

SDGS:

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SECTION 2

PLAN CITIES FOR PEOPLE

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KEY MESSAGES

Despite significant global progress, lack of access to safe and sustainable water and sanitation continues to pose an urgent challenge for cities.

•

Cities can be designed and managed in ways that enable healthier behaviour and achieve better health outcomes.

•

Urban transport can be transformed to be healthier, safer and more sustainable.

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Targeted housing interventions, greater use of clean energy and improved affordability can help tackle the global challenge of healthy and sustainable urban housing.

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Poor safety and urban violence come at a significant cost to the health of urban residents and the societies where they live.

INTRODUCTION

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As the populations of cities around the world have surged in recent decades, this demographic change has challenged cities and their leaders to adjust to the new reality of ever-growing urban populations. Their cities would have to grow in order to accommodate more people – either with denser housing and workspaces or by stretching the boundaries of cities. Cities need to plan for these growing populations to live their lives and contribute to the city. Doing so would entail planning for residential areas and transportation to get people to and from work and other daily needs. It requires planning for water provision, energy and other basic services provision such as education, health and safety.

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Many cities simply grew too quickly, outpacing their capacity to cope with planning and resources. They are often challenged by the proliferation of informal settlements, substandard housing, inaccessible basic needs and undrinkable water, among many other challenges for urban inhabitants. There has been large-scale development of urban slums, where hundreds of millions still live. Twice as many people are projected to live under these conditions by 2050, unless there is fundamental change in the way cities absorb growing populations. The effects of living under these conditions on residents' health are powerful. As discussed earlier in this report, people living under these conditions often have significantly worse health outcomes, sometimes even worse than their rural counterparts who have no access to the benefits of the city at all.

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In many other places, while cities have managed to keep pace, too often the focus has prioritized economic vitality, and not the people themselves. They present familiar scenes of urban sprawl, traffic-clogged streets and polluted air. Even in the most prosperous cities, neighbourhoods are deprived of green spaces. Many are burdened with longer commute times or inaccessible or unusable mass transportation, among other forms of intra-city inequality in planning and resources. Residents of such cities or neighbourhoods may struggle with

NCDs, the result of one or more environmental factors such as exposure to pollution or insufficient physical activity.

The ways that cities are planned can profoundly affect the ability of their residents to live long, healthy and productive lives. There is no reason why these effects should be negative. Planning for commerce and planning for people are not mutually exclusive parts of a zero sum game. Cities can be planned for both. People can be enabled to move about the city affordably and safely. They can be enabled to be physically active and to access the things they need. There is nothing inevitable about unsafe drinking-water, even in the fastest growing cities. Practical standards, policies and programmes can enable people to live in safer, healthier homes. Cities can be safer.

Cities can be planned for people and there are great opportunities to do so. There are practical solutions to fix the features of cities that have already been built. Furthermore, since half of all people who will live in cities by 2050 do not live there yet, there is an opportunity, with currently available evidence, to plan healthier cities for these future residents.

Section 2 investigates in more detail the evidence on how people's lives and health are affected by the physical characteristics of the cities they live in. It examines the ways that these characteristics are inequitable in cities. The very fact that the distribution of healthy environments is inequitable clearly indicates that healthier living environments are indeed attainable. This section discusses practical solutions that can be deployed for people living in cities now, and which can also inform planning for future city residents. It focuses on four of the most important aspects of urban planning that have direct implications for people's health and the quality of urban life: water and sanitation management; spatial planning and land use; transport; and housing, including energy-related issues, and safety.

CHAPTER 6 — PROVIDE SAFE WATER AND SANITATION FOR ALL

KEY MESSAGE • Despite significant global progress, lack of access to safe and sustainable water and sanitation continues to pose an urgent challenge for cities.

Access to water and sanitation is a human right, as explicitly recognized by the United Nations General Assembly in July 2010 (192). It acknowledged that clean drinking-water and sanitation are essential to the realization of all human rights. Water and sanitation is also one of the most significant urban services related to health outcomes, poverty alleviation and sustainable development. Thus, urban management must ensure equitable provision of safe, clean, accessible and affordable drinking-water and sanitation, with provisions to accommodate urban expansion and population growth.

Rapid population growth especially puts an enormous strain on the sanitation and solid waste management capacities of cities, more so in the developing world where such infrastructure is already weak or stretched. Inadequacies in urban environmental health infrastructure and services increase the transmission of diseases acquired through contact with contaminated water, soil and waste (see the chapter on communicable diseases in Section 1), and can have broader, long-term impacts on people's health and well-being.

RENEWED AGENDA ON WATER AND SANITATION FROM THE MILLENNIUM DEVELOPMENT GOALS (MDGS) TO THE SDGS

The world achieved the MDG target of halving the proportion of people without access to improved sources of water in 2010, five years ahead of schedule. Between 1990 and 2015, 2.6 billion people gained access to improved drinking-water sources. In the same time, 2.1 billion people gained access to improved sanitation (193).

Despite progress, 2.4 billion people are still using unimproved sanitation facilities. A further 1.9 billion people are estimated to be using either an unimproved water source or an improved source that has faecal contamination (194). Continued lack of access to clean and safe water and sanitation puts people at risk of a wide range of diseases such as dysentery, cholera, typhoid, schistosomiasis, trachoma and intestinal worms (195,196). These are major contributors to ill-health and preventable mortality, which likely held back progress on other related global goals, such as on maternal and child health, nutrition and education.

Although the number of deaths attributable to inadequate water, sanitation and hygiene was halved between 1990 and 2012, 502 000 diarrhoea deaths were still estimated to be caused by unsafe drinking-water, 280 000 by inadequate sanitation and 297 000 by inadequate personal hygiene. In total, there were an estimated 842 000 diarrhoea deaths caused by this cluster of risks globally in 2012 (197). And these are likely to be underestimates, in part because the global burden of disease estimates do not take into consideration the possibility of exposure to drinking-water that is contaminated at the source (194).

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Even when diarrhoeal diseases are not fatal, frequent diarrhoea in early childhood can contribute to malnutrition and potential long-term consequences for child development (19).

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The safe management of human excrement and effective removal and treatment of solid waste are also an integral part of the sanitation service chain as one of the most vital urban environmental services. These services are often focused on downtown and higher-income areas, while poor people, especially in unplanned areas, have to rely on onsite systems. The management of faecal sludge from these facilities is typically unregulated and in the informal sector, as it may be officially regarded as a temporary solution (198). In areas where waste is not collected frequently, the incidence of diarrhoea can be twice as high and acute respiratory infections six times higher than in areas where collection is frequent (199).

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Clearly, water and sanitation is an unfinished MDG agenda goal, which is why it is prominently placed among the new SDGs for 2016–2030.

WATER AND SANITATION A PARTICULARLY URGENT PROBLEM IN CITIES

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The lack of access to safe water and sanitation is a problem for both rural and urban areas. Although it is generally the case that these services are more developed in urban areas, it is often a particularly pressing problem in cities due to rapid urbanization that outpaces cities' coping ability, the size and fluctuation of demand for the services due to migration, and the huge pockets of poor and un-served populations.

INFRA
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The density of cities also increases the potential population health impact of exposure. In crowded urban environments, pollution created by any single individual has the potential to reach many others, placing all residents at risk from poor sanitation and not just disadvantaged communities. One manifestation of this is the effect of poor sanitation on child stunting (a result of chronic malnutrition strongly associated with frequent diarrhoea), which is much stronger in urban than in rural areas. An analysis of data from a multicountry study showed that eliminating open defecation thus has a much greater positive effect on child height in urban areas than in rural areas (200).

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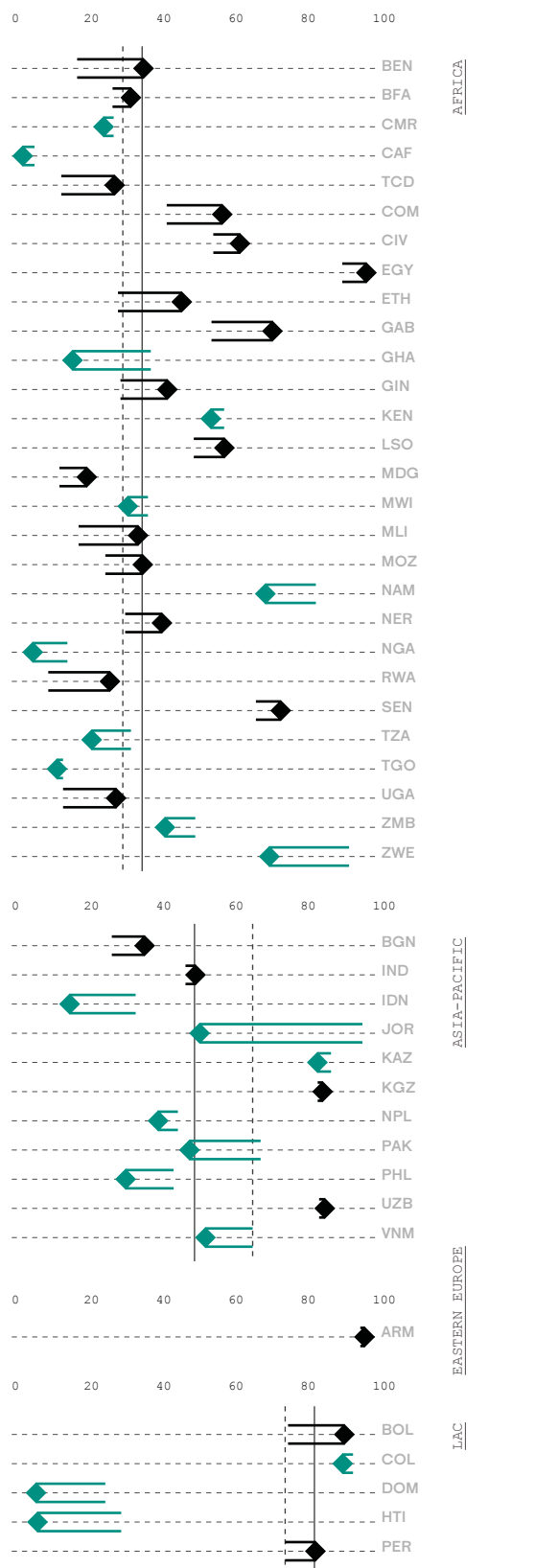
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The successes and challenges of increasing access to improved water sources in urban areas is shown in Figure 22. On average, urban access to improved water sources has exceeded the UHC target of 80% in all regions examined, based on the most recently available data from the DHS. The greatest improvement in urban water access between 1990–2004 and 2005–2013 was ob-

URBAN HOUSEHOLDS WITH ACCESS TO IMPROVED WATER SOURCE (%)



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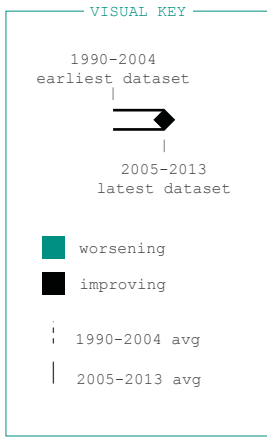


Figure 22.
Trends in country-level urban prevalence of access to improved water sources comparing 1990–2004 to 2005–2013, by world region

Note: Median lines are provided for each time period and region in the graphs.

Source: Global Health Observatory 2015 (21).

served in countries in Africa. Countries in Africa and LAC also improved equity in urban access to water in this period, as seen in the narrowing of the gaps between the countries. However, in the Asia-Pacific, household access to improved water sources in urban areas actually declined during these periods, and the disparity between the countries widened. In terms of sanitation, since 1990, 1.2 billion people have gained access to improved sanitation in urban areas, increasing coverage from 76% in 1990 to 80% in 2012. Nevertheless, the population without sanitation in urban areas increased significantly from 215 million in 1990 to 756 million in 2012 (201).

Sanitation coverage for urban residents in the world's least developed regions remains very low at 47%, and particularly in sub-Saharan Africa where only 40% of its urban population has access to improved sanitation (193). Even when individuals have access to sanitation options such as community toilets, usage of these facilities remains low and many households continue to practise open defecation. Between 20% and 30% of urban populations in the regions mentioned above use shared sanitation facilities, and open defecation rates ranged from 6% in east Asia to 14% in south Asia (202). One potential explanation for the persistence of this practice is that it has become an ingrained habit that individuals continue to engage in despite having a better alternative.

With the urban population expected to double globally in the next 40 years, most cities already lack adequate wastewater management due to ageing, absent or inadequate sewage infrastructure. Low-income countries have only 8% of the required capacity to treat waste water effectively (203). This will not only lead to severe damage to the ecosystems and biodiversity, but also pose a major threat to human health, economic activity and water security if left unaddressed.

As for municipal solid waste, cities currently generate roughly 1.3 billion tonnes per year worldwide (204). For many cities in LMICs, solid waste management is already the single largest budget item, and biggest employer. Yet, as societies get wealthier and urbanize, solid waste production generally increases. It is estimated that solid waste production from cities will increase by 70% to 2.2 billion tonnes per year by 2025 (204).

Solid waste management is a critical matter for public health and environmental quality. Poor waste management can lead to clogged drainage ditches that can cause flooding and stagnant water. Blocked storm drains and pools of stagnant water provide breeding and feeding grounds for mosquitoes, flies and rodents. These, in turn, can increase the risk of diseases such as dengue, leptospirosis, gastrointestinal disorders, dermal infections and respiratory infections. Waste left to accumulate in private or public areas and disposed of in open landfill can also be sources of disease vectors. Burned waste can emit hazardous substances into the air. Proper management of solid waste can thus have a great impact on people's health. The sanitation service chain must be developed, financed, managed and maintained continuously and sustainably as services, with a focus on outcomes (e.g. how much solid waste is safely managed) rather than inputs (e.g. construction of latrines and sewers).

INEQUITABLE DISTRIBUTION OF QUALITY WATER AND SANITATION SERVICES

Most countries generally achieve an increase in access to water and sanitation, as well as a narrowing of inequality in coverage, with improved development. The practice of open

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Water Supply Beneficiary

Source: Water Supply Beneficiary
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defecation also appears to decline, for example, with increasing levels of education (201). Yet, major differences in access to water and sanitation between rich and poor in urban areas remain widely prevalent. It is the poor and otherwise excluded and marginalized populations who tend to have the least access to improved drinking-water supplies and sanitation.

Figures 23 and 24 clearly illustrate how the practice of open defecation and access to improved water sources are strongly correlated with household wealth in urban areas, albeit in different patterns. In most of the countries where open defecation is still prevalent in urban areas, it is primarily among the poorest households. This indicates the exclusion of the poorest minority of urban households from receiving the benefits of improved sanitation. This may be because these households have no access to improved sanitation, or they are accessible but not used due to reasons such as poor maintenance or behavioural preferences.

Massive investments are made in infrastructure to address urban sanitation in developing countries, including construction of household latrines and public toilets, but often in favour of richer users. The poor are frequently left to fend for themselves. Self-built onsite systems are the norm for slum households. In these contexts, wastewater and faecal sludge from rich areas are typically channelled far away to a wastewater treatment plant, while those from poor areas stay onsite near the residences (198). However, the location of many cities in the world in coastal or riverine areas means that even privileged areas may be affected if the area is flooded, as faecal material will mix with the floodwaters and cause widespread contamination.

Similarly, stark inequities are found in urban access to safe water in some countries where, on average, less than half of the poorest one fifth of urban households have access to improved water sources in contrast to the richest one fifth that have over 90% access (Figure 24). These countries present a very steep social gradient in urban water access whereby the level of access to improved water sources increases systematically, and quite dramatically, with increasing levels of household wealth.

The perils of poor water, sanitation and hygiene are most egregious in informal settlements. A survey of New Delhi's slums found that 44% faced water scarcity, 90% reported that the drains were overflowing and 99% reported that the nearby dumpsters were emptied less than once a month. A toilet audit in these same communities found that 83% of toilets had faecal material, or significant amounts of other waste lying around the facilities, and only 16% had soap or sanitary fluid for washing (205).

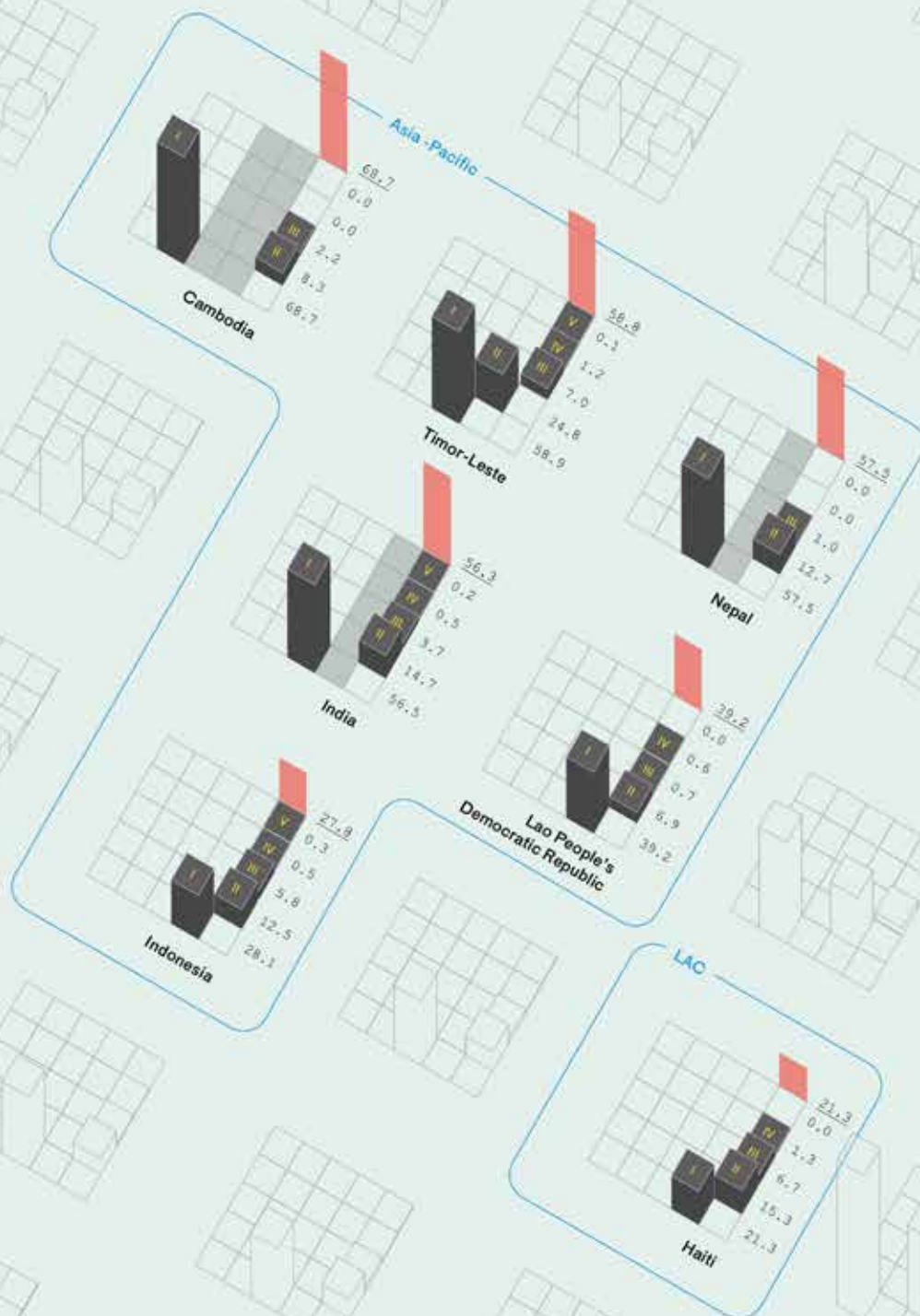
However, informal settlements are far from being homogeneous as unfair differences exist even within these settings. In Mombasa, Kenya, almost one third of the better-off slum residents had piped water to their homes, while the poorest relied on water kiosks about twice as much as the better-off homes. Flush toilets were used by 70% of the richest one third of households compared to 10% of the poorest one third, and none of the richest one third practised open defecation compared to more than 15% of the poorest one third (201). The quality of facilities was also inconsistent. In the unplanned, low-income subwards of Dar es Salaam, United Republic of Tanzania, 56% of households used sanitation facilities that technically qualified as improved, but only 8% had the functional facility that can be considered as hygienically safe and sustainable. The biggest share of this unsafe sanitation was due to unsafe pit emptying (206).

