies are not directly comparable to each other, the results of all provide alarming evidence of a high prevalence of overweight and obesity in Iran's capital city.

Anecdotally, we know that Western fast food has become increasingly popular with young people in Tehran, and this is likely to be a contributing factor to the increase in obesity. While there is not yet any evidence of what programmes would work to prevent obesity in the specific cultural environment of the city, it is certain that future interventions need to include educational activities and better provision of physical activity at school, as elsewhere. Effective strategies also need to include cooperation between schools and families and the substantial contribution of the government in providing a supportive environment [Mohammadpour-Ahranjani, 2010]. The need to act is supported by research which found correlations between the severity of obesity in children in Iran and higher prevalence of CVD risk factors including high blood pressure [Hamidi, et al., 2006].

Researchers recommend the introduction of a national strategy that integrates "preventative measures including lifestyle modification, notably dietary change and encouraging physical activity, in the primary healthcare system and routine child healthcare programmes at a population level" [Ziaoddini, et al., 2010]. At the same time, under-nutrition also needs to be tackled,

representing a dual challenge for Iran. The researchers comment that more studies are needed to explore the ethnic and socio-cultural factors contributing to the weight of children, together with a surveillance system and programmes to prevent and control the factors leading to weight disorders in children [Ziaoddini, et al., 2010].

Cultural and social patterns in Iran have a major impact on levels of physical activity among children. For example, 48 per cent of children in Tehran walk to school in the morning and 56 per cent walk home after school [Shokoohi, Hanif and Dali, 2010]. The remainder are driven in cars or buses. The choice of travel is largely influenced by parents' perception of safety in the neighbourhood. Concerns about safety can lead to parents insisting that their children must be driven to school. Increased use of cars and buses to travel to school removes one or two daily opportunities for physical activity for schoolchildren.

There is a lack of systematic data on changes in levels of physical activity in Iran. However, one study for a dissertation (a one-off in-depth study taking years) discusses how factors such as a poor public transport system, investment in education leading to fewer manual occupations, greater access to computers for leisure, and strict governmental regulations regarding dress code (especially for women), create barriers and obstacles to physical activity for children in Tehran [Mohammadpour-Ahranjani, 2010].

The study found that 60 per cent of children in Tehran achieved the recommended level of 60 minutes of physical activity a day; however, the mean time spent undertaking vigorous physical activity was only 24 minutes a day [Mohammadpour-Ahranjani, 2010].

#### 4.7.3.2 Tobacco use

Just over one-third of men in Iran smoked in 2003, and 3.5 per cent of women smoked [WHO, 2004(b)]. In 2007, just over 11 per cent of the Iranian adult population smoked every day (5.6 million smokers; 21.4 per cent of males and 1.4 per cent of females) [Meysamie, et al., 2010]. On average, people started smoking at the age of 20.5 years (24.2 males and 20.4 females) [Meysamie, et al., 2010]. Meysamie et al. note that although the prevalence of tobacco use has not escalated over recent years, the burden is still high and “therefore warrants preventative public health policies” [Meysamie, et al., 2010].

As noted elsewhere in this report, children are likely exposed to second-hand smoke if their parents are smokers. A study conducted by Shiva and Padyab aimed to determine patterns of parental smoking in Tehran, and assess parental awareness regarding smoke exposure of their pre-schoolchildren [Shiva and Padyab, 2008]. The large majority of smokers in Tehran are men, and the study notes that fathers are the sole habitual smokers in most families. It also notes that smoking rates increase with lower education and income status, thus these are identified as risk factors for children’s exposure to second-hand smoke. Parental risk awareness had no apparent impact on smoking behaviour. The research thus concludes that programmes to tackle passive smoking by children need to be sensitive to cultural factors [Shiva and Padyab, 2008].

#### 4.7.4 Conclusion

Based on a survey of adults in 2007, researchers in Iran concluded that there is “a strikingly high prevalence of a number of chronic NCDs and their risk factors among Iranian adults. Urgent preventive interventions should be implemented to combat the growing public health problems in Iran” [Esteghamati, et al., 2009]. They also predicted that prevalence of CVD and other NCDs will rise given the presence of risk factors observed in Iran. They note that risk factor prevalence rates are higher among females and urban residents [Esteghamati, et al., 2009]; therefore it is recommended that attention should be especially focused on women and on people living in cities.

This overview of CVD risks and trends in Tehran illustrates many of the same challenges that we have seen in fully-fledged megacities, particularly the alarming and rising levels of obesity in both adults and children. The case of Tehran also highlights other social and cultural factors, such as expectations for how women should dress and behave, which affect levels of physical



activity. The limited evidence of prevention programmes from Tehran also highlights the urgent need to examine what works best in terms of tackling as well as monitoring risk factors and hence preventing future CVD. In designing and testing prevention programmes, it is essential to take into account local conditions, including cultural and socioeconomic factors. With these factors in mind, as Tehran continues to expand, there is an exceptional opportunity to address these factors and to limit the future increase of CVD.

### 4.8 Nairobi and slum settlements

#### 4.8.1 An introduction

Nairobi is Kenya’s largest city. As one of the most populated cities in Sub-Saharan Africa (SSA), the conditions it faces are similar to those of other African cities. Nairobi is strategically located along the Northern Mombasa-Kampala corridor. From the time of the first census in 1948 to 2007, the population has seen explosive growth, from 120,000 to an estimated 3.5 million inhabitants, the fastest per annum growth rate in Africa [UN-HABITAT, 2008]. The rapid rise in population far outpaced urban planning or development by the government, leading to a proliferation of “informal settlements.” Over a 25 year period (1970–1995) the number of “informal settlements,” also known as slums, grew from 50 to 130, with a population increase from 100,000 to over 1 million [Amnesty International, 2009]. Today, Kenya has among the highest levels of poverty and slum populations in the world,

concentrated primarily in Nairobi. Of the over 3.5 million Nairobi urban dwellers, between 50–70 per cent live in some of the most densely populated slums, or slum-like, areas of the world [World Bank, 1999; Amnesty International, 2009; UN-HABITAT, 2010(b)]. The density of the city population is varied and determined by type of settlement.

According to the 1999 census, the population density of Nairobi was 3,079 people per square kilometre [CBS, 2001]. It is unknown what the population density is today, as census data does not accurately reflect the true population living in slum settlements; however UN-HABITAT and Amnesty International suggest that nearly 2 million people live in these settlements. Slums in Nairobi account for less than 5 per cent of Nairobi’s total residential area, and only 1 per cent of Nairobi’s total land area, which translates to nearly 300,000 people per square kilometre. As slum settlements are not recognized as residential areas, its inhabitants have limited access to many services, including sewage and water systems, waste removal, and property ownership. The scarcity of basic services, health or otherwise, in slum settings, coupled with conditions conducive to health, economic and environmental problems, has made slum dwellers particularly vulnerable to CVD and its risk factors. As a whole, the population of the municipality is intended to continue to grow significantly to between 5–8 million by 2025 [UN-HABITAT, 2010(b)]. Although, by definition Nairobi is not a megacity it will rise to those proportions in



the not too distant future, which will cause the health problems that exist today to further exacerbate if left ignored.

#### 4.8.2 Nairobi and cardiovascular disease

CVD is now the second leading cause of death in SSA, and the first cause of death for those aged over 30 years old. It accounts for 11 per cent of all mortality, a number which is expected to double by 2020 [World Bank, 2006]. The epidemiological shift taking place in conjunction with urbanization, increased exposure to CVD risk factors, and existing health and development challenges, suggest that the future burden of CVD will be significant, specifically among the poorest populations. Of particular concern is the increasing rate of those with hypertension. The prevalence of hypertension among urban dwellers in SSA appears to be particularly high, ranging from 8–25 per cent. Furthermore, as a result of developments in combating communicable diseases and a decrease in childhood mortality, the number of individuals aged over 60 years is predicted to increase from 39 to 80 million by 2025. Thus, both middle-aged and older populations will be at greater risk of CVD. Finally, there is a large body of evidence that links nutrition, over or under, early in life with an increased risk of CVD. The foetal origins of CVD suggest that individuals, who may have faced under-nutrition in the utero, as well as at birth, will be at increased risk of developing CVD when middle-aged. Furthermore, low birth weight, followed by rapid weight gain, can also increase CVD risk later in life [IOM, 2010].

In Kenya specifically, CVD accounts for 12 per cent of all deaths, data on the exact prevalence of CVD within Nairobi however, is currently unknown [WHO, 2011(g)]. National survey data are aggregated at the provincial level, making health indicators for Nairobi city, the same as for Nairobi Province. Yet, the economic and health divide in Nairobi, and within other African cities, is staggering, suggesting the same could be true for CVD. The inequities between Nairobi city dwellers and slum dwellers are found in all health indicators available: the percentage of children fully vaccinated in slums is 44 per cent, while it is 73 per cent for Nairobi province. This trend continues when looking at the mortality rate of those aged less than 5 years old, which is 139 in slums, as opposed to 95 in the province per 1,000 live births. A study conducted from 2008–2009 in Nairobi slums found high prevalence rates of hypertension and diabetes, both risk factors for CVD. The study indicated that 20.2 per cent had hypertension (12.3 per cent prevalence when adjusted for sampling) and 6.1 per cent had diabetes (4.3 per cent when adjusted for sampling). Of concern is that the level of awareness among these populations regarding their diagnosis was 5 per cent for hypertension and 1.9 per cent for diabetes. This indicates that surveys based on self reporting would miss nearly three-quarters of those with hypertension and two-thirds of those with diabetes [Boufford, Vlahov and Person, 2010].