Even in high-income countries, there are intra-urban disparities in access to safe drinking-water. In the USA, the first study to systematically examine the role of

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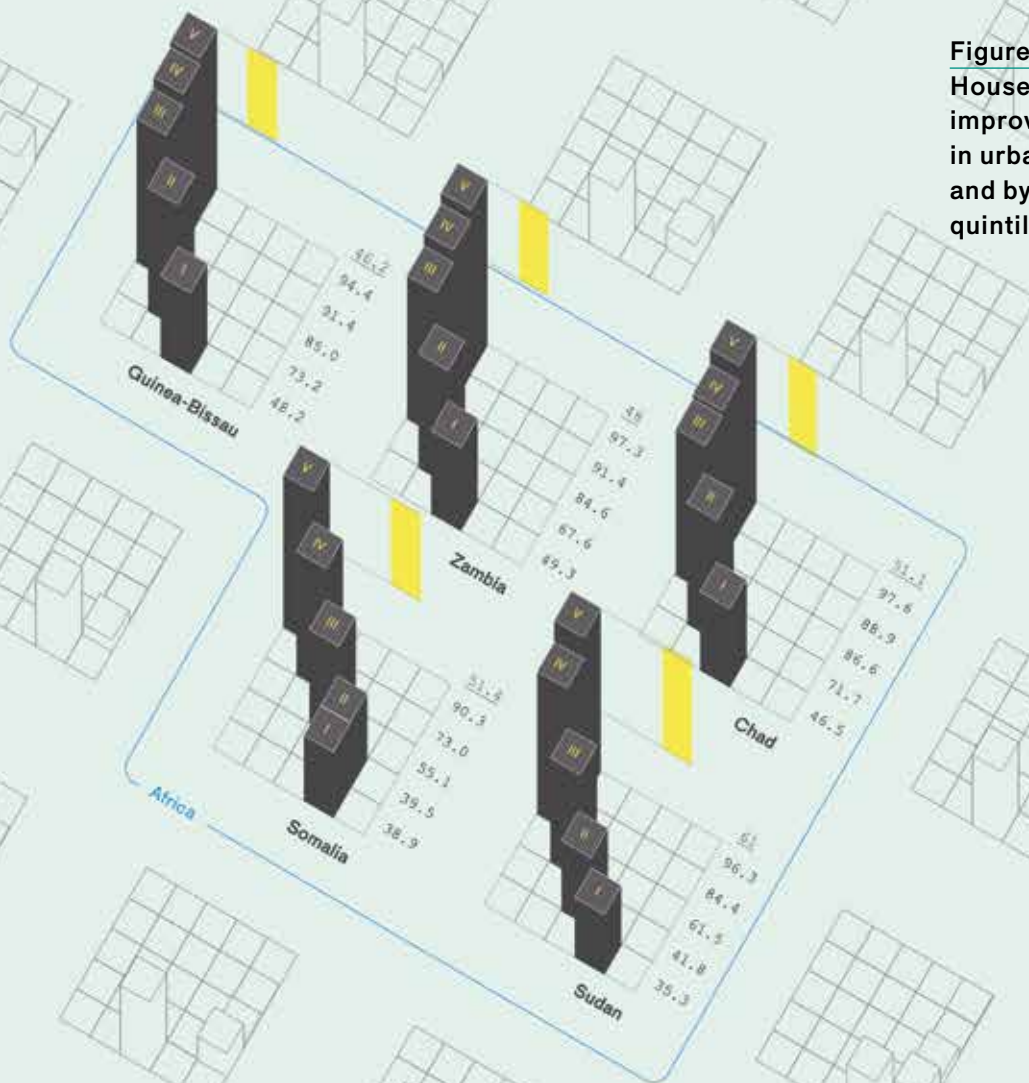
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Note: For the full country names, see Annex 1, Table A1.2. Q2, 2nd quintile; Q4, 4th quintile
 Source: Global Health Observatory 2015 (21).

Figure 24.
Household access to improved water sources in urban areas by country and by household wealth quintile



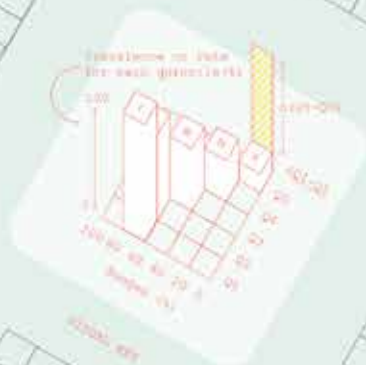
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Note: Q2, 2nd quintile; Q4, 4th quintile
Source: Global Health Observatory 2015 (21).

race in access to municipal water service found that access was significantly lower in African-American neighbourhoods than in some other neighbourhoods. A study in Wake County, USA, the second most populous county in the state of North Carolina and home to the state capital, showed that African-American communities are significantly less likely than Caucasian communities are to be connected to a municipal water supply system in what are known as extraterritorial jurisdictions. Moreover, every 10% increase in the African-American population proportion within a census block increases the odds of exclusion from municipal water service by 3.8%. This disparity is a legacy of racial segregation. Historically, many cities and towns drew their boundaries to exclude African-American neighbourhoods from city limits, while encompassing them within extraterritorial jurisdictions over which town councils with a Caucasian majority retained control (207).

Nicosia, the capital of Cyprus, another high-income country, exhibits wide variability of exposure to environmental contaminants in piped water, with lower-income neighbourhoods exposed to worse pipe quality. Historically defined geographic



Source: WHO/Anna Kari

boundaries within a city, such as those defined by the drinking-water pipe infrastructure, provide a unique opportunity for city planners, policy-makers and health professionals to formulate cost-effective urban health interventions, if environmental exposures are well clustered within each neighbourhood (208).

While access to improved water sources and piped water are necessary steps in the right direction, they are insufficient in themselves to prevent ill-health from unsafe water. Microbiological contamination of water between the source and point-of-use is widespread and often significant. Increased faecal and total coliform counts in stored domestic water are frequently found in urban areas with uncontaminated sup-



plies (209). Many systems classified as “improved” are in reality well below the standard necessary to reduce the risk of human contact with faeces. Access to an “improved source” provides a measure of sanitary protection, but does not ensure water is free of faecal contamination, nor is the level of contamination consistent between type of water source and the setting (194). Such evidence suggests that international estimates greatly overstate the use of safe drinking-water and do not fully reflect disparities in access. An enhanced monitoring strategy would combine indicators of sanitary protection with measures of water quality (210).

Similarly, sanitation is a complex service chain along which any failures will compromise safety. Providing access to “improved sanitation” alone does not necessarily ensure access to safe, sustainable sanitation. Sanitation consists not only of providing toilets, but also in making sure that people use, maintain and empty them safely. A recent systematic review found that individual psychosocial motivators, such as perceived benefit and self-efficacy, as well as interpersonal factors, such as social norms, are strongly influential in whether there is sustained adoption of safe water, hygiene and sanitation, in addition to contextual factors within the environment and characteristics of the technology itself (e.g. cost; durability) (211). Thus, community education and training as well as adequate drainage and solid waste management are essential complements to excreta management services.

The most effective household-level drinking-water intervention to impact diarrhoeal disease in LMICs has been shown to be a point-of-use filter in combination

Source: WHO/Anna Kari

with safe water storage, according to a recent systematic review and analysis (212). At the community level, introduction of high-quality piped water was found to be most effective. The same study also found evidence that sewer interventions are associated with a greater reduction in diarrhoea than basic household sanitation. These results are largely consistent with previously published reviews.

BARRIERS TO HOUSEHOLD INVESTMENT IN IMPROVED WATER AND SANITATION

Many cities, especially those in developing countries, suffer from inadequate supply of improved water and sanitation. Building such infrastructure is costly and may involve numerous technical, bureaucratic and legal constraints. However, even in places where the water and sanitation network exists and it is technically feasible to connect to it, there may be demand constraints that limit people's access to these services. Understanding the underlying factors that affect demand for urban services is a necessary first step in the design of the most suitable incentive mechanisms to improve access.

Evidence from different country contexts suggest that many families and households in developing country cities do not want to invest in improved water and sanitation, even if they could afford it (213,214). Many urbanites are also migrants who are temporary or transient and are even less likely to invest in their houses. People may simply lack the money or willingness to pay for the service, may have a poor understanding of the benefits and costs of those services or may not be fully aware of the health costs of current options, partly because such information is not communicated to them (214).

A common situation is that people who do not have legal property rights to their dwellings, often informal settlers, are not motivated to make major improvements to them. They see no reason to invest in homes if they are not the recognized owners. Evidence in Latin America has shown that, in fact, households with insecure property rights are less likely to invest in improvements or to use their house as collateral for a loan to invest in improvements. While strengthening property rights in urban slums has been shown to have a significant effect on residential investment, it has also created other problems. Once land rights are granted, the poor may resell the land to wealthier people (215), and then create new slums elsewhere, perpetuating the problem of poor water and sanitation.

There are some examples of success, however. A randomized evaluation of a social programme in Tangier, Morocco, that offered low-income households a chance to get an in-home connection to the city water system by providing technical assistance and interest-free loans found that families were willing to pay a lot to have a private tap in their home. While there was no impact on health because these families already had access to clean water at public taps, the new water connections enabled more leisure time, fewer tensions with neighbours over using a communal tap and better perceptions of quality of life. The evaluation showed that not only making credit available, but also simplifying or assisting with the application process could greatly increase families' willingness to invest in water connections. It also showed that social networks (i.e. observing the benefits enjoyed by neighbours) are an important channel for learning about new programmes and benefits (216).

MAR

COORDINATED, SYSTEM-WIDE SOLUTIONS ARE NEEDED AND POSSIBLE

Given the challenges to small-scale private initiatives to invest in water and sanitation solutions and the systemic nature of water and sanitation services, well-coordinated system-wide solutions are also needed to achieve efficiency and effectiveness on a broad scale. This involves coordination between the water and sanitation sectors, including public and private providers, along the chain of services within each sector, within the affected community and between relevant national and local level policies.

Community level coordination is important in mobilizing the resources needed to invest in water and sanitation infrastructure and to ensure public health safety for all. To be effective, urban water and sanitation management has to be inclusive of all residents and areas, including the poor, and implemented within a city-wide framework. When done well, it could provide a wide range of benefits, including longer lifespan, reduced morbidity and mortality, higher school attendance, lower health costs and less time and effort devoted to managing water and waste (214). In economic terms, it is estimated that combined water supply and sanitation interventions have a cost-benefit ratio of 4.3 (i.e. an economic return of US\$ 4.3 per US\$ 1 invested) at the global level, ranging from 2.0 in Oceania to more than 5.0 in LAC and East Asia (217).

Coordination failures, however, pose serious challenges to implementing community-wide solutions. Not all individuals in the community may approve the development of water and sanitation services. For example, small, private water service providers – tanker operators, private kiosk operators, household resellers, door-to-door vendors, and operators of small boreholes and private piped networks – have a vested interest in preventing the construction of formal network-based services. Some of these provide good quality service under competitive conditions, but the price of water is usually much higher than that of the main water utility, and they are most often informal and unregulated providers. Even when new and improved solutions are implemented, they may not be sustained if no one takes responsibility for maintenance. There is evidence that community sanitation facilities are usually poorly maintained – and the failure of one affects many. Mismatches can also occur between demand for improved sanitation and the type of services provided, often resulting in unused or underused sanitation infrastructure.

Coordination can be challenging, especially in urban areas. In contrast to rural areas, urban settlements are often heterogeneous, both ethnically and in socioeconomic status, which hinders collective action. Longer-term residents may also find it difficult to motivate new settlers, especially transient migrants, or hold them accountable to investments, norms and rules. Poor communities face the additional challenge of lacking the political influence to affect municipal decisions. Sanitary conditions in these communities may not be the priorities for policy-makers.

For larger-scale solutions beyond the household or community level, local and central government participation is necessary. Issues surrounding the accountability of elected representatives in poor neighbourhoods then become very relevant. Despite the urban poor forming a sizable proportion of the population, this voting bloc has often been unable to leverage their political weight to gain improved public service delivery.

States should adopt the necessary measures to certify that water is universally guaranteed and affordable. Households must be able to afford a basic quantity of

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water for essential consumption. If the cost of water is above the financial availability of the poor, this will hinder universal access and the fulfilment of the right to the city for all. When water is unaffordable, consumption could decrease below the level of essential needs and result in serious health risks to the most disadvantaged (218). The public sector must, therefore, ensure tariff schemes that protect the most disadvantaged from disconnections due to high prices associated with weak financial capacity, without jeopardizing financial sustainability of service providers (219). At the same time, subsidy policies can ensure access for the poor, served both by formal or informal providers. If the poor are willing to pay for improved drinking-water quality, as is evidenced in some countries (220–222), volumetric rate of water service charge (instead of regressive lump sum water service charge) can be an important economic instrument and policy tool. It can increase efficiency in the water supply system by maintaining distributive justice, reduce wastage of water and ensure that the water provider has sufficient revenue to maintain safety (223).

Despite formidable challenges, coordinated system-wide solutions to deliver safe water and sanitation are achievable and sustainable. They can be successful even in urban slums as seen, for example, in Nairobi. Over the last 10 years, Kenyan government ministries, development agencies and civil society have invested considerably in initiatives to improve sanitation in urban slums. Great improvements have been made in the provision of water and sanitation facilities with corresponding improvements in health outcomes (224). Between 2000 and 2012, the proportion of Nairobi slum households buying water from vendors decreased from 74.8% to 11.4%, and those accessing water through public taps increased from 2.7% to 59.3%. The proportion of slum households using flush toilets increased six fold from 7.3% to 46.2%, while households using traditional pit latrines decreased from 78.8% to 44.0% – an almost 50% decrease. These improvements in access to water and sanitation have been linked to declines in diarrhoeal deaths (35) and in under-5 mortality (225).

Despite formidable challenges, coordinated system-wide solutions to deliver safe water and sanitation are achievable and sustainable. They can be successful even in urban slums as seen, for example, in Nairobi. Over the last 10 years, Kenyan government ministries, development agencies and civil society have invested considerably in initiatives to improve sanitation in urban slums. Great improvements have been made in the provision of water and sanitation facilities with corresponding improvements in health outcomes (224). Between 2000 and 2012, the proportion of Nairobi slum households buying water from vendors decreased from 74.8% to 11.4%, and those accessing water through public taps increased from 2.7% to 59.3%. The proportion of slum households using flush toilets increased six fold from 7.3% to 46.2%, while households using traditional pit latrines decreased from 78.8% to 44.0% – an almost 50% decrease. These improvements in access to water and sanitation have been linked to declines in diarrhoeal deaths (35) and in under-5 mortality (225).

SUMMARY

This chapter illustrates the pressing need to address the urban water and sanitation challenge comprehensively, with a strong emphasis on including slum dwellers and poor communities that have typically been neglected.

Lack of access to and use of safe, sustainable water and sanitation is globally one of the biggest contributors to ill-health and preventable mortality. Both access and quality will need to improve at a much faster pace and on a larger scale than in the past to meet this continuously growing demand. Currently, lack of access puts 2.5 billion people at risk of many diarrhoeal and other diseases even though, as noted, access is a globally recognized human right.

Without concerted intervention, the health, development and quality of life of all urban dwellers will be in jeopardy. There will be greater risks of diarrhoeal and other diseases and hazards that this chapter discusses and lead to significant disadvantages in education and productivity.

While water and sanitation is a problem for both rural and urban areas, it is particularly urgent in cities, and especially for marginalized populations in them. Furthermore, even though access to improved water and piped water are important steps in the right direction, they are insufficient alone to prevent ill-health from unsafe water

thus water quality deserves more attention.

There are undoubtedly many obstacles at every level, however, solutions are available, achievable and sustainable. Some of these are system wide, and require local and central government participation. Others are on a smaller scale, involving communities and households. This chapter offers evidence of these solutions and ways that city leaders and urban communities can move towards implementing them.

CHAPTER 7 — DESIGN HEALTHIER, MORE SUSTAINABLE CITIES

KEY MESSAGE • Cities can be designed and managed in ways that enable healthier behaviour and achieve better health outcomes.

The ways that cities are planned can profoundly affect the ability of their populations to live long, healthy and productive lives. Planning influences the layout of streets and corridors, including which parts of the city they connect. It determines where to find the various features of the city – everything from hospitals and schools to commercial spaces and public parks. It determines whether a growing city stretches towards the sky or spreads out. These are among the ways that the invisible hand of city planners plays a role in where residents live, work and play, and how they access these features of their daily lives. The combination of these factors gives each city its own identity, with its different areas and neighbourhoods, streets and transport corridors of road and rail networks. The combination of these features, or the absence of them, also influences urban residents' health and quality of life.

Many cities around the world have grown so rapidly that they have had little opportunity to keep the interests of their residents firmly in mind, much less look ahead and plan for the future. Where the pace of urbanization has allowed planning to be done, too many of our modern cities have concentrated on providing for motor vehicles, commerce, industry and economic growth. Cities have become engines for economic growth, generating more than 80% of global economic activity (226). So often, the people who live in cities have been left off the designers' drawing board. This is a common, recurring oversight. When people and their quality of life are not recognized as priorities, the consequences are likely to be at least unhealthy and at worst fatal.

These unintended outcomes include featureless urban sprawl, substandard housing, traffic-clogged streets, toxic air quality and underserved neighbourhoods. Like so many other elements of the city, it is often the poorest families who are most affected, and are thus further locked into poverty.

The design of a city, while seeking to create a place where people can live and thrive, also often casts a long shadow over the health of the very people it tries to accommodate. This does not have to continue. The city environment is not an inherently unhealthy place. Quite the contrary, the city ideally offers opportunities and access that

can enable people to live healthier lives. Through improved design and planning, city leaders can play an enabling role in their constituents' health. They have an incredible opportunity to do so. For the multitude of cities that are already invested in less healthy infrastructure and planning, they can still make adjustments to the city environment to enable the current cohort of urban dwellers to live healthier lives. City leaders can plan healthier environments for the 3 billion future urban dwellers that do not yet live in cities. Many elements of planning that can affect the health of urban residents. The development of slum homes and neighbourhoods is a critically important issue to address (see the chapter on housing). City streets and other elements of mobility are also instrumental in the health of city residents. This chapter looks at how cities manage urban spaces and the ways that they can either positively or negatively influence the health of city residents. It also briefly addresses how cities are increasingly being planned for the health and well-being of older adults. In addition, it looks at how better urban planning can mitigate the impact of disasters on urban populations.

HLTH
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A WORLD OF SPRAWLING CITIES

The growth of city populations over the last century has forced urban planners and city leaders around the world to cope with significant numbers of new residents in a short time. In most cases, cities have accommodated their new residents by pushing the boundaries of the city for expansion. These cities occupy increasing volumes of land cover – they stretch and they sprawl as they grow. Meanwhile, some cities have not coped with swelling urban populations and the new residents have pushed the city boundaries themselves, constructing informal settlements at the periphery of the city, where they lack city services and infrastructure.

ENRG
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INFRA
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Planned, or unplanned, cities have expanded significantly in response to urbanization. The problem this presents for planners is that many cities are expanding at rates that exceed their capacity to accommodate the growing population. In a global sample of 120 cities measured during 1990–2000, the geographic extent of the city grew more than twice as fast as the population (Figure 25) (227). At these growth rates, the world's urban population will double in 43 years, whereas the world's urban land cover will double in only 19 years.

CITY
11

Sprawling cities are among those whose outward expansion has outpaced population growth, resulting in lower density settlements. In some cities, relatively wealthy residents, seeking more space and access to the city, occupy these lower density settlements. In other cities, relatively poorer residents, often seeking more affordable housing, occupy the peripheral settlements.

CLIMT
13

In sprawling cities, the necessities of everyday life for many residents become less accessible. Public transportation requires dense populations in order to be sustainable. In the absence of density, public transportation for certain communities can be either infrequent or non-existent. Hospitals, schools, businesses, city parks and planned public spaces are all more sustainable with human density. With lower density – when cities sprawl – these institutions and infrastructure that make up the very essence of the urban advantage become unsustainable. In these cases, urban spaces often become single-use spaces – places where people live, or places where people work, play and access their daily needs, but not both.

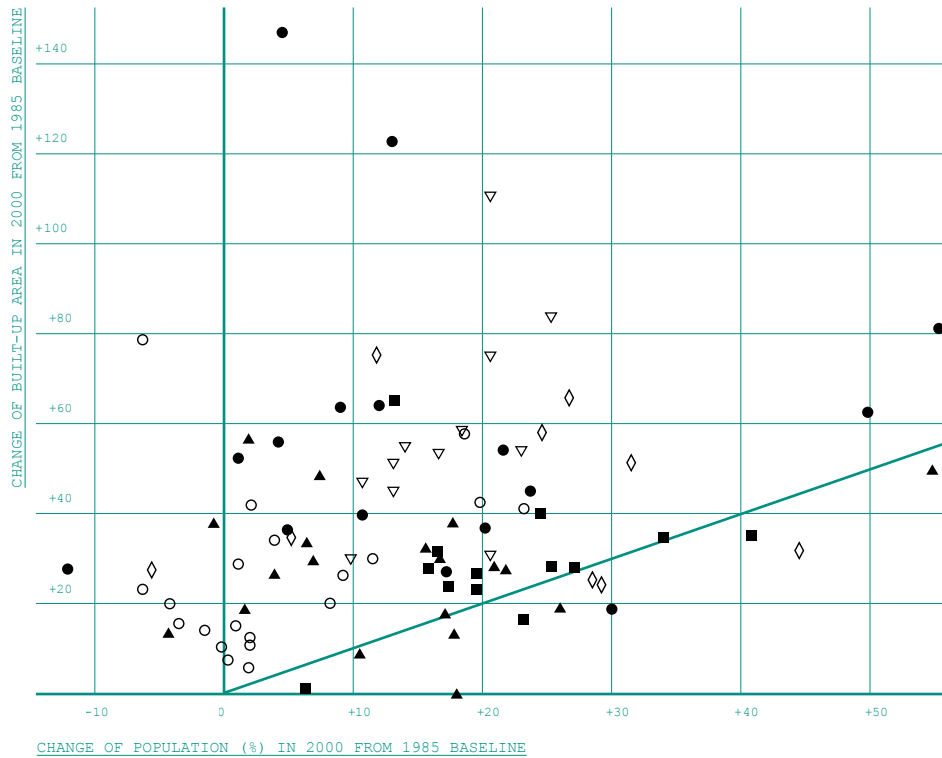


Figure 25.
Urban spatial expansion and population growth

Source: Angel et al. 2005 (228).