#### 4.8.3 Nairobi and non-heart-healthy behaviours

##### 4.8.3.1 Diet, nutrition, physical activity

Significant challenges are faced by individuals living in SSA in their ability to adopt heart-healthy lifestyles. Specifically, urban sprawl, including the lack of integrated planning, inadequate housing, poor water supply and sanitation – lack of or poor delivery of – basic services such as education, health and electricity, dangerous and congested transport systems, growing insecurity and cultural perceptions, all contribute to an environment with limited choice for nutrition, physical activity and tobacco exposure. Among urban dwellers in the region, intake of fat has increased, while intake of high-fibre has fallen and the prevalence of hypertension is higher than of that in high-income countries [World Bank, 2006].

The SSA region faces the dual burden and challenge of over- and under-nutrition. Insufficient intake of fruit and vegetables is estimated to cause approximately 11 per cent of ischaemic heart disease deaths and approximately 9 per cent of stroke deaths worldwide [WHO, 2009]. Studies indicated that urbanization tends to reduce levels of malnutrition as it provides increased access to food. Yet, it is within these areas that food is more often consumed outside of the home. In some instances, surveys suggest that more than 70 per cent of food consumed by low- and middle-income groups is from street vendors. Furthermore, it is



the poorest segments of the urban population that spend the highest proportions of their budgets on street food [Maxwell, et al., 2000]. This puts the urban poor at even greater risk of food price spikes and raises issues of food security. Although this report does not have the scope to address the issue of food security, with increased urbanization, agriculture will be challenged to meet these increasing demands. The epidemiological transition being witnessed has meant that traditional staples are becoming more expensive, particularly in urban areas. People are becoming increasingly distanced from the source of primary food production as processed foods and beverages become less expensive and more accessible. Low fruit and vegetable intake is a significant contributor to death. Together environmental risks and nutritional risks account for 39 per cent of child deaths. In Africa the percentage of deaths in people aged less than 60 years old caused by overweight- and obesity-related conditions continues to rise [WHO, 2009].

Perceptions of what constitutes “modern” styles, values and dietary habits is also increasingly playing a role in dietary and smoking habits. Recent studies among urban dwellers in some African countries have shown that despite high prevalence of CVD risk factors, societal perceptions of what is considered to be medically overweight is desirable among women. Ideals of what constitutes social status – increased body weight – further amplify the likelihood that the urban poor may make unhealthy decisions regarding health [World Bank, 2006].

#### 4.8.3.2 Tobacco

In the area of tobacco, SSA is a growing and untapped market. As smoking rates decrease in the rest of the world, WHO statistics indicate that SSA is in the first stage of the four stage tobacco epidemic model [Lopez, Collishaw and Piha, 1994; Shafey, Dolwick and Guindon, 2003]. According to this model, in the first stage, prevalence is low and contained mainly among higher socioeconomic groups. Women smoking increases during stage two. However, while prevalence is low, tobacco companies are using perceptions of tobacco and false ideas of its association with wealth and glamour to attract both women and youth earlier [WHO, 2010(d)]. The increased marketing and sponsorship tactics of the tobacco industry in cities makes urban youth particularly vulnerable. Although data is scarce, a survey completed in 2001 indicates that while smoking prevalence among students was 14.8 per cent for the entire country of Kenya, it was 27.3 per cent in Nairobi [Kenyan Ministry of Health, 2001]. The most significant increase has been seen in the uptake of smoking by girls. While anti-tobacco campaigns exist, the WHO suggests that only 56 per cent of students report being taught about the dangers of tobacco use [WHO Africa, 2011].

#### 4.8.4 Access to health

With the specific challenges faced by the SSA region, and slum dwellers, the lack of access to healthcare, and under-resourced healthcare centres, is detrimental

to CVD prevention and control. As the above data indicates, diabetes and hypertension amount to a combined crude prevalence rate of 24 per cent (16.6 after adjustment). Yet, the majority of health efforts are directed at HIV/AIDS prevention, management and care. Despite the increased prevalence of all health conditions and infections, there is no government health facility in the slum settlements. Of the 326 health facilities that serve the slum areas, 82 per cent are clinics that lack the staff, equipment and drugs to address CVD. While these clinics had blood pressure testing machines, most of these clinics lacked the mandate to in fact screen for and treat CVD. Of the 11 centres that are better equipped, only six offered “lifestyle counseling” [Boufford, Vlahov and Person, 2010].

#### 4.8.5 Conclusion

The SSA region faces a dual burden of disease that if not addressed, could have disastrous consequences for development. With rising levels of hypertension among the urban poor, a growing population and inadequate screening, monitoring and treatment, levels of CVD mortality could rise dramatically. A mandate that includes CVD screening, access to healthcare and human personnel will be critical in addressing these expected increases and preventing CVD.







## Chapter Five

# Conclusions and recommendations

### 5.1 Conclusions

At the outset of the development of this report, the World Heart Federation devised a hypothesis that “*the social determinants associated with families – especially those with children – living in urban areas place them at greater risk of heart disease and stroke, compared to those living in rural areas, and this public health problem will worsen over time unless action is taken now*”. Although this research has been unable to prove or refute the hypothesis, this report has presented analysis and evidence from desk-top research which suggests that a relationship between urbanization and children’s cardiovascular health exists. Given the demographic shifts occurring in LMICs, where the majority of the world’s people live, more and more of them in urban areas, this relationship has a potentially strong impact on current and future patterns of CVD.

The information and megacity case studies presented within this report reveal that urbanization can both hinder and encourage heart-healthy lifestyles. For many urban dwellers, heart-healthy options are non-existent, as people are constrained by their physical and economic environments; even those with more freedom from a physicality and economic perspective may be heavily influenced by their social environment, impacted particularly by industry marketing and development via which the consumption of unhealthy food or tobacco becomes intrinsic to city life. However, the information and case studies also optimistically reveal that prevention and intervention strategies to tackle CVD can contribute to a reduction in morbidity and mortality trends, as seen in São Paulo for example.

In collating information from all over the world, this report has been pivotal in understanding the influence of city living on CVD risk. The study assumes four main observations that:

- CVD continues to be the leading cause of death worldwide, and places a massive

socioeconomic burden on individuals and societies, particularly in LMICs.

- Urbanization is continuing to occur rapidly worldwide, particularly in LMICs.
- City living can impose certain limitations on the way in which people live, and restricts their opportunities to be heart healthy.
- Informed action by governments and other stakeholders has been shown to dramatically reduce the level of CVD risk.

In focusing on child heart health, this report has also revealed the urgent necessity of considering children specifically within discussions and policy developments related to both CVD prevention, and indeed, city planning, since they are particularly vulnerable to CVD and its consequences:

- Both congenital and acquired heart disease can take a heavy toll on children, particularly on symptomatic children in LMICs where access to treatment may be difficult: they may face a life-time of ill health and disability, thereby affecting their educational, economic and social life chances.
- Even children who do not have heart disease themselves can be affected by the burden of it: children in families affected by CVD may face food, economic and social insecurity, particularly if the CVD has impacted a parent during their most productive years.

This report therefore concludes that children are not only affected by CVD, but are core to global efforts to prevent and control it, particularly in the context of rapidly urbanizing populations [NCD Alliance, 2011(d)]:

- The behaviour of children now affects the likelihood of a CVD epidemic in future years: there is a lag between people’s behaviours and the occurrence of CVD. Therefore action must be taken now to allow and encourage children to engage in heart-healthy behaviours, in order to reduce the occurrence of risk factors (including tobacco use, overweight and obesity, and

physical inactivity) and therefore future cases of CVD.

- A life-course (whole of life) approach is needed for the prevention of CVD and its risk factors: given that the occurrence of CVD can be determined as early as 1000 days into life, or even during foetal development, it is vital that policies to mitigate the impact of CVD consider early life right through to adulthood and old age.

As demonstrated, the world is becoming increasingly urban. It already contains megacities with more than 10 million inhabitants; most of these cities are in developing countries [WHO, 2008]. As industrialization and urbanization continues to spread globally, the population of these megacities will continue to grow, as will the number of megacities across the world as people continue to migrate from rural to urban areas.

Urbanization itself is a determinant of health. As the WHO aptly explains, “*The urban setting is a lens that magnifies or diminishes other social determinants of health... Urban settings have distinct qualities, resources, and problems; as a place made by people, urban settings can also be modified, enhanced, and transformed*” [WHO, 2008]. The “transformation” part of this quote is crucial; as this research reveals, cities can be places where success in reducing NCDs including CVD can occur. And there is significant potential to impact the current and future heart health of children by linking to best practices in urban policies around health and development.

This research should therefore be considered a wake-up call for governments and stakeholders to take actions to change our urban environments to reduce children’s exposure to CVD risk factors, and hence reduce deaths and limit disease. The research clearly demonstrates an urgent need to:



- Improve the quality of information about CVD risk, to equip people with the knowledge to make informed decisions about their behaviours.
- Improve urban environments to facilitate heart-healthy behaviours.
- Improve access to healthcare, including diagnostic tools and CVD treatments.

The myriad of factors associated with urbanization means that health promotion within urban environments is complex. In order to reduce CVD risk within cities the World Heart Federation recommends that actions under the S.P.A.C.E (Stakeholder collaboration, Planning cities, Access to healthcare, Child-focused dialogue and Evaluation) approach (as described in chapter two of this report) are taken. This approach is not intended to encompass an exhaustive list of actions, and is not based upon scientific research or analysis. However, it is intended to act as a prompt for multiple sectors to consider interventions that could be employed to tackle CVD risk within their cities.

## 5.2. Recommendations

### 5.2.1 Stakeholder collaboration

Children rely upon multiple agents within society for their well-being including family, peers, education systems and religious institutions. Making improvements to children's living conditions (and therefore to their health and well-being) is hence not a role for governments alone but for the whole of society: all government sectors, the private sector and civil society.