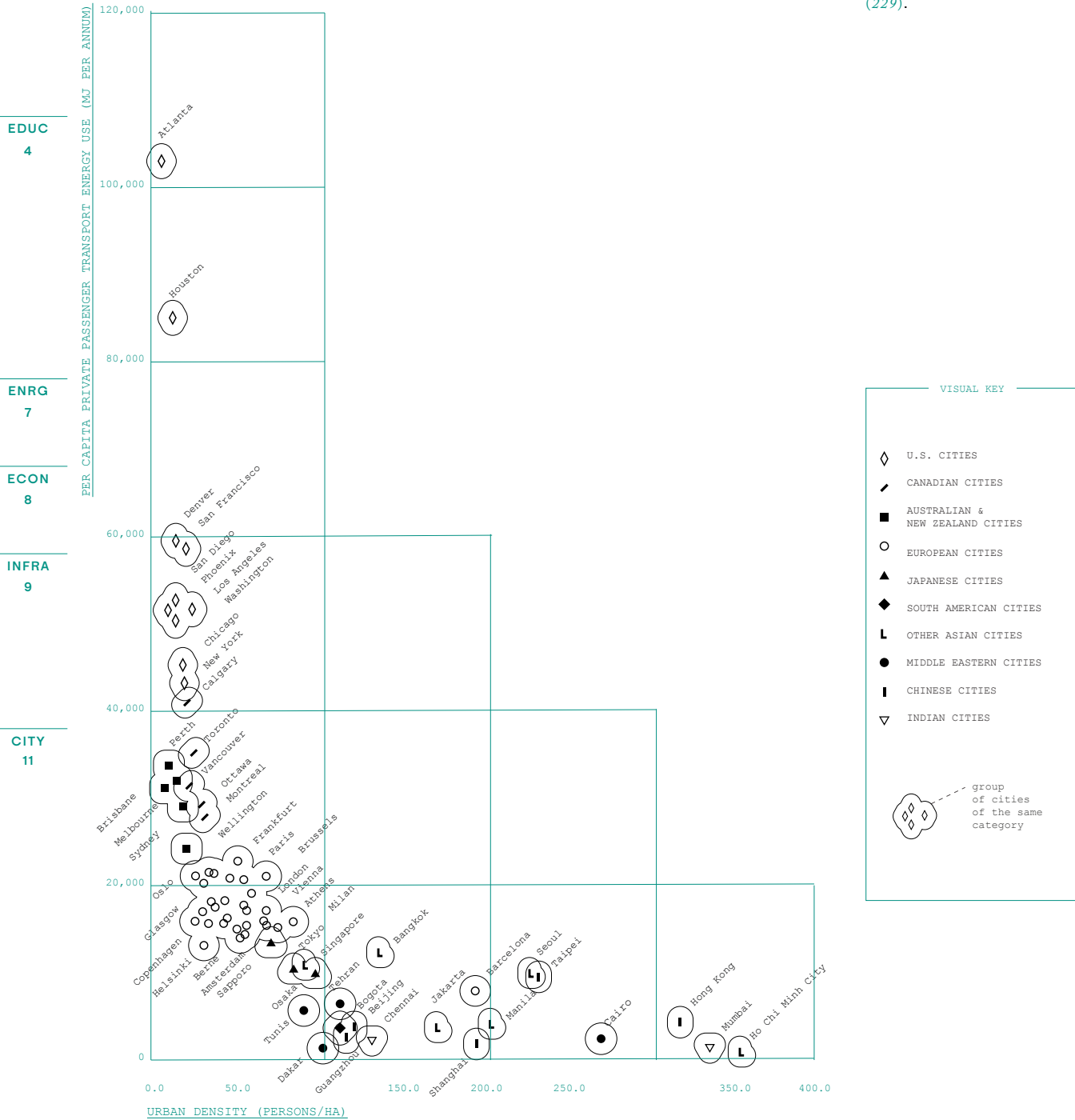


In these modern cities, residents become more car-dependent. As cities have grown, and more single or limited-use communities develop, many people live long distances from work and other needs. Figure 26 depicts the relationship between transportation energy use and urban density, showing clearly that less dense cities have more energy-intensive mobility. Atlanta, USA, needs 783 gallons of petrol per person per year to make its urban mobility system work. By contrast, relatively more compact cities such as Barcelona, Spain, and New York City require 64 and 80 gallons, respectively, of petroleum per person (229).

Energy-intensive mobility is associated with a great proportion of the population relying on private motor vehicles and driving longer distances. Lower population density is also correlated with longer trips in private vehicles (230). Importantly, greater numbers of private vehicles on the road and kilometres travelled are directly related to health problems associated with air pollution and road traffic accidents (see on the chapter on transport). It is the structure of the city that allows for longer commute times and greater distances to daily needs. It virtually ensures longer daily vehicle time, and, for many people, less physical activity and reliance on less nutritious convenience foods. When combined with single-use neighbourhoods that lack accessible commercial, public and green spaces, the planning of the city can become a significant contributor to sedentary behaviour. Annually, 3.2 million deaths are attributed to insufficient physical activity. WHO recommends at least 150 minutes of moderate intensity physical activity per week for average adults (231). A person who walks or bicycles 10 minutes to and from the bus or train, from home and then to work every day, would get 200 minutes of walking just from their commute five days per week. Meanwhile, commute times and traffic congestion are worsening. In 95% of the largest cities in the USA, traffic congestion has been increasing (232).

Figure 26.
Population density and
transport energy use

Source: Reproduced with permission from Rode and Floater 2014 (229).



While the causal link is not yet established, the correlation between sprawl and ill-health is well documented, and there is clear value in enabling those who are constrained by the urban environment to live healthier lives if they so choose. In a 2014 update to a landmark study of sprawling metropolises, Ewing and colleagues again found a negative correlation between sprawl, health and economic opportunity across 221 cities and 994 counties in the USA (233). Put another way, the data indicated that in less sprawling cities people live longer and have greater economic mobility.

CITIES CAN BE DESIGNED TO IMPROVE HEALTH FOR EVERYONE

Cities can be planned for the health of their residents. It is certainly true that urban infrastructure is difficult to change once it is in place; streets and buildings live long lives with some maintenance, and cities can be difficult to rezone. However, it is possible to take steps to shape even the most sprawling cities for better health. In 2015, Los Angeles, California, passed sweeping legislation to overhaul city mobility. Rather than adding lanes to streets for more cars to alleviate congestion, the city is planning to add bicycle lanes, sidewalks and dedicated spaces for bus rapid transit (BRT) (234). Copenhagen, Denmark, embarked on a multi-decade project to remake completely the city with mixed-use neighbourhoods around transit-oriented development (Box 11). Not every city can do an “extreme makeover” for health, but every city can take steps in the direction of healthier planning. Furthermore, there is an opportunity to build healthier cities when it is clear that urban populations are set to more than double over the next several decades to 2050. There is a long time to plan these spaces for a better future.

DNK

Box 11.	Copenhagen: The world's best bicycle city?
<p>The municipality of Copenhagen aims to be the “world’s best bicycle city” and has a target for 75% of all trips to be by foot, bicycle or public transport by 2025. Good conditions for cycling are also part of the city’s official health policy. Cycling is not a goal in itself, but a highly prioritized endeavour for creating a more liveable city. Currently, 26% of all trips to work or schools in Copenhagen are by bike. This high share is a key element of their goal to make the Danish capital carbon dioxide-neutral. More than six decades ago, Copenhagen initiated an integrated transport and land use strategy that led to the development of dense walkable urban centres connected to one another by rail-based public transport. Effective land-use regulations, considerable investments in public transport infrastructure and a clear spatial strategy, known as the Finger Plan, made this possible. The Finger Plan calls for urban growth along rail corridors (the fingers) from the city centre and protects the in-between green wedges from development. City-level land use planning promotes high-density, mixed-use developments around public transport stations and limits parking options for private vehicles.</p> <p style="text-align: right;"><i>Source: Rode and Floater 2014 (229).</i></p>	



One key principle for making cities healthier for their residents is to make their daily needs accessible by a combination of walking or cycling and public transportation. Physical activity is a critical mechanism by which the built environment can affect health, particularly NCDs. One of the ways that city design can promote physical activity is through compact city design. Compact cities have relatively high residential density. In compact cities, intra-urban distances tend to be shorter – the things people need and the places people need to go are close by. Shorter intra-urban distances reduce time spent in a vehicle and lowers travel costs. The lower cost of transport can substantially help low- and middle-income households, where transport and housing can consume a great proportion of household income. Decreased transit time yields a boost to mental health as well as economic benefits. The average urban resident in an American city spends 42 hours in traffic, or the equivalent of one working week in their motor vehicle every year commuting to work (232). This is a week that could be reallocated to more productive activity, including work, but also leisure. Higher density residential neighbourhoods with shorter intra-urban distances are associated with more walking and cycling. This all adds up to fewer kilometres travelled by car, which reduces air pollution. Studies in the USA have also shown that relatively compact cities with mixed land use have better air quality than relatively sprawling cities (235).

Cities have to give careful consideration to how they should reap the rewards of compactness. For example, at the extreme, city density can lead to crowding. Crowding can of course be a cause of ill-health. In striving to achieve a more compact city and more sustainable density, it is important that city leaders do not artificially constrain the housing stock by limiting land use (236), which limits housing supply and can drive up home prices and rents.

Furthermore, the composition of spaces in cities can determine the extent to which high-density living can positively affect health, or not. Mixed land use spaces are a key element of healthy city planning. Cities do not have to be dense everywhere, but they can plan for residential density around mixed land use spaces. Mixed land use,

Los Angeles in a Good Light

Source: Los Angeles in a Good Light by Ron Reiring is licensed under CC BY 2.0, <https://creativecommons.org/licenses/by/2.0/legalcode>

together with high-density living, is correlated with increased levels of physical activity (237). Ideally, residential density around mixed land use means that people’s needs are very close to their homes, which makes walking or cycling more attractive choices. Ensuring that corridors safely connect people to their daily needs within neighbourhoods will also encourage walking and cycling. Street connectivity and intersection density have both been found to be positively correlated with walking and cycling (238).

Urban density often conjures up images of concrete and metal landscapes, but green and recreational spaces are crucial additions to mixed land use planning for cities. Green spaces and recreational areas give city residents the opportunity to be physically active and promote mental health (239). Without them, physical activity is limited to paved spaces shared with cars and other obstacles. An international study in 17 cities found that proximity to public parks and attractive aesthetics positively correlated with leisure time physical activity among adults. The findings were similar across diverse cities on five continents (240). These results confirm those of prior studies and demonstrate that the importance of having parks within neighbourhoods is universal. Another significant study showed that proximity to parks was one of the most consistent correlates of children’s physical activity (241). Parks can provide places for physical activity and favourable aesthetics of buildings and landscapes can help people enjoy being active in their neighbourhoods.

Cities can plan for smarter growth that enables their residents to live healthier lives. For cities that are more “locked in” to their current forms, it is more difficult and it can take some time to steer the city in another direction. Even then, it is possible. The Copenhagen example illustrates how a strategic approach to making the city healthier can succeed with patience and perseverance. Other cities around the world are also taking steps in this direction. The next chapter on transportation discusses cities that are making adjustments to locked-in forms in order to promote healthier transport. The payoff of creating the conditions for a healthier city is potentially significant for residents. In the Ewing cross-sectional study mentioned above of more than 200 cities and 994 counties, the researchers found that residents of relatively more compact areas performed better on selected economic and health measures. Although residents of compact cities tended to have higher housing expenses, they spent less on combined housing and transportation expenses, as savings in transportation costs outweighed higher housing costs. The more compact the area, the more these residents walked, while motor vehicle ownership and drive time decreased. People who lived in areas with more sprawl had higher BMI values, while those in areas that are more compact tended to live longer.

CHN

DNK

Box 12.	Piloting sustainable urbanization in China	
	<p>Within three decades, China has experienced unprecedented urban growth unseen in any other parts of the world. China currently has 600 urban areas with populations exceeding 100 000, and it is expected to have over 1 billion urban dwellers over the next 35</p>	<p>years. While this has contributed to China’s sustained high economic growth and overall raised living standards, the speed and scale of its urban development threatens to outpace the ability to plan and resource urbanization. High energy consumption, traffic congestion,</p>

worsening air quality and the deterioration of quality of life have become major interrelated threats to the sustainability of China's cities. City governments have had to tear down and rebuild infrastructure no more than a few years old. Superblock style developments were designed as replicable, scalable, efficient housing to accommodate fast-growing urban populations. They were mono-functional and paired with widened roads in order to ferry residents to work and other needs, but this risks concentrating the flow of traffic, creating congestion and longer commute times. At the same time, they were significantly less accommodating to pedestrians and cyclists, which was a feature of traditional Chinese cities.

Solutions, however, are being sought. The Ministry of Housing and Urban-Rural Development has initiated a Low Carbon Eco-city Pilot programme. The city of Kunming is among those chosen for the pilot programme. The city has partnered with the Energy Foundation China in redesigning an 8-kilometre square core area of the city based on eight key principles: (i) develop

neighbourhoods that promote walking; (ii) prioritize bicycle networks; (iii) create dense networks of streets and paths; (iv) support high-quality transit; (v) develop a zone for mixed-use neighbourhoods; (vi) match density to transit capacity; (vii) create compact regions with short commutes; and (viii) increase mobility by regulating parking and road use. In practice, this has led to smaller neighbourhood blocks replacing superblocks, and a transit-oriented mixed land use development pattern. The new design resulted in a compact grid of smaller neighbourhoods with multimodal transportation infrastructure. The expected environmental benefits include reductions in vehicle emissions by 72%, greenhouse gas emissions by 59% and total vehicle kilometres travelled by 67%. While the pilot redesign is still too recent to measure outcomes, the standards from this project have been entered into the urban planning legal code, which means that all future developments in this area must follow these specifications.

Source: Energy Foundation China (242).

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MAKING CITIES AGE-FRIENDLY

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From the latest demographic projections, the trend towards an urbanized world is expected to continue at great pace and scale. The urban population is projected to add another 2.5 billion people to cities by 2050 (84). At the same time, the number of people 60 years or older is expected to more than double from 841 million in 2013 to more than 2 billion in 2050 (243). As the world is becoming older and more urbanized, the population of older adults living in the world's cities is growing. The population of older adults living in Organisation for Economic Co-operation and Development (OECD) cities grew by 23.8% in just 10 years during 2001–2011 (36). And while many of the most rapidly urbanizing cities in the world are still proportionately young, the number of older adults living in these same cities is nevertheless growing.

The implications of the convergence of these two demographic changes are significant for cities worldwide. It presents a compelling case for intersectoral, collaborative work across agencies in city leadership. For health sector managers, the shifting health profile of city residents requires careful planning and adjustment. The instrumental role of the city environment on the health of all residents, and particularly for older

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adults, is increasingly well understood. Research in this area has sought to determine relationships between the health of older adults and such factors as the accessibility of public spaces and homes, public transportation and neighbourhood walkability as well as the myriad elements of the social environment. These are elements of city living that interact in highly complex ways to affect health, although they are often managed by a range of responsible bodies within a city administration as well as the communities and individuals themselves.

WHO and its partners have created parameters and domains of action to enable cities to take on these complex forces and to work towards making our cities more conducive to active, healthy ageing. WHO also created a Global Network of Age-friendly Cities and Communities that helps promote sharing of lessons across cities of structures and services that are accessible to and inclusive of older people with varying needs and capacities. As of October 2015, the Network includes 287 cities and communities in 33 countries, covering over 113 million people worldwide.

Age-friendly initiatives generate more physically accessible and socially inclusive environments that can help ensure quality of life and dignity for all people as they age. The WHO introductory guide outlines the requirements for needs assessment and action in specific areas: (i) outdoor spaces and buildings; (ii) transportation; (iii) social participation; (iv) civic participation and employment; (v) respect and social inclusion; (vi) communication and information; and (vii) community and health services. Cities now have a tool for tracking their progress (244). They now have a tool for monitoring progress in their age-friendliness and evaluating outcomes. The WHO Centre for Health Development has developed a framework and indicator guide that articulates core indicators as an approach to measuring physical accessibility, social inclusiveness, quality of life and, importantly, equity (245).

All relevant government departments are called to collaborate on the development and implementation of a comprehensive action plan. The establishment of a mechanism to involve older people throughout the whole development process is also an essential feature of becoming an age-friendly city.

Opportunities to make cities age friendly exist at many levels. In Brazil, for instance, a federal law enacted in 2012 established the directives for a National Policy on Urban Mobility. By the end of 2015, Brazilian municipalities with over 20 000 inhabitants are required to present their Municipal Plans on Urban Mobility. This presents a unique opportunity to develop urban transport policies that are guided by the principles of universal design and by the aspirations of their residents, both young and old. Age-friendly city initiatives have also led to aligning policies on ageing between states and municipal governments (246). In some instances, such as the state of Sao Paulo, Brazil, and the province of Quebec, Canada, the age-friendly city initiative has been foundational for the ageing policy at the state and province level.

Ultimately, an age-friendly city requires action at the local level. In late 2010, the mayor of Bilbao, Spain, joined many other mayors in committing to create an age-friendly city. Since then, the city has carried out numerous interdepartmental, cross-sectoral initiatives in partnership with the community. As in many other cities, transport accessibility is one of the city's top priorities. Access to alternatives to private motor vehicle use for transport and mobility is considered an essential feature of age-friendliness in the city. It offers a sustainable way of enabling older people to move about in the city to access essential services and to go where they want. In the case of Bil-

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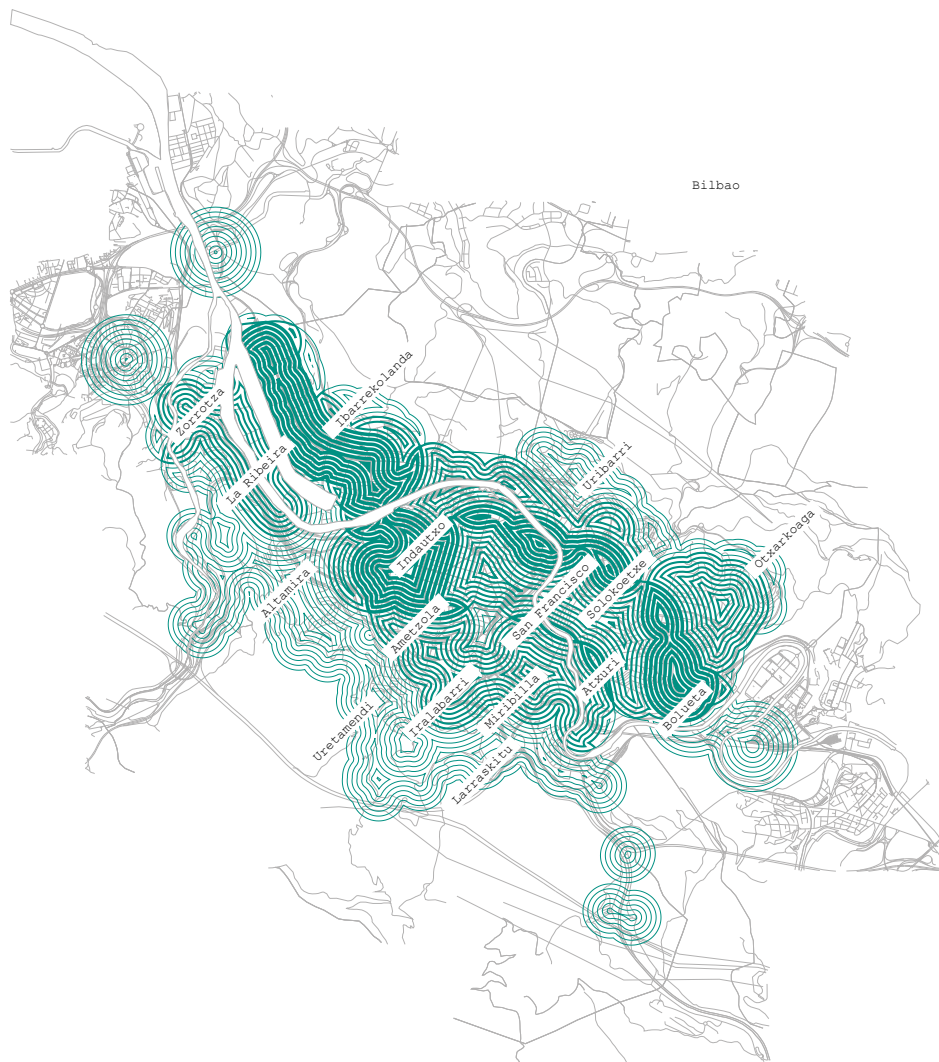
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Figure 27.
Map of areas that are within one or more alternative transport networks in Bilbao, Spain, 2015

Notes: Green areas are within walking distance (500 metres) of all three alternative transport networks: urban bus and tram stops; subway stations; and bicycle lanes. Yellow areas are within walking distance of two of the three networks. Orange areas are within walking distance of one of the three networks.

Source: Bilboa City Council 2015 (247).

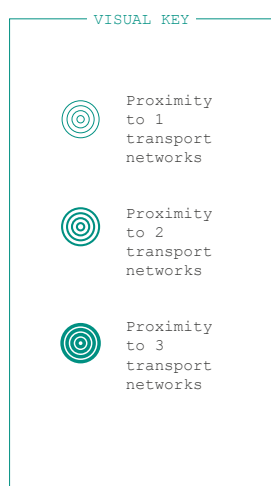
bao, the City Council focused on improving access to two or more alternative transport networks, including bus and metro systems and bicycle paths, within walking distance (defined as 500 metres) (Figure 27). Currently, about 84% of the population enjoys this level of accessibility, but the city is aiming for 100%.