### Recommendations:

- Convene a working group to focus specifically on CVD risk in cities (including government representatives, NGOs, religious leaders, educators and civil society amongst others). Ensure that the focus includes an emphasis on children, by promoting and enabling children's heart-healthy habits.
- Adopt a "health in all policies" approach, whereby the potential benefits and hindrances to children's cardiovascular health are considered within all policy developments or community projects. Where barriers to heart health are foreseen, consider ways to mitigate these; where benefits are established, consider actions that can be taken to expand these.
- Ensure inter-sectoral coordination of healthcare provision. This refers to one part or parts of the healthcare sector working with parts of another sector to take action on a health issue or improve health outcomes in a way that is more effective, efficient and sustainable than could be achieved by the health sector alone [WHO, 1997]. For example, tobacco use could be controlled via an inter-sectoral approach: governments could work with healthcare professionals to establish health warnings on cigarette packaging; healthcare professionals and pharmaceutical industry could work together to provide smoking-cessation services; and educators and NGOs could establish educational campaigns to ensure young people are aware of the dangers of tobacco use.

- Establish a management group – although actions to tackle CVD should be collaborative and involve multiple stakeholders, establishing a management team will help to coordinate input from all stakeholders involved and ensure that activity is driven forward. Ensure alignment with healthcare professionals, policy makers, those working at relevant not-for-profit or specialist organizations and other stakeholders working in wider NCDs, including type 2 diabetes; since many of the risk factors are the same, resource use can be maximized by pooling expertise.
- Lead by example [WHO and UN-HABITAT, 2010]: all stakeholders involved in the development of cities should endeavour to lead as heart-healthy lives as possible.

### 5.2.2 Planning Cities

As cities increase in size, it is vital that infrastructures are developed to facilitate heart-healthy behaviour. Policy makers from all sectors involved in urban planning need to work together with medical professionals to develop policies and strategies to allow and increase the likelihood of individuals adopting healthy behaviours and veering away from unhealthy ones. The natural, built, social, and economic environment should be considered. The development of policies should include methodology for their implementation.

### Recommendations:

- Ensure that the disadvantages of crowded living conditions are balanced with the



development of leisure facilities to encourage active lifestyles. For example, for every housing block for 200 people or more, ensure the installation of a gym (exercise room).

- Develop city infrastructures with active lifestyles in mind for example, road planning should ensure wider pavements and regular crossing opportunities as standard, to enable children to walk to school safely. Engage a traffic management advisor where possible, to consider traffic control and “car free” pedestrian areas.
- Use zoning and land use regulations to create parks and green spaces within megacities. Ensure the maintenance of such parks and green spaces to allow communities a safe-space for exercise. Policies should ensure that green spaces are smoke-free.
- Incorporate health impact assessments into the consideration of alternative planning choices and policies [WHO and UN-HABITAT, 2010].
- Encourage healthier city living via campaigns to encourage healthy activity. For example, once a year the *London SkyRide* facilitates the closure of roads for children to cycle across the city of London safely, under the Mayor’s ambition to get 1 million people cycling.
- Where urbanization brings with it an increase in establishments offering fast-food or tobacco access, mitigate their negative impacts on health via laws restricting advertising and trading.

### 5.2.3 Access to healthcare

Cities have significant advantages over rural areas for access to healthcare; however this report has shown that inequities in access can exist prominently within urban areas, with those most at risk of ill-health sometimes least able to access health services. Since a significant proportion of CVD death and illness can be prevented with appropriate treatment, investment in paediatric diagnostic tools, quality improvements in medical centres, and increased access to affordable, quality essential medicines will greatly improve CVD outcomes. Policies need to ensure that the health needs of all members of society are accounted for regardless of economic income.

#### Recommendations:

- Policy makers and medical professionals urgently need to work together to develop policies and strategies to improve medical care for patients of low socioeconomic status and minority groups, and develop methodology for their implementation [World Heart Federation, 2010]. This should include the incorporation of coverage for paediatric cardiac care within health insurance schemes [NCD Alliance, 2011(d)].
- Policy makers and medical professionals need to improve the provision of paediatric cardiac healthcare, via increased training of specialist healthcare professionals and via investments in hospitals with specialist healthcare facilities and equipment.

- The cardiac workforce must be appropriately supported, via monetary investments and via task-shifting (the passing of basic healthcare to lower-skilled team members) to ensure that specialist members of staff are able to best utilize their specialist skills.
- Governments and specialist agencies need to work together to develop or significantly improve paediatric cardiac screening, diagnosis and treatment systems so that more children will be screened, diagnosed and treated for CHD and RHD at an earlier age [NCD Alliance, 2011(d)].
- Policy makers and health system leads should promote health resources to ensure adequate treatment reaches minority groups and those of low income, particularly antibiotic treatment for RHD.
- Governments should strengthen their countries’ systems for prevention of RF, so that children are less likely to suffer from RHD and resulting heart valve damage [NCD Alliance, 2011(d)].

### 5.2.4 Child-focused dialogue

The prior conclusions show that children are pivotal to the future of CVD trends. However, children are different to adults by nature of their physiology and also their dependency on adults for healthcare. It is therefore crucial that policy discussions around CVD focus on children specifically, and that child health isn’t wrapped into decisions for adult healthcare.



### Recommendations:

- Governments and wider stakeholders should ensure that the rights of the child are upheld via regular consultation of the United Nations *Convention on the Rights of the Child*.
- Governments and wider stakeholders should ensure a clear understanding of the problems and barriers specific to paediatric health, and the potential solutions, via regular liaisons with medical experts and specialist child-health organizations.
- Establish a working group to represent the rights of children during all health-policy discussions.
- Ensure that the wants of children are represented, via regular communication with children and young adults. Where their wants are unusual, foster innovation; children are our future, and new and creative ways to deliver services should be considered for their age-group.
- Increase and accelerate health research on child CVD and risk factors. Consider regular cross-city surveys of their needs, and consider solutions to these. This report should act as a stepping stone for further research on the topic of urbanization and child heart health.
- Consider a whole-of-life approach to all interventions to improve CVD health within urban environments. A continuum of cardiac care should be provided from maternal health, through infancy, childhood, adolescence and into adulthood.

### 5.2.5 Evaluation

Reducing CVD risk involves understanding the burden; knowing which city dwellers face which barriers to heart-healthy living and why. Once this is understood, actions can be taken to break down the barriers and facilitate healthier lifestyles.

#### Recommendations:

- Conduct an evaluation to assess the health needs of dwellers within a given city. Policy makers may wish to use a tool such as The Community Health Environment Scan Survey (CHESS) (as referred to in chapter two). The WHO recommends tools such as Urban HEART (a user-friendly guide to assess and respond to urban health inequities) [WHO, 2010(c)] and UrbanInfo (a software programme designed to help store, analyse and present urban indicators) [UN-HABITAT, 2010].
- Use the information to establish priority interventions specific to groups of children most in need. Ensure that priority interventions are feasible and sustainable [WHO and UN-HABITAT, 2010]. Set clear timelines and targets for the intervention to be measured against.
- Where suitable, proven interventions should be prioritized. Local governments should look to other cities and in-country successes for leadership; national governments should draw on successes and expertise from other countries and adapt initiatives for suitability to their own country.
- Governments, researchers, medical

professionals and specialist agencies should work together on budgeting to ensure appropriate investment into child cardiac services.

- Interventions, once established, must be regularly reviewed and measured in terms of the impact on communities. Adaptations should be made to maximize impact and therefore return of investment. If an intervention is not working, resources should be reallocated.

### 5.3 Summary

Tobacco use, poor diet, lack of physical activity and excessive alcohol consumption all contribute to high incidences of CVD around the world; prevention of these risk factors could sharply reduce the morbidity and mortalities that occur every year. Banning tobacco adverts, limiting levels of sugar, saturated and trans fat and salt in foods, encouraging physical activity and increasing taxation of alcohol and tobacco, coupled with actions to improve healthcare access, will help to limit the devastating impact of CVD. This publication reveals that multi-stakeholder action is needed to address the growing global burden; encouragingly, where intervention strategies have been implemented, reductions in CVD risk factors and disease burden have been seen. However, with a lack of finite resources, innovative thinking is needed, and interventions must be based on an evaluation of community need, and reviewed regularly to assess return on investment.



## References

- Action on Smoking and Health (ASH), 1999. *WHO report: Smoke endangers 1/2 world's kids*. Washington: Action on Smoking and Health. [online]. Available at: <<http://no-smoking.org/june99/06-16-99-6.html>> [Accessed January 2012].
- Action on Smoking and Health (ASH), 2011. *Tobacco facts: Plain packaging of tobacco products*. [pdf] Australia: Action on Smoking and Health. Available at: <<http://www.ashaust.org.au/pdfs/TFacMPfed1105PlainPack.pdf>> [Accessed January 2012].
- Adamo, S.B. et al., 2010. A spatial analysis of urbanization, migration and cardiovascular disease risk factors in China: A regional comparison to inform future health care policy for cardiovascular disease prevention. Presented at *Population Association of America Annual Meeting*, Dallas, Texas, USA, 15–17 April 2010. Available at: <<http://paa2010.princeton.edu/download.aspx?submissionId=101594>> [Accessed January 2012].
- Agrawal, A. et al., 2008. High trans fatty acid content in common Indian fast foods. *Nutrition & Food Science*, 38(6), pp.564–569.
- Ajay, V.S. and Prabhakaran, D., 2010. Coronary heart disease in Indians: Implications of the INTERHEART study. *The Indian Journal of Medical Research*, 132(5), pp.561–566.
- Amnesty International, 2009. *Kenya - the unseen majority: Nairobi's two-million slum dwellers*. [pdf] London: Amnesty International. Available at: <<http://www.amnesty.org/en/library/asset/AFR32/005/2009/en/3b6e7351-8e08-4b61-9d7b-6e3b86eb0057/afr320052009eng.pdf>> [Accessed January 2012].
- André, C. et al., 2006. Progressive decline in stroke mortality in Brazil from 1980 to 1982, 1990 to 1992, and 2000 to 2002. *Stroke*, 37, pp.2784–2789.
- Araújo, D.V. et al., 2010. Analysis of the Cost-Effectiveness of Thrombolysis with Alteplase in Stroke. *Arquivos Brasileiros de Cardiologia*, 95(1), pp.12–20.
- Azarpazhooh, M.R. et al., 2010. Excessive incidence of stroke in Iran: evidence from the Mashhad stroke incidence study (MSIS), a population-based study of stroke in the Middle East. *Stroke*, 41, e.3–10.
- Balarajan, Y. and Villamor, E., 2009. Nationally Representative Surveys Show Recent Increases in the Prevalence of Overweight and Obesity among Women of Reproductive Age in Bangladesh, Nepal, and India. *The Journal of Nutrition*, 139, pp.2139–2144.
- Barquera, S. et al., 2009. Energy and nutrient consumption in adults: Analysis of the Mexican National Health and Nutrition Survey 2006. *Salud Pública de México*, 51(Supplement 4), pp.562–573.
- Bezerra, I. and Sichieri, R., 2010. Characteristics and spending on out-of-home eating in Brazil. *Revista de Saúde Pública*, 44(2).
- Biener, L. and Siegel, M., 2000. Tobacco marketing and adolescent smoking: More support for a causal inference. *American Journal of Public Health*, 90(3), pp.407–411.
- Bike Shanghai, 2008. *Shanghai Launches Bike-Sharing Program*. Original source: Agence France-Presse. [online] Available at: <[http://www.bikeshanghai.com/shanghai/Bike\\_Sharing.html](http://www.bikeshanghai.com/shanghai/Bike_Sharing.html)> [Accessed January 2012].
- Bonvecchio, A. et al., 2009. Overweight and obesity trends in Mexican children 2 to 18 years of age from 1988 to 2006. *Salud Pública de México*, 51(Supplement 4), pp.586–594.
- Boufford, J.I., Vlahov, D. and Person, C., 2010. *Urban Health: Global Perspectives*. Jossey-Bass.
- Cancer Research UK. *Smoking and cancer: Children and smoking*. [online] London: Cancer Research UK. Available at: <<http://info.cancerresearchuk.org/healthyliving/smokingandtobacco/childrenandsmoking/>> [Accessed January 2012].

Carapetis, J.R. McDonald, M. and Wilson, N.J., 2005. Acute rheumatic fever. *The Lancet*, 366, pp.155–168.

Centers for Disease Control and Prevention, 2011. *Overweight and Obesity, Data and Statistics: Obesity rates among all children in the United States*. [online] Atlanta: Centers for Disease Control and Prevention, Available at: <<http://www.cdc.gov/obesity/childhood/data.html>> [Accessed January 2012].

Central Bureau of Statistics (CBS), 2001. *Socio-economic Profile of the population, Kenya 1999 Population and Housing Census Volume 2*. Nairobi: Kenyan Ministry of Planning and National Development.

Central Intelligence Agency, 2011. *The World Fact Book*. [online] Washington: Central Intelligence Agency. Available at: <<https://www.cia.gov/library/publications/the-world-factbook>> [Accessed January 2012].

Champagne, B.M. et al., 2010. Tobacco smoking in seven Latin American cities: the CARMELA study. *Tobacco Control*, 19, pp.457–462.

(a) Children's Food Campaign, 2011. *Keep Kids Cooking!* [online] Available at: <[http://www.sustainweb.org/childrensfoodcampaign/keep\\_kids\\_cooking/](http://www.sustainweb.org/childrensfoodcampaign/keep_kids_cooking/)> [Accessed January 2012].

(b) Children's Food Campaign, 2011. *Ten top chefs tell Government to keep kids cooking*. [online] Available at: <[http://www.sustainweb.org/news/mar11\\_chefs\\_tell\\_gov\\_keep\\_kids\\_cooking/](http://www.sustainweb.org/news/mar11_chefs_tell_gov_keep_kids_cooking/)> [Accessed January 2012].

(c) Children's Food Campaign, 2011. *Twenty top health organisations tell Government to keep kids cooking*. [online] Available at: <[http://www.sustainweb.org/news/health\\_orgs\\_cooking\\_letter\\_apr11/](http://www.sustainweb.org/news/health_orgs_cooking_letter_apr11/)> [Accessed January 2012].

China Tobacco. Available at: <<http://www.china-tobacco.com/>> [Accessed January 2012].

Cities Alliance, 2009. *Social Housing in São Paulo: Challenges and New Management Tools*. [pdf] Washington: Cities Alliance. Available at: <[http://www.citiesalliance.org/ca/sites/citiesalliance.org/files/CA\\_Docs/resources/upgrading/Social%20Housing%20in%20Sao%20Paulo/English/Social\\_Housing\\_SaoPaulo\\_Eng\\_fulltxt.pdf](http://www.citiesalliance.org/ca/sites/citiesalliance.org/files/CA_Docs/resources/upgrading/Social%20Housing%20in%20Sao%20Paulo/English/Social_Housing_SaoPaulo_Eng_fulltxt.pdf)> [Accessed January 2012].

City Mayor Statistics, 2007. *The largest cities in the world by land area, population and density*. [online] Available at: <<http://www.citymayors.com/statistics/largest-cities-density-125.html>> [Accessed January 2012].

CNN, 2010. Group calls for beef boycott in Argentina. *CNN*, [online] 15 February. Available at: <[http://articles.cnn.com/2010-02-15/world/argentina.beef.boycott\\_1\\_beef-consumption-consumer-group-boycott?\\_s=PM:WORLD](http://articles.cnn.com/2010-02-15/world/argentina.beef.boycott_1_beef-consumption-consumer-group-boycott?_s=PM:WORLD)> [Accessed January 2012].

Commission on Social Determinants of Health, 2008. *Closing the gap in a generation: Health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health*. [pdf] Geneva: World Health Organization. Available at: <[http://www.searo.who.int/LinkFiles/SDH\\_SDH\\_FinalReport.pdf](http://www.searo.who.int/LinkFiles/SDH_SDH_FinalReport.pdf)> [Accessed January 2012].

Crosbie, E., Sebrie, M. and Glantz, S., 2011. Strong advocacy led to successful implementation of smokefree Mexico City. *Tobacco Control*, 20(1), pp.64–72.

Daily Mail, 2010. Still puffing away: Six weeks on, the smoking toddler has not quit - and his parents say he may never kick the habit. *Daily Mail*. [online] (last updated 9:37 AM on 2 July 2010). Available at: <<http://www.dailymail.co.uk/news/article-1291421/Smoking-toddler-Indonesian-boy-Aldi-Suganda-quit-cigarettes.html>> [Accessed January 2012].

Daniel, C.R. et al., 2011. A cross-sectional investigation of regional patterns of diet and cardio-metabolic risk in India. *Nutrition Journal*, 10, p.12.

De Leeuw, E., 2001. Global and local (glocal) health: The WHO healthy cities programme. *Global Change & Human Health*, 2(1), pp.34–45.

De Padua Mansur, A. et al., 2009. Epidemiologic Transition in Mortality Rate from Circulatory Diseases in Brazil. *Arquivos Brasileiros de Cardiologia*, 93(5), pp.468–472.

Diez Roux, A.V. et al., 2007. Intraurban variations in adult mortality in a large Latin American city. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 84(3), pp.319–333.

Do Pilar Carneiro Bertolace, M. et al., 2008. Association between obesity and asthma among teenagers. *Sao Paulo Medical Journal*, 126(5), pp.285–287.

Downie, A., 2008. The world's worst traffic jams. *TIME*, [online] 21 April. Available at: <<http://www.time.com/time/world/article/0,8599,1733872,00.html>> [Accessed January 2012].

Ebrahim, S. et al., 2010. The effect of rural-to-urban migration on obesity and diabetes in India: A cross-sectional study. *PLoS Medicine*, 7(4), e1000268.

Esteghamati, A. et al., 2009. Third national surveillance of risk factors of non-communicable diseases (SuRFNCD-2007) in Iran: methods and results on prevalence of diabetes, hypertension, obesity, central obesity, and dyslipidemia. *BMC Public Health*, 9, p.167.

Farias, N. et al., 2009. Cardiovascular mortality by gender and age range in the city of Sao Paulo, Brazil: 1996 to 1998, and 2003 to 2005. *Arquivos Brasileiros de Cardiologia*, 93(5), pp.461–467.

Fleischer, N.L. et al., 2008. Social Patterning of Chronic Disease Risk Factors in a Latin American City. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 85(6).