PLANNING FOR RESILIENT URBAN ENVIRONMENTS

It is seen with increasing clarity how the environments where we live can affect our health, both in the short term and in the longer term. From the homes we live in, to where those homes are located and how we move about the city, the impact of those factors on our health is clear. These are all manageable parts of a complex urban environment that city planners grapple with when trying to design prosperous and healthy cities. In today's cities, and for the planet as a whole, there are a number of shocks to the environments that we live in, many occurring with greater frequency and impact. These shocks come in many forms, including both natural and man-made disruptive forces that can cause immediate as well as long-term harm. Many of them are social in nature, ranging from age-old problems such as violent conflict to modern problems such as stock market flash crashes. These types of shocks are often visited upon the economy and the social fabric of a city, with important implications for health. Natural phenomena, including floods, earthquakes and heat waves, among other exogenous natural forces, will impact both the built and social environment. They can destroy infrastructure. They are also exacerbated by the ways our cities are built. Rising temperatures pose both the challenge of gradual disruption as well as significant events, such as heat waves and fires. In recognition of these phenomena, cities are joining a global movement to become more resilient to these impactful events. In 2015, the global movement culminated in the 2015 Sendai Framework for Disaster Risk Reduction, a landmark document signalling the global community's commitment to reducing the impact of disasters, importantly with emphasis for action on health.

Multilateral organizations, foundations, foreign assistance agencies and legions of cities champion urban resilience as a way to help urban populations to absorb these shocks when they happen. Resilience takes on many definitions. They all generally adhere to the principle that while these shocks are difficult to prevent altogether, their impact can be mitigated. In the context of the built environment and its relationship with urban health, natural disasters are highly pertinent. This chapter focuses on two in particular. First, heat waves and urban heat island effects increasingly affect city populations as global temperatures rise and urban environments continue to have heat-producing and heat-trapping features. Second, flooding continues to impact more people worldwide than any other natural disaster. Many cities are situated near bodies of water and the features of their modern construction often cause the city to retain water, rather than ushering it away. While global temperatures and water levels are not significantly modifiable by city leaders, these are two important areas in which cities can be planned and constructed to mitigate their effects on their populations.

ESP



RESILIENCE TO HEAT WAVES AND URBAN HEAT ISLANDS

PVRTY

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In 2014, the global community experienced the hottest year on record and 2015 is on pace to surpass those levels. Nine of the 10 warmest years in recorded history have occurred after 2000 (248). There is little doubt that global temperatures are rising, and now with 2014 being the 38th straight year of above average temperatures, it seems clear that higher temperatures are the new normal. The global rise in temperatures is one of the most evident impacts of climate change and has significant heat-related health effects, including increased mortality and morbidity.

HLTH

3

Excessive exposure to heat is a serious health risk, with possible effects ranging from mild illnesses such as rashes and fatigue to serious disorders such as cramps, heat exhaustion and heat stroke and even death (249). A heat wave that struck Europe in 2003 resulted in the deaths of 70 000 people (250). Subsequent heat waves across the world have also claimed thousands of lives; a 2010 heat wave in the Russian Federation led to 55 000 deaths (251). Most recently, heat waves that hit India and Pakistan from May–June 2015 led to over 3000 deaths (252). Climate change and the consequent increase in greenhouse gas concentrations are expected to result in more frequent, persistent and intense heat waves.

WATR

6

Cities experience discernibly higher temperatures than rural areas due to what is called the urban heat island effect, the result of a combination of factors emerging from the urban built environment and human activity. Cities are composed of streets, rooftops and other nonreflective structures that absorb the sun's rays and heat. These surfaces retain heat and re-release the heat into the city environment, raising temperatures. Many cities lack sufficient trees and other types of vegetation that provide shade from the sun's rays and dissipate heat with evaporated water. People living in cities are more likely to contribute to harmful feedback mechanisms that increase city heat levels. Urban residents are more dependent on air-conditioning, cooled water and artificial lighting in shaded offices and rely more on private motor vehicles. However, by using these modern conveniences, residents increase the generation of anthropogenic heat waste and carbon emissions, further contributing to the urban heat island and global warming. The use of air-conditioners, in particular, is a difficult problem to resolve – in conditions of extreme temperatures, one person's air-conditioner can keep them from suffering from heat effects, but the air-conditioner would be exacerbating the overall heat of the city. A recent study found that a city running air-conditioners at night can experience an increase in temperature of up to 1 degree Celsius (253).

INEQ

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CITY

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Heat island effects can make cities on average up to 1–3 degrees Celsius warmer than rural areas, and as much as 1–2 degrees Celsius warmer in the evening (254). This leads to chronically higher temperatures in urban areas. Evidence indicates that when a heat wave strikes, the event intensifies the heat island effect (255), and the temperature gap between urban and rural areas widens. The combined impact of the urban heat island effect with a heat wave can be devastating, as heat waves expose people to elevated temperatures over a prolonged period of time. In the case of the 2003 European heat wave, it lasted as long as a week in some places.

CLIMT

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Vulnerability to heat depends on climate factors (such as the intensity and frequency of heat waves) as well as on individual medical, behavioural and environmental risk factors (256). People at increased risk primarily include older adults as well as infants, those confined to bed and/or unable to care for themselves and those with

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Design healthier, more sustainable cities

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Source: WHO/Anna Kari

pre-existing cardiovascular and pulmonary disease. Older adults are at especially high risk because ageing decreases tolerance to heat; thermoregulation is impaired with age. In addition, older adults often suffer from comorbidity (other diseases) and physical and cognitive impairment (249). They often take multiple medications, and certain medications – in particular, ones that affect organs involved in thermoregulation – can increase the risk of heat-related illness or death. Children and infants have a limited ability to thermoregulate because of their high volume to surface ratio and because they depend on their caregivers for the thermalregulation of their environments. Social isolation tends to be an important risk factor for heat-related health illnesses. Studies in the wake of the Chicago, USA, heat wave of 1995 and the European heat wave of 2003 suggest that isolated residents – who are more likely to be the elderly, poor or disabled – are more vulnerable to the effects of heat (257). In addition, isolation has been found to be a stronger predictor of heat-related illnesses than wealth or age in some studies (258).

The impact and causes of urban heat waves and urban heat islands are intricately linked and require concerted efforts on the part of municipal governments, civil society and international organizations to strengthen urban resilience to heat through adaptation and mitigation strategies. Resilience to heat waves and urban heat islands can be strengthened by strategies that address the short-term effects and by efforts to mitigate the broader challenges of urbanization and global warming. Ways to adapt include raising public awareness on health risks of heat waves, developing early warning systems that provide advance notice to the public about predicted high temperatures and increasing capacity among health-care workers to recognize and treat heat-related illnesses.

Longer-term initiatives must be aimed at altering the use of urban spaces and building materials in cities. City planners can intervene to encourage people to be more responsible. There are reflective, permeable pavements that can replace impermeable surfaces in cities and reduce urban temperatures (259). They can increase the share of space allocated to green spaces. They can enable residents to reduce anthropogenic heat generation.

IND

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RUS

In response to the rising threat posed by heat exposure, many cities around the world have worked to strengthen resilience to heat. Some cities have targeted interventions on rooftops. Toronto was among the first in the world to adopt a policy mandating green roofs for buildings of a certain height (260). Los Angeles has similarly mandated that buildings adopt lighter coloured reflective roofs. Paris has passed legislation to pursue green roofing and solar panel roofs. These alternative roofs can help to cool the building and reduce the overall heat retention of the city, however, recent findings indicate that reflective roofs may disrupt helpful cloud cover and they do little to cool surface temperatures at street level.

Strategically allocating more of the city to green spaces and parks can potentially have greater effects. Recent studies have shown that parks and densely planted streetscapes were up to 3–4 degrees Celsius cooler than the surrounding urban landscape at mid-day (261). Studies have also demonstrated that non-wooded parks can be even cooler than tree-filled parks at night as they allow the flow of air and the release of heat (261). Some examples include a study of 92 parks in Japan found that parks needed to be larger than two hectares before a significant temperature difference could be detected.

Increasing the amount of green space in cities can pay dividends to health by enabling physical activity, but increasing the number of green spaces allocated to larger parks could also yield significant benefits by reducing urban heat. In Manchester, England, researchers have estimated that a 10% increase in green cover would keep surface temperatures stable, even with global climate change predictions for the next 70–80 years. And Stuttgart, Germany, has developed a green infrastructure strategy to mitigate urban heat island effects. The city has widened open spaces covered with vegetation to create corridors that allow large-scale air flows to reduce temperatures, bringing cooler air in from the mountains and sweeping hotter air away.

URBAN PLANNING AND FLOOD RESILIENCE

As the most common natural disaster and the second leading cause of natural disaster fatalities worldwide, floods in particular have a significant health impact (262). Flooding accounts for over two thirds of people affected by natural disasters (263). Between 1994 and 2013, approximately 2.4 billion people were affected by flooding (264) that damaged more housing, schools and hospitals worldwide than any other type of disaster. Climate change and the consequent rise in sea levels, changing rainfall patterns and increase in storm surges are expected to increase the number of floods globally. The primary health effect of floods is drowning, which accounts for two thirds of flood-related mortality. Other health concerns include injuries, physical trauma, heart attacks, infectious diseases, stress and loss of essential services (265).

Cities are especially vulnerable to flooding and its impacts. Urban flooding risks stem from a number of factors: (i) the predominance of impermeable surfaces that cause water run-off; (ii) the general scarcity of parks and other green spaces to absorb water flows; (iii) rudimentary drainage systems that are often clogged by waste and quickly overloaded with water; and (iv) the ill-advised development of marshlands and other natural buffers (266). Given the projected rise in sea levels due to the effects of climate change, coastal cities, in particular, are exposed to flooding. In a more detailed look at the hazards faced by port cities with over 1 million population, an OECD study estimated

that, in 2005, about 40 million inhabitants were exposed to what is called a 100-year coastal flood event – a flood of significant magnitude that was once a rare occurrence (267). The study estimated that, by 2070, climate change, subsidence, population growth and urbanization would increase this figure to about 150 million (263). The urban poor are disproportionately affected by the impact of flooding because they often live in hazardous areas, lacking adequate housing, services and financial means. For example, it is estimated that in metro Manila, some 800 000 people, mostly informal settlers, live in high-risk areas. In Jakarta, Indonesia, spatial analysis of slum settlements and flood-risk areas shows strong correlation between informal and high-risk areas (268). The urban poor are more exposed to the environmental hazards caused by flooding because the housing they can afford tends to be located in riskier areas (266).

An integrated strategy for managing flood risk can help cities face current and future flood risk, and many tools and techniques are available to help them do so. Urbanization can be a positive force to build resilience and protect the most vulnerable.

The impacts of climate change on poverty will most significantly affect the urban poor and highly vulnerable countries in sub-Saharan Africa and South Asia, where the number of exposed poor may reach 325 million by 2030 (268). Urban planning and design that takes into account hazardous areas, location of vulnerable populations and of critical assets (such as schools and hospitals) can decrease the vulnerability of infrastructure and in this way protect unnecessary human loss and economic damage. As the poor are traditionally more reliant on public infrastructure, risk-conscious urbanization can play an important role in supporting poverty reduction and protecting the lives and livelihoods of urban dwellers. Flood risk management should be part of a broader agenda to make cities more liveable, sustainable and resilient. Promoting responsible urban governance, planning and development are vital for strengthening flood resilience.

In responding to flooding disasters, many cities worldwide have employed strategies that strengthen flood resilience. The flood risk management strategies of the

Source: WHO/Anna Kari



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city of Hoboken, New Jersey, implemented in the aftermath of Hurricane Sandy have been recognized by the United Nations Office for Disaster Risk Reduction (UNISDR) as a Role Model City of the Making Cities Resilient campaign (269). These strategies included plans to retain over 1 million gallons of storm water through green infrastructure initiatives such as building of “resiliency parks” as well as an emphasis on land-use regulations and public awareness of flood risks. Since the 2005 floods in Mumbai, the city has also worked to enhance its resilience to flooding through structural improvements such as widening, deepening and enhancing the capacity of the Mithi River, the flood plains that house a large number of vulnerable informal settlements (270). In addition, warnings are issued if rainfall intensity and the water level exceed critical points. Mumbai has made rainfall harvesting compulsory for larger new buildings, a concrete policy decision that municipal governments can take to reduce the burden on drainage systems and reduce the impact of flooding. UNFPA estimates that while the number of disasters attributed to flooding is on the rise, the number of people killed due to flooding remains steady (263). Moreover, the overall number of deaths due to all natural disasters is decreasing. This has been attributed to investments made in disaster preparedness, adaptation and mitigation, further demonstrating the important role effective leadership on urban resilience can play in reducing the health impact of flooding.

SUMMARY

This chapter explores the ways in which cities have grown into their modern forms and their impact on the health of their residents. In many of the fastest growing cities, more recently in the developing world, planners have struggled against the challenges of unmanageable growth. In many cities, planners have kept pace with growth, and built expansive cities fit for motor vehicles and commerce. Many of these cities have found great success. However, their residents too often live in single- or limited-use neighbourhoods, with long distances to work and lack of green spaces and other essentials of daily living. Residents of these cities often fall into sedentary behaviours, poor nutrition and mental health issues, among other precursors of NCDs. Rampant air pollution and traffic accidents are also common features of these environments. Moreover, many of these environments have not been built to adapt to demographic change and the changing climate.

These challenges can be met. This chapter discusses the ways whereby cities can adapt their current forms and be built for future urban populations to enable healthier living. Healthier urban designs can keep city residents mobile, but also keep them active and eating healthier. They can facilitate residents to spend less time in their motor vehicles and more time being productive or improving the quality of their lives. Cities can adapt to enable residents to age well in their communities. They can adapt to the changing climate. These are all achievable, while keeping cities economically dynamic and progressing forward.

CHAPTER 8 — TRANSFORM URBAN MOBILITY

KEY MESSAGE • Urban transport can be transformed to be healthier, safer and more sustainable.

Cities promise to bring people closer to the things they need to live their daily lives. In this way, cities deliver access. They grant better access to jobs, food, health-care providers – everything people need, including other people. Mobility is often a high priority for urban and national policy-makers because of its role in enabling economic activity and growth. Cities deliver access by densely clustering people around their needs, or offering pathways to access these needs. However, as seen in the previous chapter, more and more cities are spreading out as they grow. City densities are declining. As cities sprawl, people living in cities become increasingly further from their daily needs. Thus, for too many people, private vehicles become almost a requirement of city living.

For this and other reasons, cities are becoming more motorized. Private motor vehicles have been a tool of enablement, and for many they still are. They can be convenient. They can shepherd people from where they are to where they want to be. Motor vehicle ownership has become an aspiration now achieved by hundreds of millions of people worldwide. The annual number of new cars sold has increased from 39 million in the 1990s to 63 million in 2012 (271). As national economies grow, evidence indicates that motor vehicle ownership tends to increase (272). Five years ago there were an estimated 1 billion motor vehicles worldwide. In another 20 years, there are expected to be 1.6 billion cars, light trucks and other motor vehicles. By 2050, this number will exceed 2.1 billion. Most of the increase will be in Asian countries, especially China and India (273). Within countries, as incomes rise, cities tend to sprawl more, while rising incomes for people are associated with increased vehicle travel (272). Figure 28 charts the per capita income against motorization rates for selected cities and countries across all regions, demonstrating the positive correlation between income and the number of cars per capita.

Whether out of necessity or for convenience, transportation in the world's cities is increasingly moving towards private motorized transportation. This trend may grant increased mobility and access to many individuals who need it, but for them and the people they share the city with, it also brings the potential for substantial hazards to health. As discussed elsewhere in this report, increasing use of motorized transport and urban sprawl are commonly associated with more sedentary behaviour, which has been shown to be closely associated with the rise of NCDs in cities.

The rising use of personal motor vehicles in cities contributes significantly to urban air pollution. Outdoor air pollution has short- and long-term health consequences for people exposed to it. There are also serious consequences for the urban environment, the whole planet and the global population due to the creation of greenhouse gases from vehicle emissions. Urban travel currently constitutes more than 60% of all kilometres travelled globally and is the largest single source of global transport-related emissions and the largest local source of urban air pollution (229).

Increasingly motorized cities are also exposing residents to significant risk of road traffic injuries and death. WHO estimates that at least 1.25 million people are killed in road traffic accidents per year (274). There are twice as many people killed by road traffic accidents than are killed by malaria (275). These numbers are trending upward with countries continuing to urbanize and private cars becoming an increasing share of urban transport.

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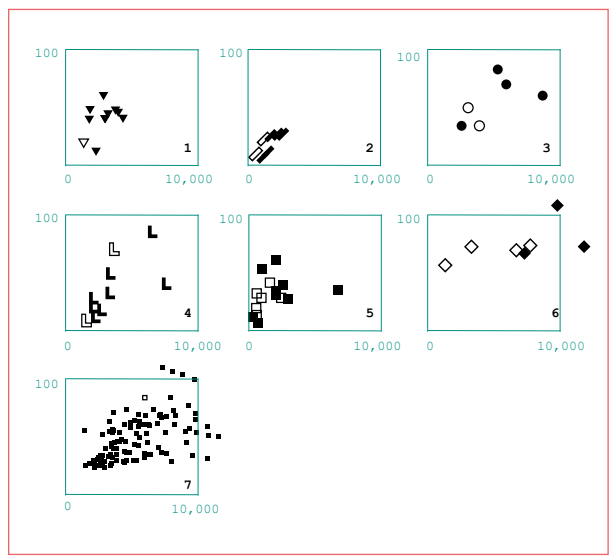
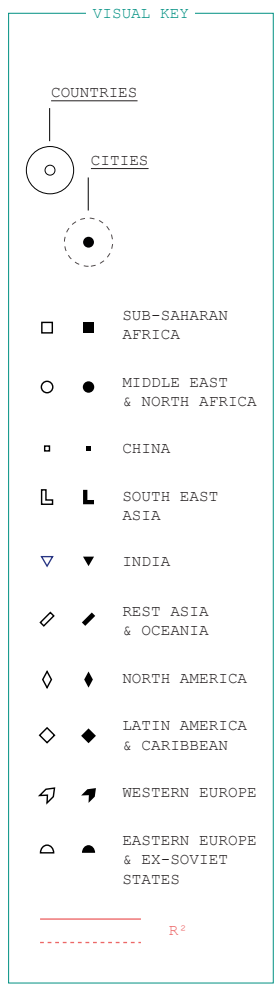
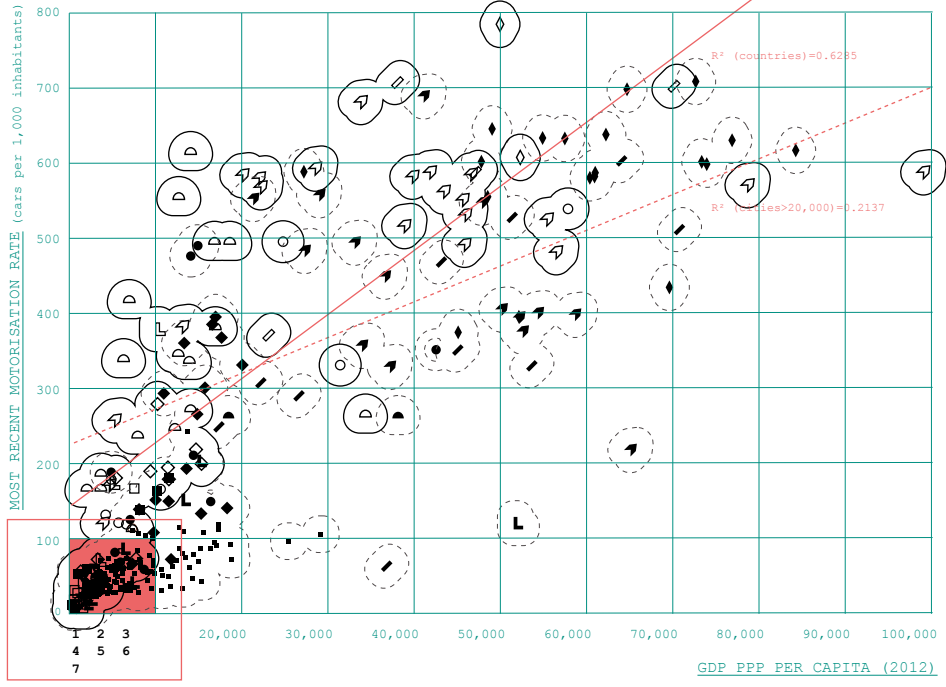


Figure 28.
Wealth and car ownership levels

Source: Rode and Floater 2014 (229)

This chapter discusses urban mobility and the evidence of its impact on the health of urban residents. These are significant, growing challenges for city leaders, yet they can do much to bring them under control and improve health. Cities can deliver on the promise of access for their residents and reduce the health risks of urban mobility. There are attainable solutions that can make cities more accessible and safe, even for cities that are already sprawling. While national-level policy-makers are often in the best position to set limits on fuel quality standards and vehicle emissions, this chapter looks at solutions in need of local-level leadership.

URBAN TRANSPORT AND AIR POLLUTION

City- and national-level decision-makers have long sought to enable urban mobility. Infrastructure investment has supported the construction of highways, ever-widening roads, parking facilities, bridges and railways to make motorized movement possible throughout our urban spaces. As dependence on motorized infrastructure has grown, it is also necessary to wrestle with the downsides that come with this dependence. These downsides have been manifesting for decades. Even as far back as the 1950s, motor vehicle emissions containing tetraethyl lead were identified as a global health menace. Since then, in most places leaded gasoline has been regulated out of fuel markets, but motor vehicle emissions that remain harmful to human health have otherwise continued to grow.

It has taken decades to develop, but the capacity to measure the magnitude of vehicle emissions has grown considerably. It is understood that cities are the most significant contributors to greenhouse gas emissions on a global scale. At least 70% of global carbon dioxide emissions are produced within cities (4). Much of the urban share of global greenhouse gas emissions can be explained by the motorization of transportation in cities, the fastest growing source of greenhouse gas emissions in the world (276). Within cities, transportation is already the largest source of urban air pollution (229). In developing countries cities, transport accounts for 80% of all outdoor air pollution (277).