- Flight global, 2009. *Global airline accident analysis for 2008*. [online] Accessed at: <<http://www.flightglobal.com/articles/2009/01/19/321124/global-airline-accident-analysis-for-2008.html>> [Accessed January 2012].
- Flores, M. et al., 2009. Energy and nutrient intake among Mexican school-aged children, Mexican National Health and Nutrition Survey 2006. *Salud Pública de México*, 51(Supplement 4), pp.540–550.
- Garlow, S., 2011. *Argentines eat less beef*. *Global Post*. [online] Available at: <<http://www.globalpost.com/dispatches/globalpost-blogs/que-pasa/argentina-beef-consumption>> [Accessed January 2012].
- Gaziano, T.A., 2007. Reducing the growing burden of cardiovascular disease in the developing world. *Health Affairs*, 26(1), pp.13–24.
- Global Advocacy for Physical Activity (GAPA) and the Advocacy Council of the International Society for Physical Activity and Health (ISPAH), 2011. *Non communicable disease prevention: Investments that work for physical activity*. [pdf] Available at: <<http://www.globalpa.org.uk/pdf/investments-work.pdf>> [Accessed January 2012].
- Global Youth Tobacco Survey Collaborative Group, 2002. Tobacco use among youth: A cross country comparison. *Tobacco Control*, 11, pp.252–270. Available at: <<http://tobaccocontrol.bmj.com/content/11/3/252.full>> [Accessed January 2012].
- Goebel, J. *Media and violence study. PPU information*. [online] London: PPU. Available at: <[http://www.ppu.org.uk/education/media\\_violence\\_survey-c.html](http://www.ppu.org.uk/education/media_violence_survey-c.html)> [Accessed January 2012].
- Google Images. Result for: 'children smoking'. Available at: <[http://www.google.co.uk/search?hl=en&sugexp=gsis.i18n%3Dtrue&cp=19&gs\\_id=2&xhr=t&q=%E2%80%98children+smoking%E2%80%99&gs\\_sm=&gs\\_upl=&bav=on.2.or.r\\_gc.r\\_pw.&biw=1280&bih=839&wrapid=t&ip=131550987180400&um=1&ie=UTF-8&tbm=isch&source=og&sa=N&tab=wj](http://www.google.co.uk/search?hl=en&sugexp=gsis.i18n%3Dtrue&cp=19&gs_id=2&xhr=t&q=%E2%80%98children+smoking%E2%80%99&gs_sm=&gs_upl=&bav=on.2.or.r_gc.r_pw.&biw=1280&bih=839&wrapid=t&ip=131550987180400&um=1&ie=UTF-8&tbm=isch&source=og&sa=N&tab=wj)> [Accessed January 2012].
- Gortmaker, S.L. et al., 2011. Changing the future of obesity: Science, policy and action. *The Lancet*. 378, pp.838–847.
- Guilherme, L., Ramasawmy, R. and Kalil, J., 2007. Rheumatic fever and rheumatic heart disease: genetics and pathogenesis. *Scandinavian Journal of Immunology*, 66, pp.199–207.
- Gupta, R., Prakash, H. and Gupta, R.R., 2005. Economic issues in coronary heart disease prevention in India. *Journal of Human Hypertension*, 19, pp.655–657.
- Hakeem, R., Thomas, J. and Badruddin, S.H., 2001. Urbanization and coronary heart disease risk factors in South Asian children. *Journal of Pakistan Medical Association*, 51, pp.22–28.
- Hamidi, A. et al., 2006. Obesity and associated cardiovascular risk factors in Iranian children: A cross-sectional study. *Pediatrics International*, 48, pp.566–571.
- (a) Health Related Information Dissemination Amongst Youth (HRIDAY). *MYTRI: India's first successful school based tobacco use prevention model*. [Factsheet] Print version.
- (b) Health Related Information Dissemination Amongst Youth (HRIDAY), 2006. *About us*. [online] Available at: <<http://www.hriday-shan.org/hriday/about.html>> [Accessed January 2012].
- Hirschler, V. et al., 2009. Overweight and lifestyle behaviors of low socioeconomic elementary school children in Buenos Aires. *BMC Pediatrics*, 9, p.17.
- Ho, M.G. et al., 2010. Smoking among rural and urban young women in China. *Tobacco Control*, 19, pp.13-18
- Holt, E., 2011. Hungary to introduce broad range of fat taxes. *The Lancet*, 378, p.755.
- Hosseinpanah, F. et al., 2009. Trends of obesity and abdominal obesity in Tehranian adults: a cohort study. *BMC Public Health*, 9, p.426.
- Hou, X. et al., 2008. Risk factors for overweight and obesity, and changes in body mass index of Chinese adults in Shanghai. *BMC Public Health*, 8, p.389.
- IOM (Institute of Medicine), 2010. *Promoting cardiovascular health in the developing world: A critical challenge to achieve global health*. [pdf] Washington: The National Academies Press. Available at: <<http://www.iom.edu/Reports/2010/Promoting-Cardiovascular-Health-in-the-Developing-World-A-Critical-Challenge-to-Achieve-Global-Health.aspx>> [Accessed January 2012].
- Instituto Nacional de Estadística y Geografía, 2010. *En México somos 112 millones 322 mil 357 habitantes at 12 de Junio de 2010*. [online] Available at: <<http://www.inegi.org.mx/inegi/contenidos/espanol/prensa/comunicados/rpcpyv10.asp>> [Accessed January 2012].
- ILSI (International Life Sciences Institute) Argentina, 2008. *Prevalence and associated factors of childhood obesity, Buenos Aires, Argentina*. [Presentation] Committee on Nutrition, Obesity and Physical Activity. Available at <[http://www.ilsa.org.ar/contactos/ILSI\\_Argentina\\_Comite\\_Nutricion\\_Obesidad\\_Actividad\\_Fisica/Dra\\_IrinaKovalskys.pdf](http://www.ilsa.org.ar/contactos/ILSI_Argentina_Comite_Nutricion_Obesidad_Actividad_Fisica/Dra_IrinaKovalskys.pdf)> [Accessed January 2012].
- International Resource Center, 2011. *Mexico: overview*. [online] Available at: <[http://tobaccofreecenter.org/resources\\_country/mexico](http://tobaccofreecenter.org/resources_country/mexico)> [Accessed January 2012].
- Jaime, P.C. et al., 2009. Factors associated with fruit and vegetable consumption in Brazil, 2006. *Revista de Saúde Pública*, 43(Supplement 2).
- Jennings-Aburto, N. et al., 2009. Physical activity during the school day in public primary schools in Mexico City. *Salud Pública de México*, 51(2), pp.141–147.



- Juárez-Rojas, J.G. et al., 2008. Blood pressure and associated cardiovascular risk factors in adolescents of Mexico City. *Archivos de Cardiología de Mexico*, 78(4), pp.384–391.
- Jurj, A.L. et al., 2007. Patterns and correlates of physical activity: a cross-sectional study in urban Chinese women. *BMC Public Health*, 7, p.213.
- Kenyan Ministry of Health, 2001. *Report on the results of the global youth tobacco survey in Kenya*. [pdf] Geneva: World Health Organization. Available at: <<http://www.afro.who.int/en/clusters-a-programmes/hpr/health-risk-factors/tobacco/tobacco-country-profiles.html>> [Accessed February 2012]
- Kuri-Morales, P et al., 2009. The prevalence of chronic diseases and major disease risk factors at different ages among 150 000 men and women living in Mexico City: Cross-sectional analyses of a prospective study. *BMC Public Health*, 9, p.9.
- Lee, S. et al., 2008. Prevalence of obesity and correlations with lifestyle and dietary factors in Chinese men. *Obesity*, 16(6), pp.1440–1447.
- Leitão Filho, F.S. et al., 2009. Random sample survey on the prevalence of smoking in the major cities of Brazil. *Jornal Brasileiro de Pneumologia*, 35(12), pp.1204–1211.
- Levine, R.V., Lynch, K. and Miyake, K., 1989. The type A city: coronary heart disease and the pace of life. *Journal of Behavioral Medicine*, 12(6), pp.509–524.
- Live United, 2011. *First lady's first mission in Chicago*. [online] Available at: <<http://www.uw-mc.org/2011/first-ladys-first-mission-in-chicago>> [Accessed January 2012].
- Lobstein, T., Baur, L. and Uauy, R., 2004. IASO International Obesity TaskForce. Obesity in children and young people: A crisis in public health. *Obesity Reviews*, 5(Supplement 1), pp.4–85.
- London School of Economics and Deutsche Bank's Alfred Herrhausen Society, 2007. *The Endless City*. Phaidon Press Ltd.
- Lopez, A.D., Collishaw, N.E. and Piha, T., 1994. A descriptive model of the cigarette epidemic in developed countries. *Tobacco Control*, 3, pp.242–247.
- Marcopito, L.F. et al., 2007. Exposition to smoking and attitudes: Comparison between inquiries applied to adult population in São Paulo city, 1987 and 2002. *Arquivos Brasileiros de Cardiologia*, 88(5), pp.301–308.
- Marijon, E. et al., 2007. Prevalence of rheumatic heart disease detected by echocardiographic screening. *New England Journal of Medicine*, 357(5), pp.470–476.
- Marijon, E. et al., 2008. Echocardiographic screening for rheumatic heart disease. *Bulletin of the World Health Organization*, 86(2), p.84. Available at: <<http://www.who.int/bulletin/volumes/86/2/07-046680.pdf>> [Accessed January 2012].
- Maxwell, D. et al., 2000. *Urban livelihoods, and good and nutrition security in Greater Accra Ghana*. [pdf] Washington: International Food Policy Research Institute. Available at: <<http://www.ifpri.org/sites/default/files/publications/rr112.pdf>> [Accessed February 2012].
- McCordle, B.W., 2007. Cardiovascular consequences of paediatric obesity: Will there be a future epidemic of premature cardiovascular disease? *Paediatric Child Health*, 12(3), pp.175–177.
- Meysamie, A. et al., 2010. Pattern of tobacco use among the Iranian adult population: results of the national survey of risk factors of non-communicable diseases (SuRFNCD-2007). *Tobacco Control*, 19, pp.125–128.
- Mohkam, M. et al., 2011. Blood Pressure Screening in School-aged Children in Tehran. *Iranian Journal of Kidney Diseases*, 5(4), pp.229–233.
- Mohammadpour-Ahranjani, B., 2010. The epidemiology and prevention of childhood obesity in Tehran, Iran. A thesis submitted to the University of Birmingham for the degree of Doctor of Philosophy. Available at: <<http://etheses.bham.ac.uk/1583/1/MohammadourAhranjani11PhD.pdf>> [Accessed January 2012].
- Moran, A. et al., 2008. The future impact of population growth and aging on coronary heart disease in China: Projections from the coronary heart disease policy model-China. *BMC Public Health*, 8, p.394.
- Müller, F. and Wehbe, L., 2008. Smoking and smoking cessation in Latin America: a review of the current situation and available treatments. *International Journal of Chronic Obstructive Pulmonary Disease*, 3(2), pp.285–293.
- (a) NCD Alliance, 2011. *Non-communicable diseases: A Priority for Women's Health and Development*. [pdf] Geneva: The NCD Alliance. Available at: <[http://www.who.int/pmnch/topics/maternal/2011\\_women\\_ncd\\_report.pdf.pdf](http://www.who.int/pmnch/topics/maternal/2011_women_ncd_report.pdf.pdf)> [Accessed January 2012].
- (b) NCD Alliance, 2011. *NCD Alliance Briefing Paper on Children and NCDs*. [pdf] Geneva: The NCD Alliance. Available at: <[http://www.world-heart-federation.org/fileadmin/user\\_upload/documents/Advocacy/NCDAlliance\\_2011/NCD\\_Alliance\\_Briefing\\_Paper\\_Children\\_and\\_NCDs.pdf](http://www.world-heart-federation.org/fileadmin/user_upload/documents/Advocacy/NCDAlliance_2011/NCD_Alliance_Briefing_Paper_Children_and_NCDs.pdf)> [Accessed January 2012].
- (c) NCD Alliance, 2011. *NCD Alliance briefing paper: NCDs, tobacco control and the FCTC*. [pdf] Geneva: The NCD Alliance. Available at: <[http://roswellitc.files.wordpress.com/2011/09/ncds\\_tobacco\\_brief\\_june11.pdf](http://roswellitc.files.wordpress.com/2011/09/ncds_tobacco_brief_june11.pdf)> [Accessed January 2012].
- (d) NCD Alliance, 2011. *A focus on Children and Non-Communicable Diseases (NCDs)*. [pdf] Geneva: The NCD Alliance. Available at: <[http://www.world-heart-federation.org/fileadmin/user\\_upload/documents/Advocacy/NCDAlliance\\_2011/20110627\\_A\\_Focus\\_on\\_Children\\_and\\_NCDs.pdf](http://www.world-heart-federation.org/fileadmin/user_upload/documents/Advocacy/NCDAlliance_2011/20110627_A_Focus_on_Children_and_NCDs.pdf)> [Accessed January 2012].