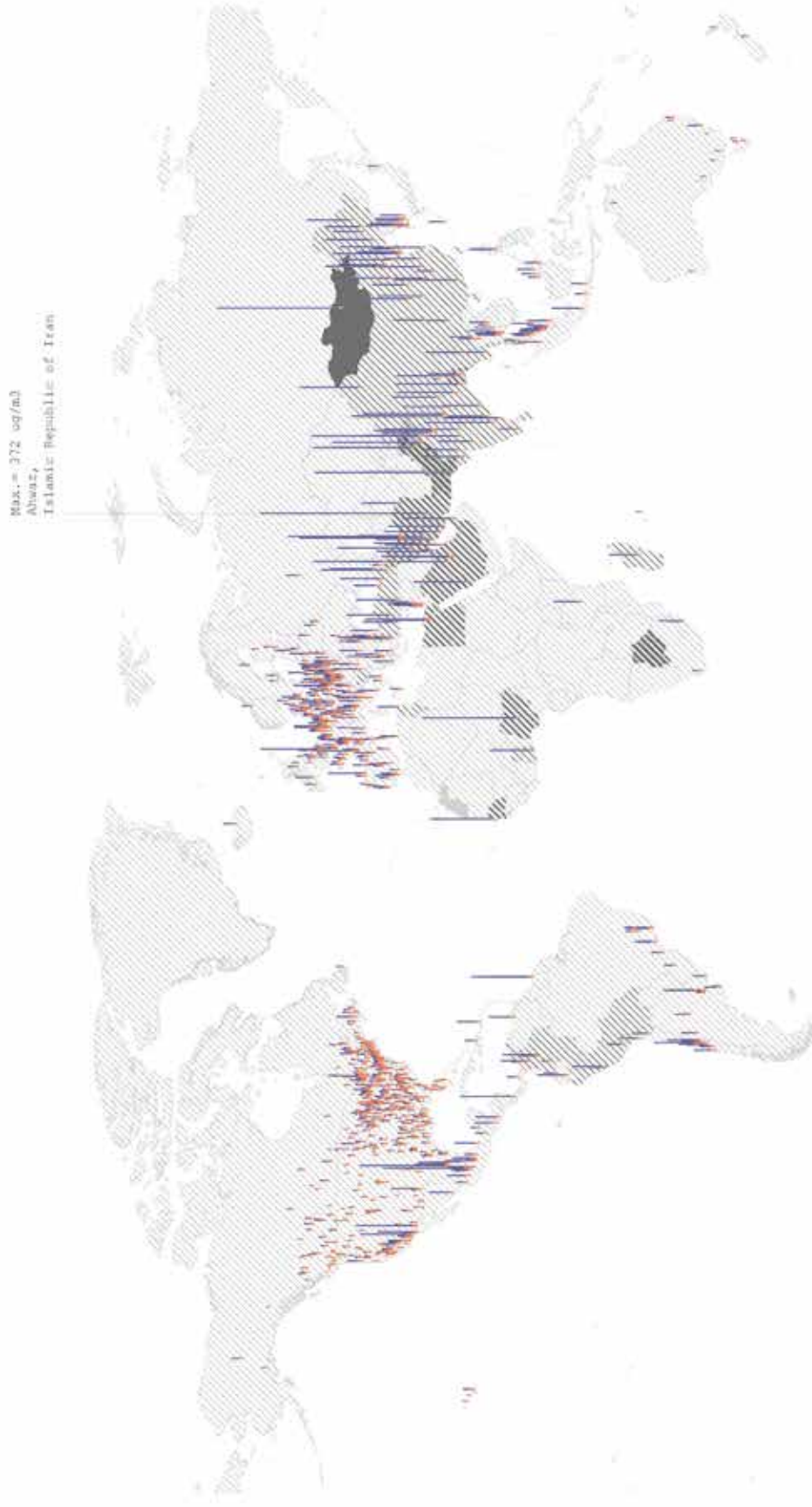
Intensifying greenhouse gas emissions emanating from cities have important implications for the health of people living in cities everywhere, as well as for the global community. WHO set guidelines for acceptable levels of ambient air pollution, above which air pollution should be considered harmful to human health. Monitoring the air quality in 1600 cities in 91 countries, WHO found that only 12% of the monitored populations were living in cities compliant with air quality guideline levels (278). Worse yet, in larger cities less than 4% of monitored populations live in cities compliant with the guidelines (279). Figure 29 maps 1600 monitored cities, colour coded for their respective levels of air pollution with darker colours indicating higher pollution levels.

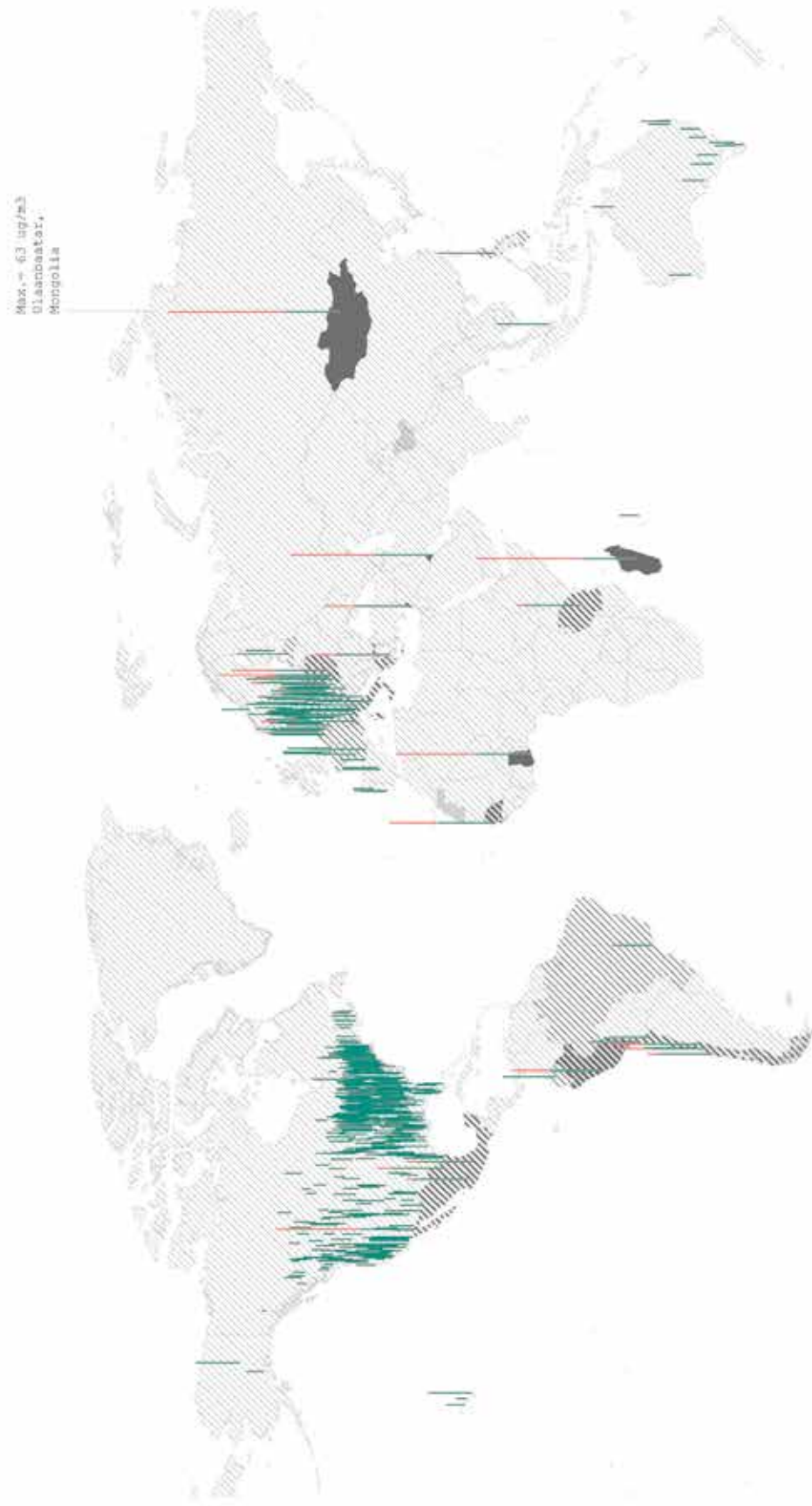
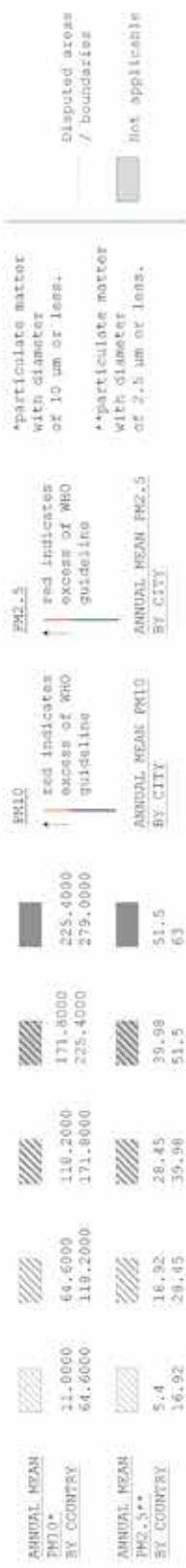
City life exposes residents to relatively higher air pollution levels, and puts them in close proximity to the source of the pollution. Research from the Health Effects Institute (HEI) finds that health impacts of vehicle tailpipe emissions are strongest within 300–500 metres of major roads (281). Proximity to major thoroughfares is a common feature of city living. For example, HEI predicts that between 37% and 45% of the city populations in the USA live within 500 metres of major roads. In New Delhi and Beijing, approximately 55–60% and 77–86% of the total city populations, respectively, live within 500 metres of a major roadway (282).

The health consequences of heavy air pollution found in cities are severe.

Figure 29.
Global map of air pollution
levels in 1600 cities

Source: World Health Organization
2014 (280).





Outdoor air pollution is strongly associated with the top five causes of death worldwide. Exposure to air pollution is associated with ischaemic heart disease, stroke, chronic obstructive pulmonary disease, lung cancer and lower respiratory infections in children. WHO estimates that outdoor air pollution was responsible for the premature deaths of 3.7 million people worldwide in 2012 (283). Recent estimates have indicated that as many as 3.3 million people die prematurely every year from exposure to fine particulate matter (284) – the type of air pollution that is most strongly associated with motor vehicle exhaust and other forms of combustion. These numbers are on the rise. Deaths attributable to air pollution to which motor vehicles are an important contributor grew by 11% (285). Even in the European Union, where many cities are compliant with particulate matter guidelines, it is estimated that life expectancy is 8.6 months lower than it would otherwise be (283).

INCREASINGLY MOTORIZED CITIES AMPLIFY RISK OF ROAD TRAFFIC INJURIES AND DEATHS

One of the most tragic consequences of the motorization of urban transport has been the rise of road traffic crashes. Road traffic injuries have emerged as the eighth leading cause of death in the world. They are also the number one killer of young adults ages 15–24 (285). Over the last 20 years, the number of deaths attributable to road traffic accidents has increased by 46%. If left unchecked, road traffic fatalities are expected to continue to climb. Without intervention, WHO expects the global burden to increase to 1.9 million people and become the seventh leading cause of death in the world by 2030.

The weight of this burden is most strongly felt in LMICs, where nine out of 10 of these fatalities occur (286). Low-income countries have the highest annual road traffic fatality rates at 24.1 per 100 000. The fatality rates in the middle-income countries are 18.4 per 100 000 (274). Even within high-income countries, people from lower socioeconomic backgrounds are more likely to be involved in road traffic crashes than their more affluent counterparts.

Figure 31 depicts road traffic fatality rates in a selection of cities. It highlights the great extent of the challenge in relatively unsafe cities. It also calls attention

Figure 30.
Top 10 causes of death among people ages 15–29, 2012

Source: WHO 2015 (274).

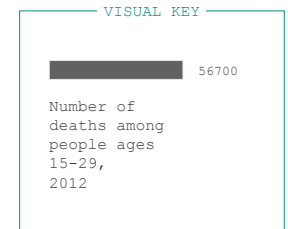
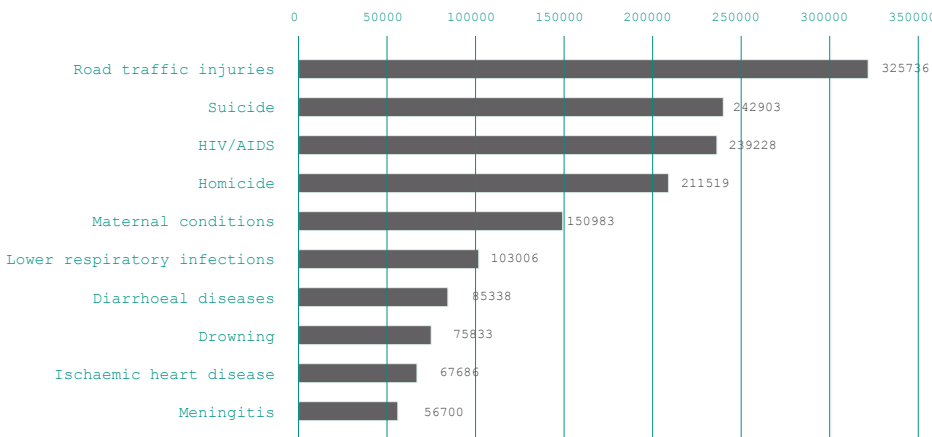
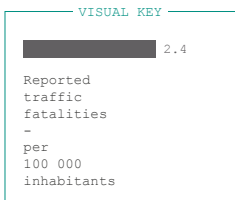
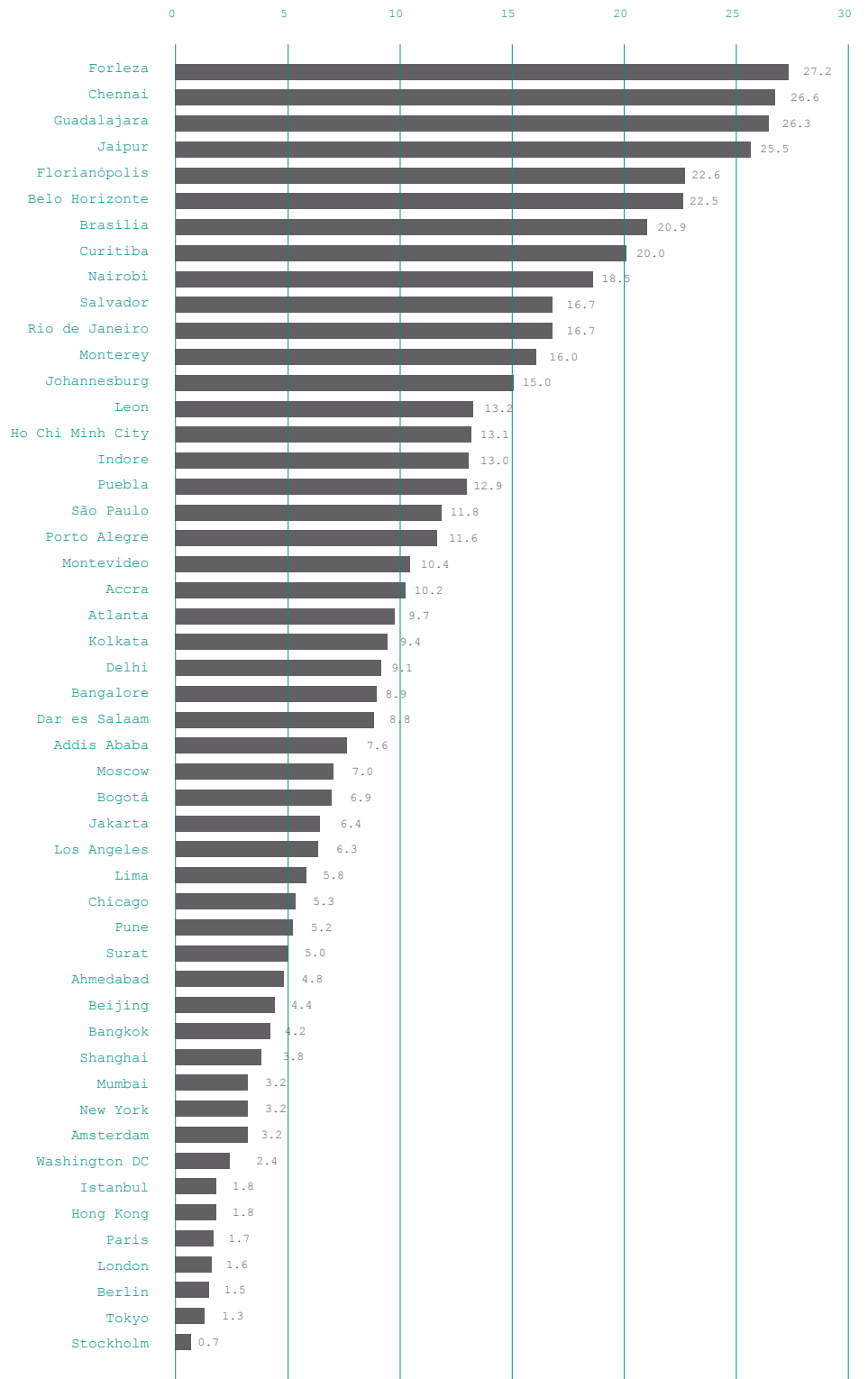


Figure 31.
Reported traffic
fatalities per 100 000
inhabitants in selected
world cities

Source: Reproduced with permission from Welle et al. 2015 (287).



to the clear contrast between cities that are struggling with road traffic safety and those that have been more successful. The differences between these cities could be wider still, as high-burden cities may have road traffic fatalities that go unreported (285). Perhaps most importantly, it demonstrates what is attainable. Progress on road traffic safety is achievable. Today's Chennai could be tomorrow's Stockholm. The next chapter considers how cities can enable people to be mobile and accessible, while controlling the transportation's negative impacts on their lives.

ENABLING VIABLE ALTERNATIVES TO REDUCE POLLUTION AND IMPROVE HEALTH

Everyone deserves the right to safe, convenient passage to the places they need to go for their daily needs. It is the role of the city to enable its citizens to do so efficiently and safely. Increasingly, city residents have chosen private motorized means to achieve this, and cities have played an enabling role with investments in infrastructure and policies. In many places, these choices help to shape mobility policy and city planning for motorized surface travel, but not for the health and safety of the passengers of these vehicles, or the other residents of the city who are exposed to the hazards motorized transport create. Reducing the impact of vehicle emissions and road traffic crashes on people living and working in cities is critical. It depends on reducing the number of vehicles on the road and the kilometres they travel as well as making the vehicles and roads safer for everyone. Initially, this requires cities to facilitate the use of desirable, safer alternatives. For many growing cities, particularly the relatively smaller secondary cities where most urban growth is projected to occur, there is a prospective opportunity for cities to plan around healthier alternatives. For many cities, growing or not, transportation infrastructure is in some or large part “locked in”. The usable lives of many highways and wide thoroughfares cutting through and around cities project long into the future. Many consider it too expensive to replace existing infrastructure, for example, with mass transit options. However, even cities that are in the near term locked in to their current infrastructure can make adjustments to help make transportation healthier and safer.

Cities that have been planned for transit-oriented development, with multi-use spaces and residences clustered around mass transit options and walkable spaces are ideal, and many cities around the world are already on this path. Many other cities have growth projections that offer opportunities to plan and build new areas of the city with this kind of approach. When people can access what they need on foot or bicycle, or quickly and conveniently by mass transit, operating a motor vehicle becomes a less desirable choice. For many cities that are already committed to private motorized surface transport, this kind of dynamic may seem out of reach in the short term. For these cities, the arrival of BRT, an older mode of transport adapted for the modern city form, presents a compelling solution.

BRT can reduce vehicle dependency, improve mobility and accessibility and decrease exposure to air pollution in cities. It is a solution designed to make use of existing city street infrastructure to make transit by bus faster and more convenient. Using the existing streets to deliver mass transit saves on costs and disruption over the construction of surface rail and subway options. BRT capital costs can be 4–20 times lower than light rail systems, and 10–100 times lower than metro systems with similar



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Daily Commute

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capacity and service level (288). It can be implemented in cities that are already locked in to motor vehicle-dependent transit by reallocating existing lanes. BRT creates segregated lanes for the buses, mimicking the traffic-free experience of urban travel by rail, with competitive speed. Raised BRT platforms make on-boarding and off-boarding more efficient, particularly when the system allows for automated payment of fares.

Where it has been implemented, BRT has a demonstrated impact on air pollution and city residents' choices for transit options. For instance, a study of Trans-Milenio, the BRT system in Bogotá found that the system has measurably reduced greenhouse gas emissions in the city (289). Before and after measurements on one of the system's main corridors, Avenida Caracas, showed a 43% reduction in sulfur dioxide, an 18% reduction in nitrogen dioxide and a 12% reduction in particulate matter. The pre-post study found that the BRT system abated air pollution levels by 9.2% overall in the city, demonstrating stronger results than the policies to regulate personal vehicles and their emissions. Mexico City's Metrobús BRT system has reduced commute times by 50% (Box 13) (290). In doing so, the economic gains from reducing commute times for nearly 1 million users have been greater than the infrastructure cost of building the new bus system. Nearly 10% of trips on Istanbul's Metrobus system are a substitute for travel by private motor vehicles. The Metrobus has saved surveyed users nearly one hour of commute time per day, and nearly 40% of users choose walking as their mode of transport from the bus, while more than 20% of all users walk more than 10 minutes to and from the bus. The WHO Health Economic Assessment Tool (HEAT) model estimates that walking trips alone have saved more than 25 premature deaths per year. BRT systems are gaining momentum in cities worldwide, with systems currently implemented in 195 cities (291). China as well as the USA have implemented BRT systems in 19 cities. Even in the car- and rail-dominated USA, a Government Accountability Office evaluation found that BRT systems were able to increase bus ridership in one year, reduce commute times by up to 35% and were perceived to have contributed to economic growth with development along the BRT lines (292).