- Neufeld, L.M. et al., 2008. Overweight and Obesity Doubled Over a 6-year Period in Young Women Living in Poverty in Mexico. *Obesity*, 16, pp.714–717.
- Office of the United Nations High Commissioner for Human Rights, 1990. *Convention on the Rights of the Child*. Available at: <<http://www2.ohchr.org/english/law/crc.htm>> [Accessed January 2012].
- Pandey, V., 2010. Mumbai Number 2 on Child Obesity List: Study. *Daily News & Analysis (DNA)*, [online] (13 November). Available at: <[http://www.dnaindia.com/mumbai/report\\_mumbai-number-two-on-child-obesity-list-study\\_1465897](http://www.dnaindia.com/mumbai/report_mumbai-number-two-on-child-obesity-list-study_1465897)> [Accessed January 2012].
- Panjwani, C. and Haigh, C., 2011. *Soft drinks, hard sell: How soft drinks companies target children and their parents*. [pdf] London: Children's Food Campaign. Available at: <[http://www.sustainweb.org/resources/files/reports/SoftDrinksHardSell\\_lowres.pdf](http://www.sustainweb.org/resources/files/reports/SoftDrinksHardSell_lowres.pdf)> [Accessed January 2012].
- Pednekar, M.S. et al., 2008. Association of body mass index with all-cause and cause-specific mortality: findings from a prospective cohort study in Mumbai (Bombay), India. *International Journal of Epidemiology*, 37, pp.524–535.
- Qian, J. et al., 2010. Smoking and smoking cessation in China, 1993–2003 - Trends in smoking and quitting in China from 1993 to 2003: National Health Service survey data. *Bulletin of the World Health Organization*, 88(10), pp.769–776. Available at: <<http://www.who.int/bulletin/volumes/88/10/09-064709/en/index.html>> [Accessed January 2012].
- QUIT. *1 in every 2 smokers?* [online] Available at: <[http://www.quit.ie/en/1\\_in\\_every\\_2\\_smokers](http://www.quit.ie/en/1_in_every_2_smokers)> [Accessed January 2012].
- Rao, K.D., Bhatnagar, A. and Murphy, A., 2011. Socio-economic inequalities in the financing of cardiovascular & diabetes inpatient treatment in India. *Indian Journal of Medical Research*, 133, pp.57–63.
- Reel, M., 2006. In Argentina they've got a beef. *Washington Post*, [online] 20 March. Available at: <<http://www.washingtonpost.com/wp-dyn/content/article/2006/03/19/AR2006031900996.html>> [Accessed January 2012].
- Ribeiro Figueiredo, I.C., Jaime, P.C. and Monteiro, C.A., 2008. Factors associated with fruit and vegetable intake among adults of the city of São Paulo, Southeastern Brazil. *Revista de Saúde Pública*, 42(5).
- Roger, V.L. et al., 2011. Heart disease and stroke statistics - 2011 update: A report from the American Heart Association. Published on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*, 123, e18–e209. Originally published online December 15, 2010.
- Romieu, I. et al., 2009. Dietary intake, lung function and airway inflammation in Mexico City school children exposed to air pollutants. *Respiratory Research*, 10, p.122.
- Ru, W., 2009. Heart Disease: China's No. 1 Killer. *China Daily*, [online] 21 April. Available at: <[http://www.chinadaily.com.cn/life/2009-04/21/content\\_7698500.htm](http://www.chinadaily.com.cn/life/2009-04/21/content_7698500.htm)> [Accessed January 2012].
- Rubinstein, A. et al., 2010. Estimation of the burden of cardiovascular disease attributable to modifiable risk factors and cost-effectiveness analysis of preventative interventions to reduce this burden in Argentina. *BMC Public Health*, 10, p.627
- Sallis, J.F. and Glanz, K., 2006. The role of built environments in physical activity, eating, and obesity in childhood. *The Future of Children*, 16(1), pp.89–108.
- Sanchez, Z.M. et al., 2010. Adolescent gender differences in the determinants of tobacco smoking: A cross sectional survey among high school students in São Paulo. *BMC Public Health*, 10, p.748.
- Schneiderman, M.A. and Levin, D.L., 1972. Trends in lung cancer: Mortality, incidence, diagnosis, treatment, smoking, and urbanization. *Cancer*, 30(5), pp.1320–1325.
- Shafey, O., Dolwick, S. and Guindon, G.E (eds), 2003. *Tobacco Control Country Profiles 2003*, American Cancer Society, Atlanta, GA.
- Shah, P.B. et al., 2008. Tobacco advertisements and youth smoking status in India: The relationship between tobacco advertisements and smoking status of youth in India. *Asian Pacific Journal of Cancer Prevention*, (9), pp.637–642.
- Shiva, F. and Padyab, M., 2008. Smoking practices and risk awareness in parents regarding passive smoke exposure of their pre-school children: A cross-sectional study in Tehran. *Indian Journal of Medical Science*, 62(6), pp.228–235.
- Shokoohi, R., Hanif, N.R. and Dali, M.M., 2011. Children walking to and from school in Tehran: associations with neighbourhood safety, parental concerns and children's perceptions. *Asian Journal of Environment-Behaviour Studies*, 2(4).
- Silva, D.A.S. et al., 2010. Comparison between the growth of Brazilian children and adolescents and the reference growth charts: Data from a Brazilian project. *Jornal de Pediatria*, 86(2), pp.115–120.
- Steyn, K. et al., 1997. Urbanization and the risk for chronic diseases of lifestyle in the black population of the Cape Peninsula, South Africa. *Journal of Cardiovascular Risk*, 4, pp.135–142.
- Stuckler, D., Basu, S. and McKee, M., 2011. Commentary: UN high level meeting on non-communicable diseases: an opportunity for whom? *British Medical Journal*, 343, d5336.
- Sustainable Cities Net, 2007. *Sustainable city – Bogota, Colombia*. [online] Melbourne: Sustainable Cities Net. Available at: <<http://www.sustainablecitiesnet.com/uncategorized/sustainable-city-bogota-colombia/>> [Accessed January 2012].