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Box 13.	Remaking transportation in Mexico City
<p>Mexico City is an economically ascendant city, home to a sprawling population of more than 20 million people. In its densest spaces, such as the <i>distrito federal</i>, 9 million people live in a 570 square mile space choked by traffic caused by 3 million cars (293). One third of these cars are at least 20 years old. Most of Mexico City's residents live at the outer reaches of the city, living along ever-stretching corridors into lower density settlements. This becomes an incentive for greater usage of cars and inefficient and informal means of public transportation. Traffic plagues the commute times of these residents, and the distances</p>	<p>they travel to get to daily needs is elongating. Daily trips can take up to three hours. The average vehicle kilometres travelled by the metropolitan population rose 36% from 1990 to 2010 (294). This has led to unacceptably bad air pollution. Studies estimate at least 2700 premature deaths per year in the metropolitan area due to air pollution (295). Mexico City has taken major, progressive actions in the last 10 years to improve transportation and air quality conditions. It has built five high-quality BRT corridors since 2005, which serve more than 900 000 passengers per day. Research shows that</p>

about 10% of passengers switched to using the Metrobús BRT from private motor vehicles (290). The Metrobús system's substantial emissions benefits are expected to eliminate an average of 6100 work loss days, 660 restricted activity days, 12 new cases of chronic bronchitis and three deaths per year (296).

In 2010, the city also implemented the Ecobici public bike sharing programme, with 271 stations, 100 000 members and 10 million yearly trips. This system is conveniently located throughout the central business district mass transit stations thus helping to expand the service area of public transportation. The Mexico City government has integrated the payment systems for the metro rail network, BRT and the bike share system.

Public spaces have been improved, including revitalizing Chapultepec Park, the city's 680 hectare (1690 acre) urban oasis that now sees 18 million yearly users. On Sundays, the city hosts a Ciclovía, a time when roadways are shut down to cars for jogging, strolling and bicycling.

In addition, the city has pedestrianized key streets in its historic centre, added protected bicycle lanes, implemented traffic calming at high-traffic pedestrian areas and developed *parques de bolsillos*, or pocket parks, in underused street space. All of these actions have been important in helping residents choose to be more active.

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Cities should also work towards making active mobility a desirable alternative for residents to choose over motorized transport. Enabling residents to walk or cycle for daily needs offers a substitute for motorized transport and facilitates physical activity. The choice may be easier for residents of more compact cities where more of their needs are already nearby. Walking and cycling in these environments may simply be the most efficient choice for residents. Even in relatively more compact cities, some destinations may lie sufficiently far away that making the choice is less clear for residents. Both convenience and safety are important considerations for the traveler and, for some, the benefits of physical activity and reducing air pollution may motivate them. Cities can make planning decisions that can make active transport a more persuasive choice for the traveler.

Cities can plan roadways and other corridors to assure safety for bicycle riders and pedestrians. Many street designs have favoured motorized commuters, granting them the greatest share of the road. Typically, projects to widen roads are intended to give a still greater share of the new road to motorized transport. Without adequate dedicated space for active commuters on transportation corridors, cyclists must share lanes with cars and trucks, and walkers and runners may not be able to share the road at all. Dedicated bicycle lanes and other bicycle and walking paths create safe spaces, segregated from motorized vehicles and at reduced risk of accident and injury. WHO developed HEAT to help city planners to make the case for the economic value of active transport investments and policies. HEAT helps cities to estimate the benefits of various numbers of people walking or cycling various distances per day by modelling for reductions in mortality. The tool is increasingly being used in Europe and recently piloted in the USA. The United Kingdom has used it to justify sustained investments in bicycle pathways. The subsequent assessment by the United Kingdom government was that bicycle pathways were "value for money". In Modena, Italy, HEAT was used to assess the value of

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existing walking and cycling infrastructure, and it has subsequently been used to model the value of investments in additional cycle paths (297).

Planning for walking and cycling infrastructure may not necessarily cause people to give up their cars for bicycles and walking shoes, but it can enable those who may already be motivated, and may motivate those who may not have previously considered it. Cities with connected networks of dedicated infrastructure for cyclists tend to be safer, especially for the cyclists themselves. These cycling networks are recommended to connect residential areas to business and retail, schools, parks and mass transport through infrastructure that physically protects bicyclists. For example, after the Bogotá added 300 kilometres of bicycle paths from 1998 to 2000, the share of bicycle trips increased from a baseline of 0.58% in 1996 to 2.2% in 2002 (298). The city added another 100 kilometres of bicycle paths from 2003 to 2013 and the share of bicycle trips increased to 6%. Bicycle deaths have decreased by 47% during the same period, even as the number of cyclists increased significantly. Data from cities such as Minneapolis, Minnesota, and Portland, Oregon, in the USA and Copenhagen in Europe show that injury rates go down and more people bike when there is a connected network of dedicated infrastructure such as off-street trails and dedicated bike lanes (299). Portland developed a city-wide plan to increase bicycle transport, resulting in considerable increases in the miles of bicycle and boulevards bicycle parking facilities. The accident rate has decreased and the number of bicycle commuters has increased by 90% in the 10 years since the plan was implemented. Studies have shown that active transport is associated with physical activity and weight reduction at the population level.

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Box 14.	Bicycle sharing schemes
<p>Many cities throughout the world have introduced bicycle sharing systems in an attempt to tackle the growing challenges of obesity, climate change and traffic congestion. These low-cost rental systems are designed to encourage cycling for short urban trips and multimodality – the combination of cycling with other modes of transport – for longer trips (300). Barcelona’s <i>Bicing</i> scheme was introduced in 2007 to promote sustainable transport, create a new individual public transport system, promote the bicycle as a common means of transport, improve air quality and reduce noise pollution. By August 2009, 182 062 people had subscribed to <i>Bicing</i> (11% of the population in the Barcelona municipality), with 68% of trips being used</p>	<p>for commuting to work or school and 37% combined with another mode of travel. A 2011 evaluation of the health co-benefits of these schemes revealed an annual reduction in mortality of the Barcelona residents using <i>Bicing</i> compared with motor vehicle users of 0.03 deaths from road traffic incidents and 0.13 deaths from air pollution. Due to physical activity, 12.46 deaths were avoided. In addition, annual carbon dioxide emissions were reduced by an estimated 9 062 344 kilograms. Since the first implementation of a bicycle sharing system in Lyon in 2005, many cities across the world have introduced them. The biggest schemes to date with over 60 000 bicycles each, have been implemented in Hangzhou and Wuhan, China (229).</p>

SAFER URBAN MOBILITY

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One of the most important factors when increasing bicycling and walking in a city is ensuring that city residents can do so safely. In many urban environments, walkers and cyclists are vulnerable to motor vehicle traffic. Currently, 26% of road traffic deaths occur among cyclists and pedestrians (274). In some cities, it is as high as 75%. There are only limited studies on road traffic injuries in LMICs, where 90% of road traffic fatalities occur worldwide, however, the studies that have been conducted are grim. In a study of road traffic accidents in Indian cities, the research found that pedestrians and bicyclists accounted for at least 44% of road traffic fatalities, but ranged as high as 60% in Mumbai (301).

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Overall, reducing the number of motor vehicles and the distances they travel can lead to fewer road fatalities, with fewer vehicles exposing all road users to a risk of death or injury (299). Efforts to foster viable alternatives such as mass transport, walking and cycling can help achieve these results. As previously noted, this can include improving mass transport through BRT or other rapid transit as well as dedicated infrastructure for bicycling and walking, particularly by designing main roads to be safer places for all road users. Measures to improve and enforce behaviour such as curtailing drunk-driving are necessary and effective. However, reducing vehicle speeds on city roads is one of the most important measures that cities can take.

In urban areas, measures to reduce speed are critical to the safety of other road users. Vehicle speeds of 50 kilometres per hour are often considered to be best practice for urban speed limits. However, according to one conservative study, the fatality risk for pedestrians with vehicles travelling at 50 kilometres per hour is more than twice as high as the risk at 40 kilometres per hour and more than five times higher than the risk at 30 kilometres per hour (302). There is much corroborating evidence to support reducing speed limits to 30 kilometres per hour in order to calm traffic, especially in high density areas (274). In the United Kingdom, for example, 30 kilometres per hour zones in residential areas resulted in overall reductions of 15 kilometres per hour, and cut vehicle collisions with pedestrians and cyclists by 67%. Establishing and enforcing lower speed limits in urban areas can dramatically reduce road fatalities. Evidence indicates that a 1% reduction in average speeds can result in a 4% reduction in fatalities (303). Reducing speed limits to safer levels is imperative, but cities can also introduce additional measures to calm vehicle speeds and further ensure vehicle safety. The Safe

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Transportation in Bangladesh

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Transportation in Bangladesh

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System Approach, endorsed by WHO in the Global Plan for the Decade of Action for Road Safety 2011–2020, assumes that road users are fallible, crashes do occur and that it is up to road designers and planners to reduce crashes and mitigate their impact. Street design can significantly influence the speed of cars and injury rates. Introducing traffic calming devices such as roundabouts, intersections, traffic lights, cross walks, protected bicycle lanes, pedestrianized retail areas and safe school zones are among the many ways that cities can suppress vehicle speeds and protect pedestrians and cyclists from being exposed to risk (287). These measures are important to implement for all city dwellers. Even in high-income countries, people from lower socioeconomic backgrounds are more likely to be involved in road traffic crashes (304). The large-scale Bridging the Gap study on income disparities in road safety and walkability in the USA showed that traffic calming devices are significantly more common in higher-income neighbourhoods in cities (305). In higher-income communities, 8% of streets featured traffic calming devices, compared to 4% and 3% of streets in middle-income and lower-income neighbourhoods, respectively. Similarly, streets with marked crosswalks are significantly more common in high-income communities (13%) than middle-income (8%) or low-income ones (7%).

Efforts are under way in many cities around the world to develop comprehensive road safety plans. For example, Sao Paulo has recently begun making changes to its streets to help improve safety and improve walkability. The Calçadas Verdes e Acessíveis (Green and Accessible Sidewalks) project has helped improve the walkability of sidewalks by repairing hazards and repurposing spaces allocated to vehicles, including parking spaces. At a centrally located intersection with high pedestrian volume, the city installed an “all red” signal crossing that allows pedestrians to cross all ways and brings all vehicle traffic to a halt during this period. The city also has begun to reduce vehicle speed limits to safer levels for pedestrians. The city of Abu Dhabi, United Arab Emirates, has recently launched a plan to retrofit its streets to improve safety for all road users. The city is improving visibility on its streets and adding raised signalled crosswalks, wider

pedestrian crossings, accessible curbs and widened safe spaces for pedestrians at medians and turn lanes. Such efforts are in motion in many cities across the world, some with measurable results.

An exceptionally successful story of safe design is the Republic of Korea, where traffic fatalities among children fell nationally by 95% from 1766 deaths in 1988 to 83 deaths in 2012 as a direct result of a range of projects that targeted regulations, education and the built environment. Among these was the School Zone Improvement Project, implemented throughout several cities, which aimed to create safe routes from children’s homes to schools and child-care facilities. Speed limits were reduced through street design measures such as speed bumps. Dedicated right-of-ways for pedestrians were established and clear distinctions between sidewalks and roads created. New fences further protected children from road hazards. City officials installed traffic signals and speed limit signs within 300 metres of a school’s main gate and painted roads within school zones with messages such as “school zone” and “protect children” so that drivers would proceed with caution. Additionally, they banned street parking on roads leading to schools’ main entrances, reducing the potential contact between vehicles and children. Such measures can be taken in all areas of cities to improve safety for all (306).

Box 15.	Envisioning a city with zero traffic fatalities
<p>A movement is under way in cities across the world, not just to reduce road traffic fatalities, but also to eliminate them. In 1997, the Swedish Parliament passed legislation for the Vision Zero plan, which has a strategy for bringing road traffic fatalities and injuries to zero. In 2013, only three out of every 100 000 people died on the road of Sweden, an 80% reduction from 1970. The rate is just over half of that of the European Union, just over one fourth of that of the USA and one thirtieth of that of Nairobi. Cities in Sweden keep the speed limit to the lower safety limit of 30 kilometres per hour. Sweden has laid down more than</p>	<p>12 000 safe road crossings, including bridges and crosswalks, protected by speed bumps. Barriers separate bicycles from cars and from oncoming traffic. Many kilometres of roads have been converted to “2+1” roads, where a third lane, alternating for both directions of traffic, allows cars to pass one another. Strict enforcement of drunk-driving laws has decreased the number of drunk drivers to 0.25% of those tested. Cities across the USA and Europe have begun to emulate Vision Zero with similarly ambitious plans.</p>
	<i>Source: The Economist 2015 (307).</i>

SUMMARY

City leadership everywhere has the opportunity to improve urban mobility and health simultaneously. In 2014, in the USA alone, urban traffic congestion added up to 6.9 billion hours, 3.1 billion gallons of fuel wasted and a cost of US\$ 160 billion (232). The most striking example of positive effects for health and for liveable cities is to reduce

ambient air pollution, that accounts for 3.3 million preventable deaths per year. The dynamics of urban mobility pose an economic challenge and a tremendous impact on human health through pollution, sedentary behaviour and road traffic crashes. Fortunately, city leadership can do a great deal. Cities around the world are demonstrating that it is indeed possible to make cities safer and healthier. Many cities have tried to reduce the hazards of personal motorized travel by increasing the cost to the user through congestion pricing, tolls or parking fees and reduced parking stock. Recently, a number of cities have taken steps to make districts of the city car-free, or to have car-free days. The capital cities of Helsinki, Finland, and Oslo, Norway, have declared their intention to be completely car-free in the near future. Even though not every city can be quite that ambitious, they can keep their residents conveniently mobile, while making them safer, healthier and more prosperous. It is essential that cities create desirable mobility alternatives. Convenient public transportation is a crucial piece of any city effort to reduce the health effects of motorized cities. It is imperative for growing cities, and can be deployed even in cities where long-term infrastructure is already in place. Cities can make active transport a more desirable alternative as well. Planning that brings people's needs closer to where they live, or close to accessible public transportation, is important. Equally important is ensuring that should people choose to walk or bicycle that they have safe means of doing so.

FIN

CHAPTER 9 — IMPROVE HEALTH IN THE HOME

KEY MESSAGE • Targeted housing interventions, greater use of clean energy and improved affordability can help tackle the global challenge of healthy and sustainable urban housing.

Access to adequate housing is so fundamental to the health and well-being of people and the smooth functioning of economies that it is embedded in the United Nations Universal Declaration of Human Rights and in the International Covenant on Economic, Social and Cultural Rights (308). Nonetheless, inadequate urban housing blights the health of billions of people worldwide. Security of tenure, availability of services and infrastructure, affordability, habitability, accessibility, location and cultural adequacy are all essential elements of adequate housing (309). The global challenge of adequate urban housing continues to grow, with a projected need of 1 billion new houses to be provided by 2025 to accommodate 50 million new urban residents per year (310).

NOR

Poor housing quality has been linked to the incidence of infectious diseases, chronic illnesses, injuries, poor nutrition and mental disorders (311). Poor housing is a particular problem in places where policies are lacking to ensure adequate housing, or where unplanned urban growth has led to the proliferation of unregulated, substandard housing. Even in cities in higher-income countries, many homes lack proper insulation, are poorly constructed or are made from hazardous materials. Furthermore, due to a lack of access to affordable and desirable energy for household needs, masses of people still

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use solid fuels at considerable risk to their health and of those around them. Fortunately, there are housing interventions that can yield both short-term and long-term health benefits, while improving overall quality of life.

Housing can be considered at four levels of scale within a local context: (i) the physical structure of the house (or dwelling); (ii) the home (psychosocial, economic and cultural construction created by the household); (iii) the neighbourhood infrastructure (physical conditions of the immediate housing environment); and (iv) the community (social environment and the population and services within the neighbourhood). At each of these levels, housing has the potential to have a direct or indirect impact on the physical, social and mental health of the residents, and two or more levels combined can have an even greater impact (312). While the preceding chapters address the broader aspects of the community, this chapter focuses primarily on the physical structure of the house and the home environment.

THE HEALTH TOLL OF POOR QUALITY URBAN HOUSING

Some of the most dire housing conditions are found in urban slums. In 2015, more than 880 million people live in housing conditions that can be classified as slums (12). Slum households are technically defined by the lack of any one of the following five elements: access to improved water; access to improved sanitation; durability of housing; sufficient living area; and security of tenure.

Sub-Saharan Africa has a slum population of 199.5 million, South Asia 190.7 million, East Asia 189.6 million, Latin America and the Caribbean 110.7 million, South-East Asia 88.9 million, West Asia 35 million and North Africa 11.8 million (313). In some cities, slum occupants represent up to 80% of the population. Slums are a clear manifestation of both poor urban planning and management as well as a malfunctioning housing sector. The pressure of housing demand does not stop, however. Estimates concerning total housing needs in Africa have been set at around 4 million units per year, with over 60% of the demand required to accommodate urban residents.

Many slum residents live in houses with dirt floors, poor-quality roofs and walls constructed out of waste materials such as cardboard, tin and plastic. These houses do not provide proper protection against inclement weather, parasitic infections or unwelcome human intruders. Many have insufficient access to services such as clean water, sanitation, electricity or security.

Inadequate housing conditions even in wealthier parts of the world carry a big health burden. WHO estimates show that in the WHO European Region inadequate housing accounts for over 100 000 deaths per year (312). These take into account 11 housing hazards such as those related to noise, dampness, indoor air quality, cold and home safety. The numbers include 38 200 excess winter deaths per year in 11 European countries due to inadequate protection from cold and 14 280 excess deaths per year due to indoor air pollution from solid fuel use. Even if the housing structure is durable, lack of adequate ventilation, air-conditioning, heating and use of hazardous building material can cause acute effects on health and comfort.

Such exposure to substandard housing is not evenly distributed across populations. Poor housing is associated with other determinants of health. Studies have shown that disadvantaged populations, such as racial ethnic minorities and people with

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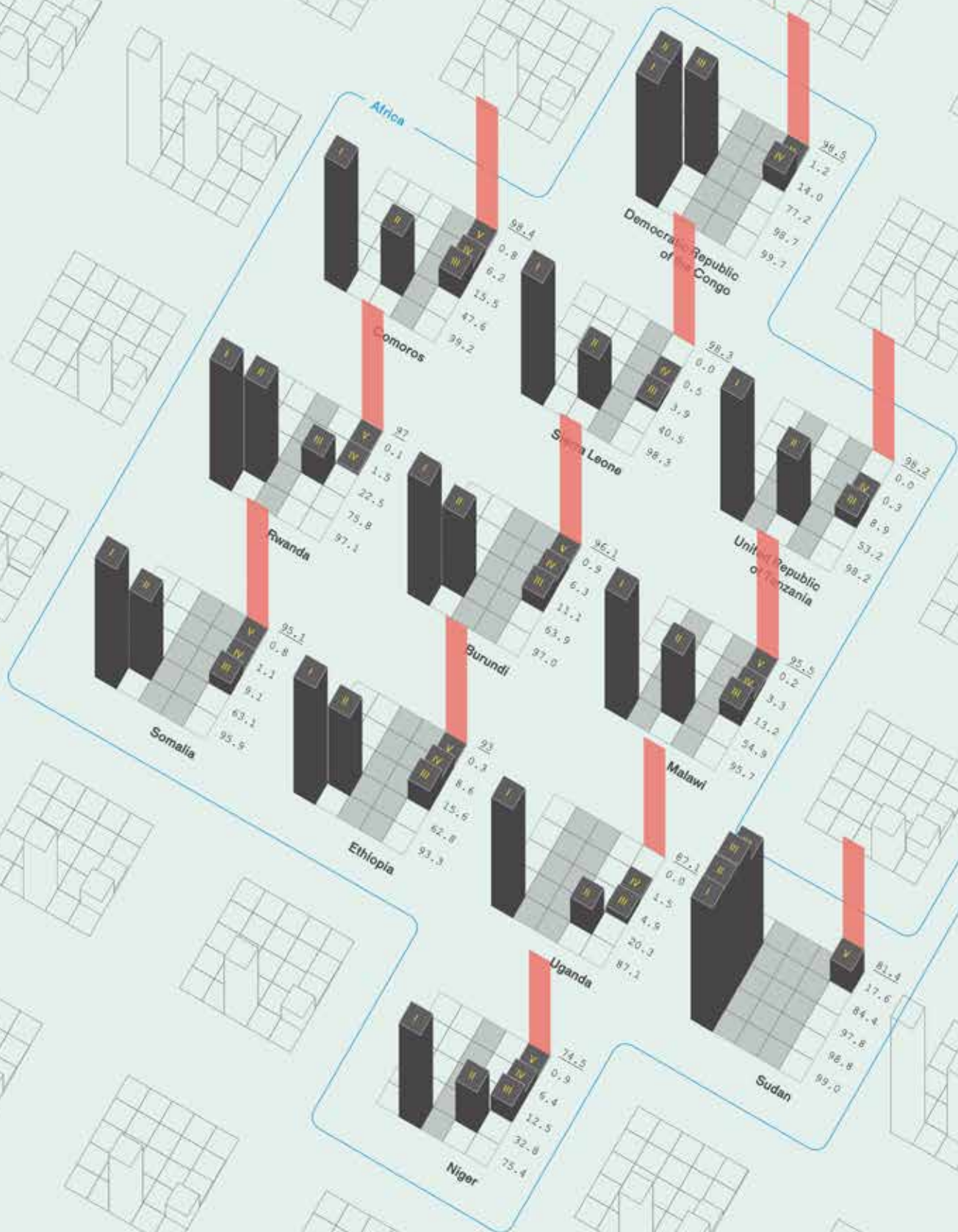
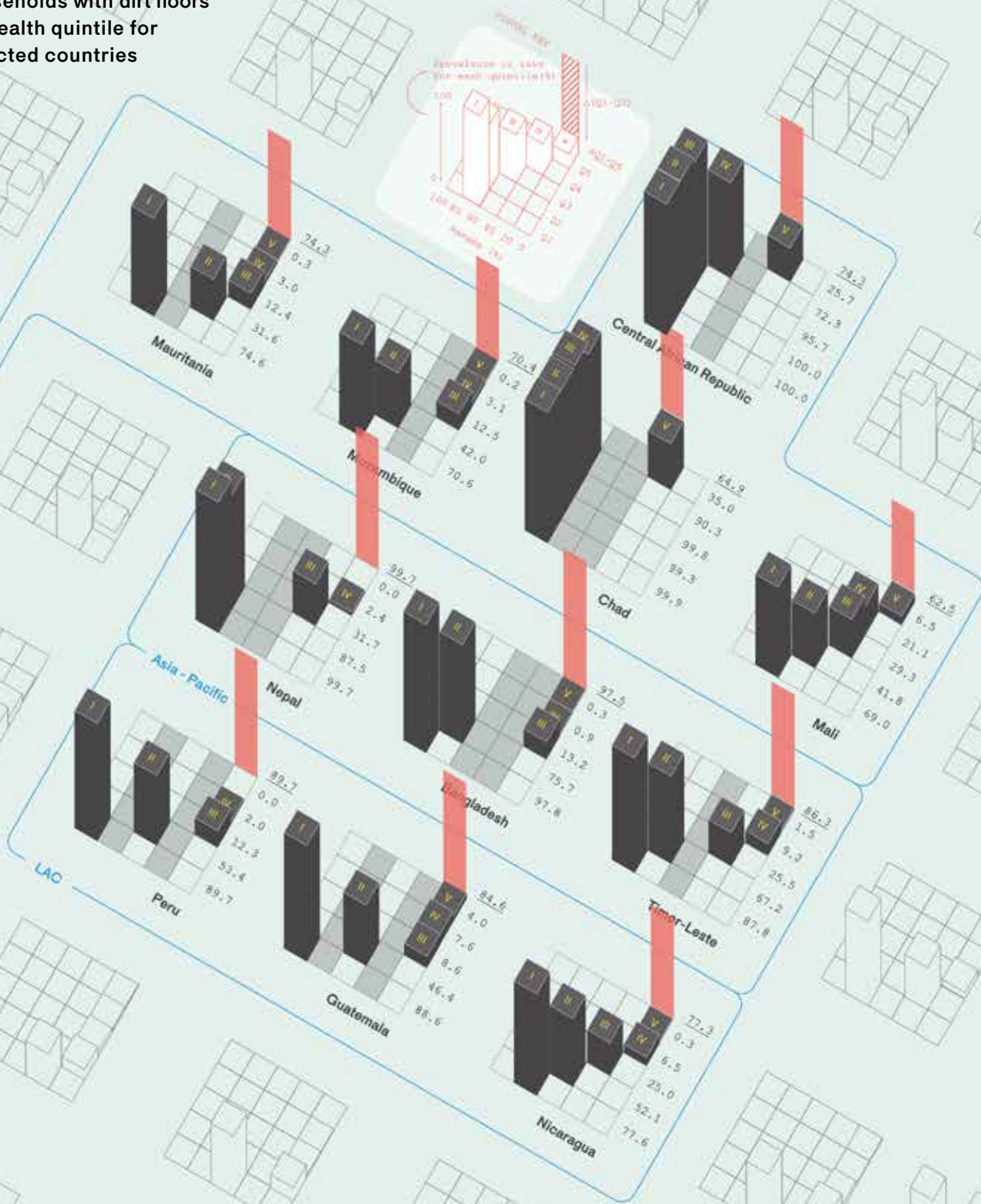


Figure 32.
Proportion of urban households with dirt floors
by wealth quintile for
selected countries



Note: For the full country names, see Annex 1, Table A1.2. Q2, 2nd quintile; Q4, 4th quintile
 Source: Global Health Observatory 2015 (21).



Hong Kong - Apartments

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low income are disproportionately affected (311). They are more likely to occupy homes with severe physical problems, live in overcrowded homes, lack adequate insulation and air-conditioning, and have increased risk of respiratory problems, injuries and home fires due to poor housing quality. Figure 32 selectively shows data for countries where, on average, over one fourth of urban homes have dirt floors. For each country, the prevalence of dirt floors is shown by wealth quintile, revealing that most of the homes with dirt floors in those countries belong to poor households. In a few countries, virtually everyone in urban areas lives in dirt floor homes except those in the richest one fifth of urban households. Vulnerable groups such as people with poor health, older people and the unemployed are among those most likely to live in poor housing, and they also tend to spend long periods of time indoors exposed to potentially hazardous environments.

By contrast, good quality housing renders substantial benefits. Housing quality contributes to well-being, quality of life and mental health, especially as people spend a large amount of time in their houses to rest and relax. It can also induce a sense of dignity and pride. Adequate housing can promote physical health by providing protection against the ravages of the environment – roofs and walls provide shelter from rain and cold; water, sanitation and non-dirt floors protect against parasitic infestations and infections. In addition, housing may provide security and serve as a defence against crime. Increased home security can allow households to accumulate assets as well as free up time for use in more productive activities that would otherwise be devoted to protecting assets (314).

TARGETED HOUSING IMPROVEMENTS

Health considerations should be a major objective in the construction and rehabilitation of housing and other built environments. Ideally, standards for “adequate housing” or “sustainable housing” should have a health rationale, and not just a technical rationale, such as strength and durability (312). While many housing standards and codes may have originally been based on health principles, in most cases, there has been a lack of

continued input from the health community. The result is that, over the years, housing providers and other housing professionals have increasingly concentrated on the buildings and equipment, with limited ability to take into account health-based evidence. The health sector must become more involved in the development and implementation of policies and programmes directed at dealing with inadequate housing, which result in additional costs to society, including the health sector.

New dwellings make up only a very small proportion of the housing stock; the vast majority of the stock already exists and some of it is old and built to standards unacceptable today. It is the existing housing, therefore, where health-based policies and actions will have the biggest impact, and guidance should be developed for its improvement and rehabilitation. Housing refurbishments are typically more efficient, generate less carbon emissions and less disruptive to tenants than demolition and reconstruction. Clearly, it will not be possible to improve all the housing stock at once. There should be national and local policies and programmes with defined, prioritized target areas where the most serious conditions are likely to exist.

Methods to improve housing are known, and there is evidence that housing upgrades and targeted housing interventions can significantly improve residents' health and quality of life, especially among those who are disadvantaged (222,315). A systematic review of studies from New Zealand and the United Kingdom examined the health impacts of housing improvements in heating and energy efficiency. After 5–12 months of the intervention, little indication of improved health was found in the United Kingdom studies, however, meaningful improvements were found across a range of respiratory and general health outcomes in the New Zealand studies (316). A key difference is that the studies in New Zealand targeted residents who lived in poor housing and residents with existing respiratory disease, and the results suggest that provision of improved warmth can lead to improved health, especially when targeted at those living under these conditions.

While housing improvements do not always lead to immediate improvements in health outcomes, there is evidence that improvements can have beneficial effects on broader socioeconomic determinants of health. The most common impacts reported shortly after housing improvements include: changes in domestic space and design; thermal comfort; housing costs (i.e. rent and fuel); and attitudes towards and control over

Source: WHO/Anna Kari

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the living environment. Where these changes are positive, they point to the potential for subsequent health improvements in the longer term (316,317). When such co-benefits of housing improvement are taken into account across multiple sectors, the time required to recover the initial investment costs can be substantially reduced.

For example, a comprehensive home improvement programme in Liverpool, United Kingdom, honed in on the deprived areas of the city to improve housing conditions that cause or exacerbate preventable disease, injury and premature death (Box 16). It is difficult to isolate the contribution of the programme to observed declines in excess winter deaths and child accidents in the home, given the large number of other projects tackling poverty and health inequalities in the city. However, the intersectoral programme enabled residents to cope with their housing-related health and safety risks as well as fuel poverty. Cost savings to the National Health Service and wider benefits to the local economy were also achieved. These impacts on important determinants of health are expected to produce long-term health benefits.

Box 16.	Liverpool's Healthy Homes Programme
<p>The city of Liverpool has one of the highest mortality rates and levels of health inequality in the United Kingdom. Over 44 000 households live in fuel poverty. Poor housing conditions are believed to be implicated in up to 500 deaths in Liverpool and around 5000 illnesses requiring medical attention each year. A significant proportion of properties within the private-rented sector is substandard, increasing the chance of occupants suffering preventable ill-health and contributing to health inequality.</p> <p>The Healthy Homes Programme, started in 2009, improves housing conditions and engages residents into mainstream health-related and well-being-related services. Deprived areas of the city are proactively targeted, where advocates visit every property in the area to offer the services. The programmes' Environmental Health teams inspect homes, assess the risk to health of housing conditions and provide an outline of improvement works that the homeowner could take to make the property safer. Where</p>	<p>the property is rented, they have enforcement powers to ensure that the property owner makes the necessary improvements. Referrals are made to a range of partners to address identified health needs.</p> <p>The scheme has already led to over 3200 referrals to dentists and general practitioners. There have also been many referrals for fuel poverty, smoking cessation, food and nutrition, and home fire safety checks. As of March 2015, there have been more than 28 000 referrals to various partner organizations, over 5700 home risk assessments carried out and over 4100 serious housing hazards remedied. This has resulted in nearly 5.2 million of private sector investment by property owners to improving the condition and safety in properties. According to an independent evaluation, the total anticipated savings by the Healthy Homes Programme in the first year of its operation was 55 million, of which 42 million was attributed to excess cold.</p> <p style="text-align: right;"><i>Source: Watson and Hatcher 2013 (318).</i></p>

There is comparatively less evidence of the health impacts of housing improvement in LMICs, but there are some particularly illustrative cases with robust evidence.

For example, a government programme in Mexico replaced dirt floors with cement floors in Mexico City slums, resulting in reductions in parasitic infestations, diarrhoea and anaemia among children (Box 17). Researchers who studied the effects of the programme importantly noted that access to safe water and child health interventions (e.g. nutrition, deworming) are key to achieve the desired effects of the dirt floor replacements.

Box 17.	Concrete action for children's health
<p>Many parasites and pathogens live in faeces and soil, and are transmitted to humans when ingested or touched. Faecal matter and parasites can enter houses on shoes, on animals, in unclean water and from unclean babies. Faecal matter tends to remain on dirt floors: it is difficult to see and dirt floors are hard to clean. Consequently, young children living and playing on dirt floors are more likely to ingest faecal materials and come in contact with parasites than children playing on concrete floors.</p> <p>State and federal governments of Mexico, under the Piso Firme programme (which originally started in 2000 in one state and later expanded to other states), had installed concrete floors in over 300 000 homes of disadvantaged families living in urban slums by 2009. The programme provides approximately 50 square metres of concrete to the home; the family provides the labour for levelling off the wet concrete. This is a one-time cost that</p>	<p>provides a benefit indefinitely. Two neighbouring cities across state borders that are socioeconomically similar except for the influence of state policies (i.e. one with the Piso Firme programme, the other without) were compared to evaluate the effects of the programme. In its first five years, the programme achieved remarkable results in improving young children's health and family welfare. It is estimated that a complete substitution of dirt floors by cement floors would lead to a 78% reduction in parasitic infestations, 49% reduction in diarrhoea, 81% reduction in anaemia and a 36–96% improvement in cognitive development in children. The programme also had a significant impact on mothers' happiness by increasing satisfaction with the quality of life, and reducing depression and perceived stress.</p> <p style="text-align: right;"><i>Source: Cattaneo et al. 2007 (315).</i></p>

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Another study provides valuable evidence regarding the causal effects of housing upgrades on the living conditions of extremely poor people in slums. It examines the impact of inexpensive, but sturdy houses constructed by TECHO, an NGO that provides basic pre-fabricated houses to extremely poor populations in Latin America. TECHO targets the poorest informal settlements, and within these settlements, the families who live in extremely substandard housing. TECHO houses are a significant improve-

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ment over existing housing units in terms of their flooring, roofs and walls, though they do not have indoor sanitation facilities, running water or kitchens.

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An assessment of the effects of this housing upgrade based on a randomized control trial in three Latin American countries – El Salvador, Mexico and Uruguay – found that the better structures had a positive effect on overall housing conditions and subjective well-being (319). Satisfaction with quality of life is a dimension of social policy that is often overlooked yet is crucial to the life experience of poor people. In El Salvador and Mexico, they also found improvements in children’s health, while in El Salvador, slum occupants’ perception of their safety and security also improved. There were, however, no noticeable effects on the possession of durable goods or in terms of employment outcomes. While the size of the effects was not as large as expected or desired, the study showed that the provision of this kind of in situ housing upgrade has some significant effects on the living conditions of slum residents. Upgrading homes in existing slums should, therefore, be considered as an alternative option to relocating residents to new houses further away from urban centres.

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Providing better housing and housing facilities improves residents’ well-being and satisfaction with life, but does not reduce the various ailments from which they suffer due to living in poor neighbourhoods. Housing upgrade programmes must be complemented with more comprehensive interventions combining infrastructure and social components that can address the other major problems affecting the lives of people living in deprived environments.

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NEIGHBOURHOOD AND COMMUNITY UPGRADING

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An important aspect of housing is the neighbourhood and community environment, which encompasses the physical and social conditions of the immediate housing environment. Urban renewal programmes have the potential to address these broader aspects. For example, neighbourhoods in Barcelona which were part of a region-wide urban renewal project in Catalonia showed improved health and health equity as a result of such interventions (Box 18).

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Box 18.	Urban renewal projects in Barcelona improve health and health equity	
<p>The Neighbourhoods Law (Llei de Barris), implemented by the Government of Catalonia between 2004 and 2011, led to large-scale urban renewal interventions across the region. The government and municipalities co-funded interventions in neighbourhoods, mostly deprived, that focused on physical improvement, social integration, health and economic gains, in order to improve living</p>		<p>conditions of residents. In Barcelona, 15 out of 73 neighbourhoods benefited from the programme, resulting in about 10% of the 1.6 million residents being directly affected by the initiative. An evaluation study assessed the health of women and men of different social classes living in five renewed neighbourhoods in Barcelona and compared it to that of people living in non-</p>

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intervened neighbourhoods with similar socioeconomic conditions (320). It evaluated two indicators from the Barcelona Health Survey: self-rated general health and mental health status. A comparison of data from 2001, 2006 and 2011 allowed an evaluation of the intervention effects on health and health inequalities. The results showed that perceived health status of both women and men improved in the renewed neighbourhoods. A particularly strong effect was found among the manual social class, resulting in reduced social class inequalities. Similar effects were found for women's mental health. The intervention did not improve men's mental health, but it did protect it from worsening. The residents also

perceived the intervention as positive and important for their well-being (321). One of the concerns about urban renewal programme is the potential for population displacement and selective mobility between neighbourhoods. The study was able to show that the observed positive effects were not due to recent in-migration; the long-term residents actually benefited. However, it did not account for the health and ethical implications of out-migration, some of which were forced, due to the renewal programmes. These are important considerations to be taken into account before such interventions are undertaken, as once those people have left and are out of sight, it is often too late.

ESP

The extent to which structures and land use can be determined by authorities through such measures as building regulation and codes varies considerably from setting to setting. In high-income countries, building regulations are more often used to control indoor environmental quality. Policies have also been developed to target households in the lowest socioeconomic group, particularly those that may live in fuel poverty (those spending more than 10% of income on fuel). In informal settlements, there is almost no control over building construction, even though inhabitants in those areas are among those who stand to benefit the most from simple measures.

Evidence of short-term health impacts of neighbourhood renewal projects is less conclusive, however, than that of targeted housing improvements (e.g. replacing dirt floors; improving warmth). Neighbourhood interventions are typically administered over broad, diverse areas, which likely include many homes that did not need or benefit from renewal. In such cases, neighbourhood-wide impacts may mask significant gains for individual households. There are potentially higher returns in neighbourhoods with relatively high proportions of homes in need, such as in slum neighbourhoods and informal settlements.

MEX

Slum upgrading is a broad term and there have been many different approaches, ranging from single interventions, such as improving sanitation, to integrated programmes comprising many activities and targeting various problems at the same time. A comprehensive systematic review of slum upgrading involving both single and multiple interventions found limited, but consistent evidence to suggest that slum upgrading that includes water infrastructure may reduce the incidence of diarrhoea among the residents and their water-related expenses (322).

Of course, slum upgrading should not only be judged from a health perspective. It is a moral imperative to improve the living conditions of the poorest in a city. It also allows residents to stay in their homes and close to their jobs, rather than uprooting them. While there is sometimes the concern that upgrading slums will attract even

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more people, often poor people, to the city and aggravate the problems of unplanned growth, there is no evidence that it actually causes increased rural–urban migration.

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An important finding from the aforementioned systematic review is that slum residents’ perspectives provide insight into barriers and facilitators for successful implementation and maintenance interventions. The value of community participation in such contexts is illustrated by the Participatory Slum Upgrading Programme (PSUP) to improve housing and the quality of living conditions in existing slums. Launched in 2008, PSUP is a joint effort of the African, Caribbean and Pacific (ACP) Group of States, the European Commission and UN-Habitat (323). To date, the programme has reached out to 38 ACP countries and 160 cities, and has provided the necessary enabling framework for improving the lives of at least 2 million slum dwellers.

In practical terms, PSUP puts slums on the urban map and encourages the necessary policy changes, budget allocations and multistakeholder partnerships for the sustainable improvement of slum dwellers’ living conditions. PSUP thus institutionalizes partnerships and empowers key urban actors to contribute to the incremental eradication of urban poverty at community, city-wide and national levels.

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While slum upgrading is viewed as a valuable approach to dealing with existing informal settlements, it should not divert attention from the fact that unplanned urban growth is inefficient and requires enormous amounts of resources to maintain. High costs of bad or no decisions with respect to urban expansion can be irreversible. Ideally, city leaders drive constructive change through anticipating a problem and then plan for urban growth in advance (324).

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UNCLEAN FUEL: A MAJOR AIR POLLUTANT PRODUCED IN THE HOME

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In addition to the physical characteristics of the home and neighbourhood environment, indoor air pollution due to solid fuel use is a major housing-related health risk factor. Urbanization has long been assumed to enable households to move away from using dirty fuels to cleaner energy, but a great number of households continues to use highly polluting fuels despite having access to cleaner alternatives. While an estimated 94% of the urban world’s homes have electricity, millions of urban households in some of the most rapidly urbanizing countries in the world are still without it and cannot afford, or choose not to use, clean energy sources (325).

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In 2014, the International Energy Agency estimated that around 1.3 billion people worldwide do not have access to electricity and around 2.7 billion people rely on solid fuels for cooking and heating (325). In sub-Saharan Africa’s least-developed countries, an average of only 45% homes have electricity, and it can be as low as 4% in the Central African Republic, Liberia and South Sudan.

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Solid fuel use in urban homes is still highly prevalent even in some European countries, where 14 280 deaths per year are related to exposure to indoor pollutants from solid fuel use (312). A major health impact of this is acute lower respiratory tract infections in children under 5 years, which are estimated to cause 16.7 deaths per 100 000 children per year.

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Household solid fuel use is also an important contributor to outdoor air pollution. About 12% of fine particulate matter (PM2.5) is attributable to household use

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of solid cooking fuels. Based on the 2010 Global Burden of Disease study, it was estimated that exposure to ambient PM_{2.5} from cooking with solid fuels caused the loss of 370 000 lives and 9.9 million disability-adjusted life years globally (326).

Household air pollution, including both indoor and ambient exposure to air pollution from household use of solid fuels, was responsible for an estimated 3.9 million premature deaths and about 4.8% of lost healthy life years in 2010. In just two years, by 2012, it was responsible for 4.3 million deaths, making it the largest environmental contributor to ill-health (327).

The importance of household air pollution as a public health threat varies quite drastically by context. In LMICs, household air pollution is responsible for almost 10% of the mortality, while the same risk factor is only responsible for 0.2% of deaths in high-income countries (328). Among countries where, on average, over one quarter of all urban households use solid fuel for cooking, there is generally a strong correlation between household wealth and solid fuel use (Figure 33). At the same time, there are several countries where nearly all urban households, or all except the richest ones, use solid fuels.

In addition, women typically have more severe exposure to pollutants in the home from unclean fuels in contexts where solid fuel use is common as they often spend a greater amount of time indoors than men do, cooking and caring for infants and young children. For example, of the deaths due to solid fuel use in Europe in 2002, 53% occurred in children, and another 36% in adult women (312).