- Tanha, T. et al., 2011. Lack of physical activity in young children is related to higher composite risk factor score for cardiovascular disease. *Acta Paediatrica*, 100(5), pp.717–721.
- Trading Economics, 2012. *Population density (people per sq. km) in China*. [online] New York: Trading Economics. Available at: <<http://www.tradingeconomics.com/china/population-density-people-per-sq-km-wb-data.html>> [Accessed January 2012].
- UNICEF, 2011. *Convention on the Rights of the Child: The human rights framework*. [online] New York: UNICEF. Available at: <[http://www.unicef.org/crc/index\\_framework.html](http://www.unicef.org/crc/index_framework.html)> [Accessed January 2012].
- (a) UN-HABITAT, 2001. *Information by country. Statistical estimates from 2001*. [online] Nairobi: UN-HABITAT. Available at: <<http://www.unhabitat.org/categories.asp?catid=2>> [Accessed January 2012].
- (b) UN-HABITAT, 2001. *Countries: China - Statistical overview. Statistical estimates from 2001*. [online] Beijing: UN-HABITAT. Available at: <<http://www.unhabitat.org/categories.asp?catid=252>> [Accessed January 2012].
- UN-HABITAT, 2008. *The state of African cities 2008: a framework for addressing urban challenges in Africa*. Nairobi: UN-HABITAT.
- (a) UN-HABITAT, 2010. *Database: UrbanInfo v2.0*. [online] Nairobi: UN-HABITAT. Available at: <<http://www.devinform.info/urbaninfo/>> [Accessed January 2012].
- (b) UN-HABITAT, 2010. *State of the World's Cities 2010/2011: Bridging the Urban Divide*. [online] Nairobi: UN-HABITAT. Available at: <<http://www.unhabitat.org/content.asp?cid=8051&catid=7&typeid=46>> [Accessed January 2012].
- United Nations, 1948. *The Universal Declaration of Human Rights*. [online] New York: United Nations. Available at: <<http://www.un.org/en/documents/udhr/>> [Accessed January 2012].
- United Nations, 2010. *UN Special No. 695*. [online] New York: United Nations. Available at: <<http://www.unspecial.org/UNS695/t51.html>> [Accessed January 2012].
- United Nations, Department of Economic and Social Affairs, Population Division., 2006. *World Urbanization Prospects: The 2005 Revision*. [pdf] New York: United Nations. Available at: <[http://www.un.org/esa/population/publications/WUP2005/2005WUP\\_FS7.pdf](http://www.un.org/esa/population/publications/WUP2005/2005WUP_FS7.pdf)> [Accessed January 2012].
- United Nations Department of Economic and Social Affairs, 2009. *World Urbanization prospects: The 2009 revision*. [online] New York: United Nations. Available at: <<http://esa.un.org/unpd/wup/index.htm>> [Accessed January 2012].
- United Nations Department of Economic and Social Affairs, 2011. *World population to reach 10 billion by 2100 if fertility in all countries converges to replacement level*. [Press release], 3rd May 2011. Available at: <[http://esa.un.org/unpd/wpp/Other-Information/Press\\_Release\\_WPP2010.pdf](http://esa.un.org/unpd/wpp/Other-Information/Press_Release_WPP2010.pdf)> [Accessed January 2012].
- Urban Age. *City Profiles*. [online] Available at: <<http://www.urban-age.net/publications/cityProfiles/>> [Accessed January 2012].
- Valdés-Salgado, R. et al., 2009. Susceptibility to Smoking among Adolescents and Its Implications for Mexico's Tobacco Control Programs. Analysis of the Global Youth Tobacco Survey 2003–2004 and 2006–2007. *International Journal of Environmental Research and Public Health*, 6, pp.1254–1267.
- Van Abeelen, A.F.M. et al., 2011. Cardiovascular consequences of famine in the young. *European Heart Journal* [epub ahead of print].
- Villalpando, S. et al., 2010. Trends for type 2 diabetes and other cardiovascular risk factors in Mexico from 1993–2006. *Salud Pública de México*, 52(Supplement 1), pp.72–79.
- Vorster, H.H., 2002. The emergence of cardiovascular disease during urbanization of Africans. *Public Health Nutrition*, 5(1A), pp.239–243.
- Wang, G., Shao, B. and Hou, Z., 2008. Children's PA and PF in China's Metropolitan City, Shanghai. [Presentation].
- Wei, J.W. et al., 2010. Variations and Determinants of Hospital Costs for Acute Stroke in China. *PLoS ONE*, 5(9), e13041.
- Wong, F. et al., 2011. Community Health Environment Scan Survey (CHESS): A novel tool that captures the impact of the built environment on lifestyle factors. *Global Health Action*, 4, p.5276.
- Wood, S., 2005. Cardiovascular disease in Africa: Unique challenges and opportunities. *Heart Wire at theheart.org*. [online] Available at: <<http://www.theheart.org/article/614439.do>> [Accessed January 2012].
- World Bank, 1999. *World Development Report 1999-2000*. [pdf] Geneva: World Bank. Available at: <<http://web.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTWDRS/0,,contentMDK:22295143~pagePK:478093~piPK:477627~theSitePK:477624,00.html>> [Accessed February 2012].
- World Bank, 2006. *Disease and Mortality in Sub-Saharan Africa*. [pdf] Washington: The World Bank. Available at: <<http://www.dcp2.org/file/66/Disease%20and%20Mortality%20in%20SSA.pdf>> [Accessed January 2012].
- World Bank, 2011. *Capitalizing on the demographic transition: Tackling non-communicable diseases in South Asia*. Washington: The World Bank.
- World Bank, 2009. *Indicators: Out of pocket healthcare expenditure (% of private expenditure on health)*. [online] Washington: The World Bank. Available at: <<http://data.worldbank.org/indicator/SH.XPD.OOPC.ZS/countries>> [Accessed January 2012].

World Bank, 2010. *Indicators: Population total. 2010*. [online] Washington: The World Bank. Available at: <<http://data.worldbank.org/indicator/SP.POP.TOTL>> [Accessed January 2012].

World Health Organization, 1997. *Intersectoral action for health: A cornerstone for health-for-all in the twenty-first century. Report of the International Conference*. [pdf] Geneva: World Health Organization. Available at: <[http://whqlibdoc.who.int/hq/1997/WHO\\_PPE\\_PAC\\_97.6.pdf](http://whqlibdoc.who.int/hq/1997/WHO_PPE_PAC_97.6.pdf)> [Accessed January 2012].

World Health Organization, 2003. *Tobacco control country profiles*. [pdf] Geneva: World Health Organization. Available at: <[http://www.who.int/tobacco/global\\_data/country\\_profiles/Introduction.pdf](http://www.who.int/tobacco/global_data/country_profiles/Introduction.pdf)> [Accessed January 2012].

(a) World Health Organization, 2004. *The atlas of heart disease and stroke: The global burden of coronary heart disease*. [pdf] Geneva: World Health Organization. Available at: <[http://www.who.int/cardiovascular\\_diseases/en/cvd\\_atlas\\_13\\_coronaryHD.pdf](http://www.who.int/cardiovascular_diseases/en/cvd_atlas_13_coronaryHD.pdf)> [Accessed January 2012].

(b) World Health Organization, 2004. *The atlas of heart disease and stroke. World Data Tables*. [pdf] Geneva: World Health Organization. Available at: <[http://www.who.int/cardiovascular\\_diseases/en/cvd\\_atlas\\_29\\_world\\_data\\_table.pdf](http://www.who.int/cardiovascular_diseases/en/cvd_atlas_29_world_data_table.pdf)> [Accessed January 2012].

World Health Organization, 2006. *Tobacco: Deadly in any form or disguise*. [pdf] Geneva: World Health Organization. Available at: <[http://www.who.int/tobacco/communications/events/wntd/2006/Tfi\\_Rapport.pdf](http://www.who.int/tobacco/communications/events/wntd/2006/Tfi_Rapport.pdf)> [Accessed January 2012].

World Health Organization, 2008. *Our cities, our health, our future: Acting on social determinants for health equity in urban settings*. [pdf] Japan: WHO Kobe Centre. Available at: <[http://www.who.int/social\\_determinants/resources/knus\\_final\\_report\\_052008.pdf](http://www.who.int/social_determinants/resources/knus_final_report_052008.pdf)> [Accessed January 2012].

World Health Organization, 2009. *Global health risks: Mortality and burden of disease attributable to selected major risks*. [pdf] Geneva: World Health Organization. Available at: <[http://www.who.int/healthinfo/global\\_burden\\_disease/GlobalHealthRisks\\_report\\_full.pdf](http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf)> [Accessed January 2012].

World Health Organization, 2010. Trends in smoking and quitting in China from 1993 to 2003: National Health Service Survey data. *Bulletin of the World Health Organization*, 88, pp.769–776. Available at <<http://www.who.int/bulletin/volumes/88/10/09-064709/en/index.html>> [Accessed January 2012].

(a) World Health Organization. *Child growth standards: The WHO Child Growth Standards*. [online] Geneva: World Health Organization. Available at: <<http://www.who.int/childgrowth/standards/en/>> [Accessed January 2012].

(b) World Health Organization. *Child growth standards: The WHO multicentre growth reference study (MGRS)*. [online] Geneva: World Health Organization. Available at: <<http://www.who.int/childgrowth/mgrs/en/>> [Accessed January 2012].

(a) World Health Organization, 2010. *World Health Day 2010: 1000 cities, 1000 lives – urban health matters toolkit for event organizers*. [pdf] Geneva: World Health Organization. Available at: <[http://www.who.int/world-health-day/2010/WHDtoolkit2010\\_en\\_full.pdf](http://www.who.int/world-health-day/2010/WHDtoolkit2010_en_full.pdf)> [Accessed January 2012].

(b) World Health Organization, 2010. Urbanization and Health. *Bulletin of the World Health Organization*, 88, pp.245–246. Available at: <<http://www.who.int/bulletin/volumes/88/4/10-010410/en/index.html>> [Accessed January 2012].

(c) World Health Organization, 2010. *Urban Health Equity Assessment and Response Tool (Urban HEART)*. [online] Geneva: World Health Organization. Available at: <<http://www.who.or.jp/urbanheart.html>> [Accessed January 2012].

(d) World Health Organization, 2010. *Gender, Women and the Tobacco Epidemic*. [pdf] Geneva: World Health Organization. Available at: <[http://whqlibdoc.who.int/publications/2010/9789241599511\\_eng.pdf](http://whqlibdoc.who.int/publications/2010/9789241599511_eng.pdf)> [Accessed February 2012]

(a) World Health Organization, 2011. *Global strategy on diet, physical activity and health: Childhood overweight and obesity*. [online] Geneva: World Health Organization. Available at: <<http://www.who.int/dietphysicalactivity/childhood/en/>> [Accessed January 2012].

(b) World Health Organization, 2011. *Global strategy on diet, physical activity and health - physical activity and young people*. [online] Geneva: World Health Organization. Available at: <[http://www.who.int/dietphysicalactivity/factsheet\\_young\\_people/en/index.html](http://www.who.int/dietphysicalactivity/factsheet_young_people/en/index.html)> [Accessed January 2012].

(c) World Health Organization, 2011. *Factsheet No. 311 - Obesity and overweight*. [online] Geneva: World Health Organization. Available at: <<http://www.who.int/mediacentre/factsheets/fs311/en/index.html>> [Accessed January 2012].

(d) World Health Organization, 2011. *Factsheet No. 317 - Cardiovascular Diseases*. [online] Geneva: World Health Organization. Available at: <<http://www.who.int/mediacentre/factsheets/fs317/en/index.html>> [Accessed January 2012].

(e) World Health Organization, 2011. *Fact sheet No. 339 - Tobacco*. [online] Geneva: World Health Organization. Available at: <<http://www.who.int/mediacentre/factsheets/fs339/en/index.html>> [Accessed January 2012].

(f) World Health Organization, 2011. *Parties to the WHO Framework Convention on Tobacco Control*. [online] Geneva: World Health Organization. Available at: <[http://www.who.int/fctc/signatories\\_parties/en/index.html](http://www.who.int/fctc/signatories_parties/en/index.html)> [Accessed January 2012].

(g) World Health Organization, 2011. *Noncommunicable diseases country profiles 2011*. [online] Geneva: World Health Organization. Available at: <[http://www.who.int/nmh/publications/ncd\\_profiles2011/en/](http://www.who.int/nmh/publications/ncd_profiles2011/en/)> [Accessed January 2012].

- World Health Organization Africa, 2011. *WHO African Region Ministerial Consultation on Noncommunicable Diseases: Background Document*. [online] Geneva: World Health Organization. Available at: <<http://www.afro.who.int/en/clusters-a-programmes/dpc/cluster/events/brazzaville-ministerial-consultation-on-ncds-april-2011.html>> [Accessed January 2012].
- World Health Organization Europe, 2006. *Promoting physical activity and active living in urban environments*. [pdf] Geneva: World Health Organization. Available at: <[http://www.euro.who.int/\\_data/assets/pdf\\_file/0009/98424/E89498.pdf](http://www.euro.who.int/_data/assets/pdf_file/0009/98424/E89498.pdf)> [Accessed January 2012].
- World Health Organization Framework Convention on Tobacco Control (FCTC), 2011. *To save lives*. [pdf] Geneva: World Health Organization. Available at: <[http://whqlibdoc.who.int/hq/2011/WHO\\_NMH\\_TFI\\_11.1\\_eng.pdf](http://whqlibdoc.who.int/hq/2011/WHO_NMH_TFI_11.1_eng.pdf)> [Accessed January 2012].
- World Health Organization and UNHABITAT, 2010. *Hidden Cities: Unmasking and overcoming health inequities in urban settings*. [pdf] Geneva: World Health Organization. Available at: <[http://www.hiddencities.org/downloads/WHO\\_UN-HABITAT\\_Hidden\\_Cities\\_Web.pdf](http://www.hiddencities.org/downloads/WHO_UN-HABITAT_Hidden_Cities_Web.pdf)> [Accessed January 2012].
- World Heart Federation, 2010. *State of the Heart: Cardiovascular disease report*. [pdf] Geneva: World Heart Federation. Available at: <<http://www.world-heart-federation.org/?id=5537>> [Accessed January 2012].
- (a) World Heart Federation, 2011. *Factsheet: physical activity*. [online] Geneva: World Heart Federation. Available at: <<http://www.world-heart-federation.org/press/fact-sheets/physical-activity/>> [Accessed January 2012].
- (b) World Heart Federation, 2011. *Physical Activity: vital to global health*. [pdf] Geneva: World Heart Federation. Available at: <[http://www.world-heart-federation.org/fileadmin/user\\_upload/children/documents/factsheets/Factsheet\\_Physical\\_activity.pdf](http://www.world-heart-federation.org/fileadmin/user_upload/children/documents/factsheets/Factsheet_Physical_activity.pdf)> [Accessed January 2012].
- (c) World Heart Federation, 2011. *Global dietary changes threaten health*. [pdf] Geneva: World Heart Federation. Available at: <[http://www.world-heart-federation.org/fileadmin/user\\_upload/children/documents/factsheets/Factsheet\\_Unhealthy\\_diet.pdf](http://www.world-heart-federation.org/fileadmin/user_upload/children/documents/factsheets/Factsheet_Unhealthy_diet.pdf)> [Accessed January 2012].
- (d) World Heart Federation, 2011. *Eat for Goals!* [online] Geneva: World Heart Federation. Available at: <<http://www.world-heart-federation.org/what-we-do/awareness/children-youth/eat-for-goals/>> [Accessed January 2012].
- (e) World Heart Federation, 2011. *Landmark in public health: Australian House of Representative passes legislation*. [online] Geneva: World Heart Federation. Available at: <<http://www.world-heart-federation.org/press/news/detail/article/landmark-in-public-health-australian-house-of-representative-passes-legislation/>> [Accessed January 2012].
- (f) World Heart Federation, 2011. *Briefing on the political declaration on NCD prevention and control*. [pdf] Geneva: World Heart Federation. Available at: <[http://www.world-heart-federation.org/fileadmin/user\\_upload/documents/members-only/Global\\_Health\\_Agenda/UN\\_Health\\_Summit\\_on\\_NCDs/CVD\\_AnalysisPDF.pdf](http://www.world-heart-federation.org/fileadmin/user_upload/documents/members-only/Global_Health_Agenda/UN_Health_Summit_on_NCDs/CVD_AnalysisPDF.pdf)> [Accessed January 2012].
- World Lung Foundation. *Tobacco facts*. [online] New York: World Lung Foundation. Available at: <<http://www.1500aday.org/>> [Accessed January 2012].
- World Port Source. *Port of Buenos Aires: Port detail*. [online] San Jose: World Port Source. Available at: <[http://www.worldportsource.com/ports/ARG\\_Port\\_of\\_Buenos\\_Aires\\_47.php](http://www.worldportsource.com/ports/ARG_Port_of_Buenos_Aires_47.php)> [Accessed January 2012].
- Wu, Y. et al., 2008. Prevalence, Awareness, Treatment, and Control of Hypertension in China: Data from the China National Nutrition and Health Survey 2002. *Circulation*, 118, pp.2679–2686.
- Xiao, J.J. and Chen, Y.H., 2010. Prevalence of cardiovascular diseases in China. *Frontiers of Medicine in China*, 4(1), pp.16–20.
- Xue-jun, Q. and Huan-zhong, S., 2007. Major causes of death during the past 25 years in China. *Chinese Medical Journal*, 120(24), pp.2317–2320.
- YouTube search. Result for: 'children smoking'. Available at: <[http://www.youtube.com/results?search\\_query=children+smoking&aq=f](http://www.youtube.com/results?search_query=children+smoking&aq=f)> [Accessed January 2012].
- Zanchetta, L.M. et al., 2010. Physical inactivity and associated factors in adults, São Paulo, Brazil. *Revista Brasileira de Epidemiologia*, 13(3), pp.1–13.
- Zanetta, R.L., Nobre, M.R.C. and Lancarotte, I., 2008. Bringing up students in the Healthy Lifestyle Multiplier Students program, São Paulo, Brazil. *Preventing Chronic Disease*, 5(3). Available at: <[http://www.cdc.gov/pcd/issues/2008/jul/07\\_0125.htm](http://www.cdc.gov/pcd/issues/2008/jul/07_0125.htm)> [Accessed January 2012].
- Ziaee, A. et al., 2009. Correlation of Obesity and Cardiovascular Diseases Risk Factors in Girls: Tehran Lipid and Glucose Study (TLGS). *International Journal of Endocrinology & Metabolism*, 1, pp.35–40.
- Ziaodini, H. et al., 2010. First nationwide survey of prevalence of weight disorders in Iranian children at school entry. *World Journal of Paediatrics*, 6(3), pp.223–227.



# Notes

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

## **Acronyms**

BMI – body mass index  
CDC – Centers for Disease Control and Prevention  
CHD – congenital heart disease  
CHESS – Community Health Environment Scan Survey  
CSDH – Commission on Social Determinants of Health  
CVD – cardiovascular disease  
DALYs – disability adjusted life years  
GYTS – Global Youth Tobacco Survey  
HLM – high-level meeting  
IOM – Institute of Medicine  
LMICs – low- and middle-income countries  
MDGs – Millennium Development Goals  
NCDs – non-communicable diseases  
PAHO – Pan American Health Organization  
RHD – rheumatic heart disease  
RF – rheumatic fever  
UN – United Nations  
UNESCO – United Nations Educational, Scientific and Cultural Organization  
WHO – World Health Organization

# Contact details

Additional information about the World Heart Federation is available on our website:

[www.worldheart.org](http://www.worldheart.org)

**World Heart Federation**  
PO Box 155  
7, rue des Battoirs  
1211 Geneva 4  
Switzerland

**Tel: +41 22 807 03 20**

**Fax: +41 22 807 03 39**

**Email: [communications@worldheart.org](mailto:communications@worldheart.org)**