CLEANER HOUSEHOLD ENERGY STRATEGIES

A recent systematic review of health risks from household air pollution exposure concluded that household air pollution is linked to multiple major disease outcomes for children and adults (329). Controlling this exposure could reduce the risk of these outcomes by 20–50%. A separate review of quantified multiple benefits showed that increased productivity through reductions in infectious disease incidence from indoor air pollution

Source: WHO/Anna Kari



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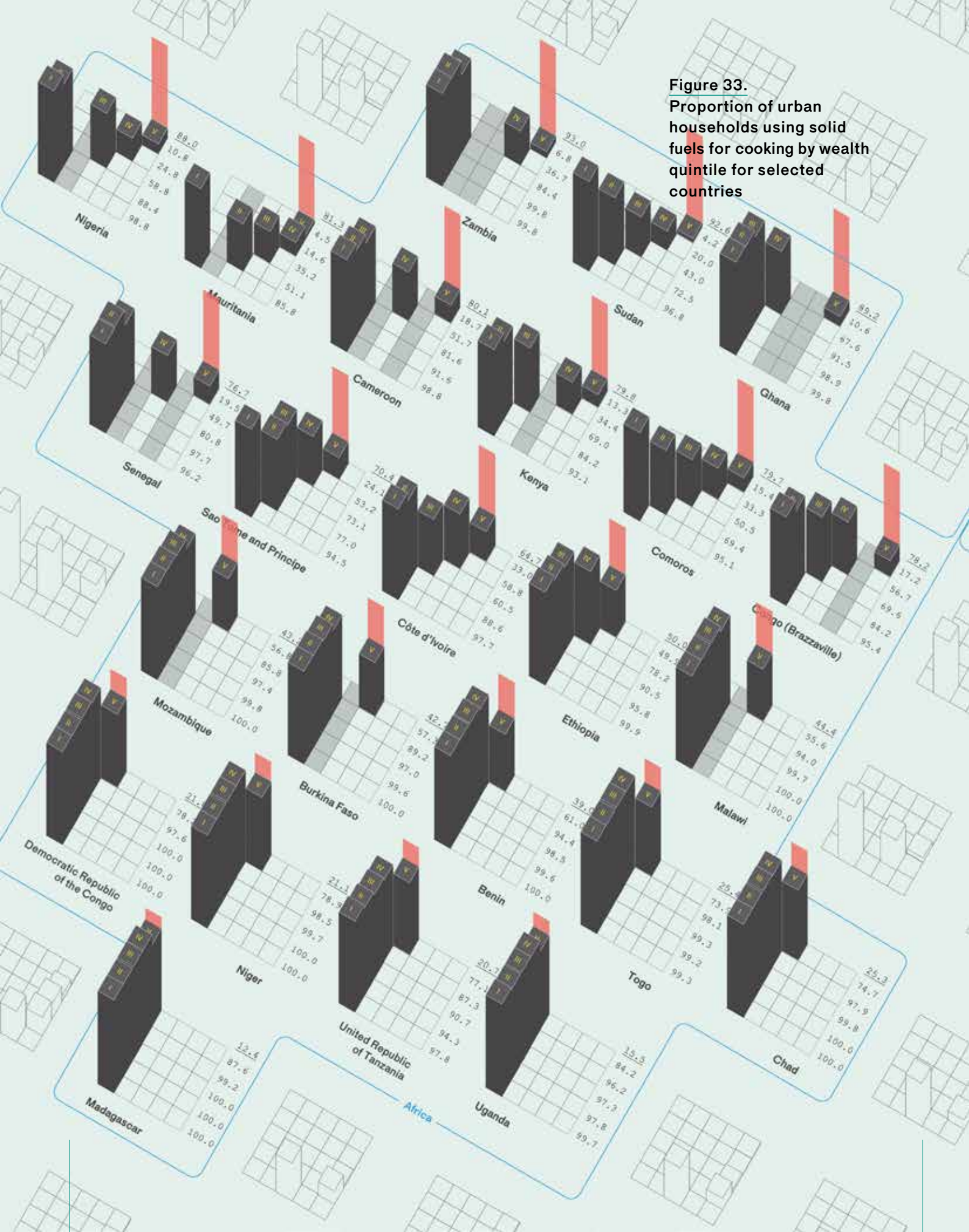
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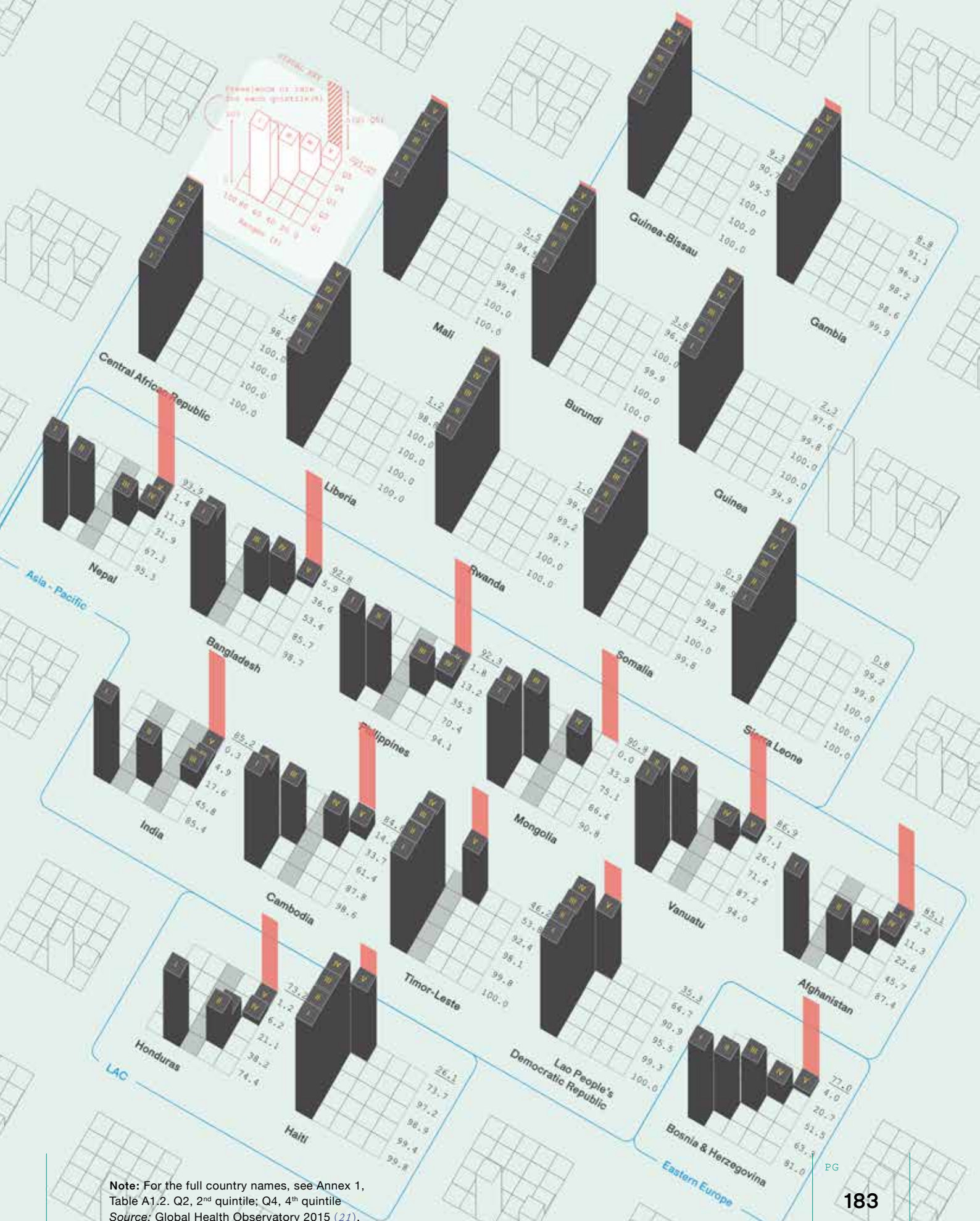
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Figure 33.
Proportion of urban households using solid fuels for cooking by wealth quintile for selected countries





Note: For the full country names, see Annex 1, Table A1.2. Q2, 2nd quintile; Q4, 4th quintile
 Source: Global Health Observatory 2015 (21).

is particularly high (330).

The best approach is to make cleaner fuels (i.e. electricity and gas) available, affordable, sustainable and desirable. Unlike typical biomass stoves, using gas and electricity does not pollute the household, even with suboptimal use. In addition to being a source of lighting, heating, cooking and air-conditioning, household electrification also allows families to store food safely.

Clean, efficient cooking stoves are actually relatively cheap and widely available in many parts of the world, but remain underutilized by the populations they are intended to reach. This may be due to relative pricing and affordability (and not simply availability), price volatility, intermittent availability and usability with existing embedded or cultural practices. Another important factor influencing the fuel choices that people make is how the built environment and housing designs facilitate the use of different fuels, and the extent to which local livelihoods depend on fuel trade. Other influences of the choice of fuels include available income, national and global trade, access to products and services, and infrastructure development aid (331).

Overall, perhaps the most crucial factor is the behaviour of individual households. Even if many people do have access to cleaner fuels, they may not make use of it because of an array of factors. There are about the same number of people using solid fuels today as 25 years ago, in spite of considerable development and urbanization during this time (332). A study among slum dwellers in Nairobi illustrates the kinds of misperceptions and related factors that can hamper widespread uptake of cleaner fuels (Box 19). Another study in Bangladesh, which looked at demand for clean cook stove technologies, found that users do not perceive indoor air pollution as a significant health hazard, they prioritize other basic needs and they prefer the free traditional cook stoves (333).

Box 19.	Health-harming perceptions of air quality in Nairobi slums
<p>A study by APHRC sought to establish the state of air quality in two slums in Nairobi, assessing the levels of fine particulate matter both in the ambient environment and indoors. Preliminary results indicated high levels of outdoor PM2.5 exceeding WHO guideline limits in both slums. Indoor air quality was equally poor in both slums with fine particulate matter exceeding WHO guidelines by a factor of about four in households using charcoal for cooking. High levels (in excess of WHO limits by a factor of three) were observed in the evenings when households reported poor ventilation practices.</p> <p>When people’s perceptions and attitudes towards air pollution and associated health</p>	<p>risks were assessed, outdoor sources of air pollution were mostly mentioned, while indoor sources were rarely mentioned. Furthermore, while people perceived outdoor air quality to be very poor and causing more annoyance, indoor air quality was apparently of little concern.</p> <p>These perceptions clearly depart from quantitative evidence of poor indoor air quality, often worsened by poor ventilation and the seepage of outdoor pollution into the indoor environment. In addition, the people in the study area believe they are unable to do anything about air pollution, citing lack of government support for inhabitants of informal neighbourhoods, and poverty. Residents</p>

appeared resigned to the state of air in their communities, reporting that they were “used to this” because they had long been exposed to air pollution.

Even so, most residents easily identified respiratory conditions as some of the health effects. Fewer people mentioned cardiac illnesses and cancers. Yet, 45% said they had never received any information about air

pollution, revealing an important knowledge gap in the two communities. The study organizers concluded that efforts to mitigate air pollution in these communities will need to include increasing awareness of the impact of commonly used cooking and lighting fuels as well as the use of ventilation.

Source: Egondi et al. 2013 (334).

BGD

For households continuing to rely on solid fuels, the best possible low-emission solid fuel stoves should be promoted, backed up by testing and in-field evaluation. A randomized control trial of the impact of inexpensive, improved cooking stoves on household well-being in India showed that while smoke inhalation decreased in the first year of use, those gains were lost in subsequent years because the stoves were not used regularly and recipients did not invest in maintaining them properly (335). Encouraging such households to choose healthier options requires new approaches by city leaders drawing on the advice of environmental health specialists, economists and social scientists. They should have features that are highly valued by users, such as reduction of operating or maintenance costs, including fuel savings, even when those features are not related to the cook stoves’ health impacts.

Whatever the mix of fuels and technologies ultimately adopted by households over the next 20 years, improved solid fuel stoves will continue to play a very important part. Achieving adoption and sustained use of improved stoves on a large scale will require community coordination and policies to support them. Even if one or several households convert to clean fuels, if the others in the community do not follow suit, all households will continue to be affected. In a systematic review of the impacts of solid fuel and clean fuel interventions on exposure to PM2.5 and carbon monoxide, researchers found that improved solid fuel stoves led to large reductions in exposure. However, post-intervention kitchen levels of PM2.5 were still very high, likely due to contamination from other sources. The evidence implies that there needs to be a strategic shift towards more rapid and widespread promotion of clean fuels along with efforts to encourage more exclusive use and to control other sources in and around the home (329).

Experts have often regarded energy access as a function of income. The assumption has been that increasing incomes would naturally lead to a transition from dirty fuels, such as crop residues, waste and dung, to cleaner sources of energy, such as electricity and gaseous fuels. Thus, it has been reasoned that households will move up the “energy ladder” and abandon “dirty” fuels, while increases in urban populations will lead both to increased incomes and access to urban infrastructure, thereby accelerating access to cleaner fuels (336). This has been the case in urban areas in some countries, such as Cambodia, but in general, the evidence is mixed. Numerous studies have revealed an extra rung at the lower end of the energy ladder. Instead of moving up to “clean” fuels, many households in low-income countries move to intermediary fuels, such as wood, coal and kerosene, where these are available (337–339). This half-step is mostly occurring in

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cities, where infrastructure and fuel markets are available and accessible. In such settings, households can choose their type of fuel replacement, but not necessarily opt for one that does not have adverse health implications.

Source: WHO/Anna Kari

At the same time, however, a global energy revolution is taking place that is destined to change the way cities are shaped and the way people live in them. Although it may not yet seem so, cities are on the threshold of potentially astonishing progress.

This is part of the energy transition. It means moving away from fuels that pose a risk to health to alternative energy sources that protect well-being and improve quality of life. In order for this transition to succeed, political leaders, planners and partners across many sectors – and people themselves – will need a better understanding of the energy landscape. The challenge for cities now is to plan to ensure that the energies consumed will be the cleanest, most efficient and equitably shared for the benefit of people at all levels of urban society. The key is to avoid getting locked into unhealthy and inefficient energy use for many decades to come.

HEALTHIER AND AFFORDABLE URBAN HOUSING

Housing affordability is in itself an element of adequate housing and a determinant of health. Yet, in developing and advanced economies alike, cities struggle with the dual challenges of housing their poorest citizens and providing housing at a reasonable cost for low- and middle-income populations (310).

“Affordable housing”, which often refers to low-income housing or social housing, is different from “housing affordability”, which is considered at the middle of the market. In order to improve equity, housing policy requires a strong focus on affordable housing, but it also requires a broader focus relating to the entire population (236).

In rapidly expanding cities, population growth puts constant pressure on housing; even in cities with ageing and shrinking populations, total housing demand could still grow, as a new generation of young adults and families enters into the housing market. Studies have shown that high education levels, good health and high income will increase a household’s demand for housing. That is, housing demand is significantly determined

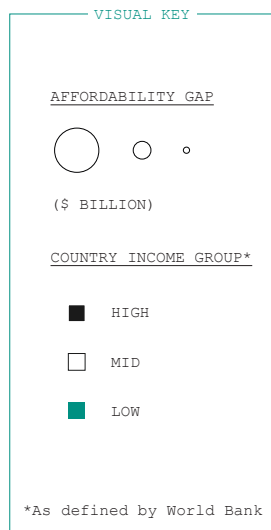
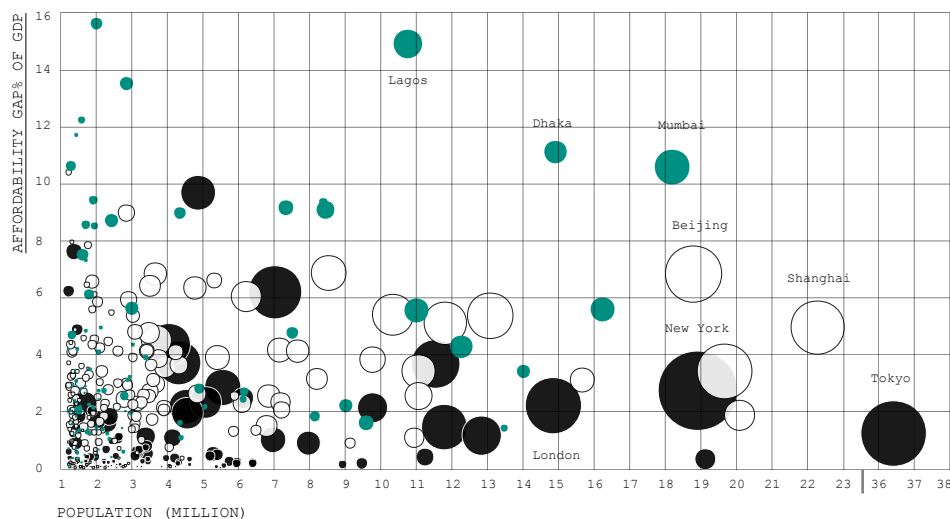
Figure 34. Global housing affordability gap for 2400 world cities

Source: World Bank; UBS Prices and Earnings Report 2012; Numbeo; CEIC; Deposits.org; Global Banking Pool; Royal Bank of Scotland; Zillow; Metroscubicos; Exame; Notaires Paris Ile de France; Jones Lang LaSalle; McKinsey Global Institute Cityscope database; United States Census Bureau; national statistics offices; McKinsey Global Institute analysis, cited in Woetzel et al. 2014 (310).

by a household’s human capital, and housing demand generally increases with age (340).

An estimated 330 million urban households around the world currently lack decent housing or are so financially stretched by housing costs that they forgo other basic needs, including food, health care and schooling for children. Based on current trends in urban migration and income growth, by 2025, about 440 million urban households around the world – at least 1.6 billion people, or one third of the urban population – will occupy crowded, inadequate and unsafe housing or will be financially stretched (310). Low- and moderate-income households are more likely to sacrifice having enough food, staying warm and living in adequate housing as housing and energy prices go up.

A study of 2400 cities worldwide revealed a substantial global housing affordability gap, defined as the difference between the cost of a city’s acceptable standard housing and what households can afford to pay for it using no more than 30% of their income (310). The global gap is estimated to amount to US\$ 650 billion per year, a full 1% of global GDP. More than two thirds of this gap is concentrated in the 100 largest cities in the world, while the largest gaps are found in low-income countries. In some of these cities, the gap is as large as 10% of GDP or more (Figure 34). In order to close the global housing affordability gap, an investment of as much as US\$ 16 trillion will be needed by 2025.



The home is one of the largest expenditures that a family makes and it is a superior good, in as much as the share of income spent on housing typically increases disproportionately as income rises. Adequate, affordable housing provides a number of benefits. In the right locations, affordable housing boosts the city’s productivity by integrating lower-income populations into the economy and reducing costs to provide shelter and services. It enables labour mobility, opening a path to rising incomes, giving households more to spend on goods and services in their neighbourhoods and, over time, enabling them to move up the income pyramid and help drive city GDP growth (310).

Achieving health equity depends substantially on changing the inequitable distribution of physical environments, with a focus on those with the highest health

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needs. Designing low-income and affordable housing to make it healthier provides important opportunities to address health equity. Creation of amenities that support health within affordable housing developments and neighbourhoods can make it possible for children, adults, older people and those with special needs who live there to have healthier lives (127). These interventions can be low cost or cost neutral, in part due to technological developments that enable lower construction costs and building materials. For instance, the costs of integrating physical activity-promoting strategies into new affordable housing developments were examined in three cities in the USA – Atlanta, New York City and San Antonio. The findings ranged from increases of 0.01% to 1.6% of total development costs to a cost savings of 0.5% (341).

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By providing affordable housing and other services, including health, education and transport to lower-income households, cities can play important roles in achieving health and social equity objectives, while simultaneously reaping economic benefits. This approach is likely to stimulate economic opportunities such as the ability of those residents to obtain jobs within convenient reach by public transport. In this way, the increased pool of workers who are available to businesses boosts urban economic development.

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For city authorities, one of the biggest questions is where housing developments should be built. The current model of urban housing development often places housing at the very edge of the urban fringe, which leads to long commutes and even abandoned units. While living away from the city centre may save on housing costs, the increase in transport costs often balance out the difference. One new model of affordable housing development now used in many cities is to locate them in mixed-income and walkable neighbourhoods with access to shops, leisure amenities and rapid, convenient public transportation. In general, smart growth principles of locating residences close to services and jobs can have great benefits to occupants as well as the larger community. Thus, transport and housing policies, along with land use and other related policies, should be jointly considered when addressing housing affordability(342). This is particularly relevant for cities with sprawling urban forms.

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The importance of coordinating different policies for housing also applies to informal settlements. Many people live in informal settlements not because of poverty or housing affordability, but because of the lack of suitable small plots of land in the formal market (343). While most of the residents have only part-time or informal sector employment, many have full-time jobs with sufficient resources to live in formal neighbourhoods. By providing small plots of serviced land and secure property rights, the government could leverage the existing resources of the poor and assist in the creation of assets that would improve welfare of the poor.

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SUMMARY

Given the pressing need to provide adequate housing to all current and future urban residents, housing policy must be elevated on the urban agenda. Too often, housing is not appropriately integrated into urban policies despite the fact that residential land use occupies the majority of the surface area of many cities (309). This practice must change in order to ensure the right to adequate housing for urban populations, including for the ever-increasing number of migrants and internally displaced people due to natural hazards and forced evictions.

CLIMT
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SUBSECTION

Improve health in the home

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This chapter highlights the health risks of inadequate housing with a focus on the physical conditions of the home and neighbourhood environments, household energy use and affordability. It also demonstrates a number of interventions that cities can leverage to address these issues, from housing and neighbourhood upgrades to designing healthier affordable housing, and better urban planning to reduce transport expenditures associated with housing location. Greater policy coordination on housing will not only improve health outcomes, but also contribute towards the goals of other sectors. Such co-benefits could include increased participation in education and the work force, faster adoption and scale-up of clean energy, reduced air pollution and greenhouse gas emissions, lower levels of neighbourhood crime and poverty reduction. Reducing indoor air pollution alone will make significant contributions to reduced morbidity and mortality.

As the poor and vulnerable households are the most affected by lack of adequate housing, the focus on these groups must not be lost. At the same time, due attention should be paid to the broad spectrum of urban middle-income households, even in some of the wealthiest cities, for whom housing is unaffordable or of substandard quality.

CHAPTER 10 — ENSURE SAFETY IN THE CITY

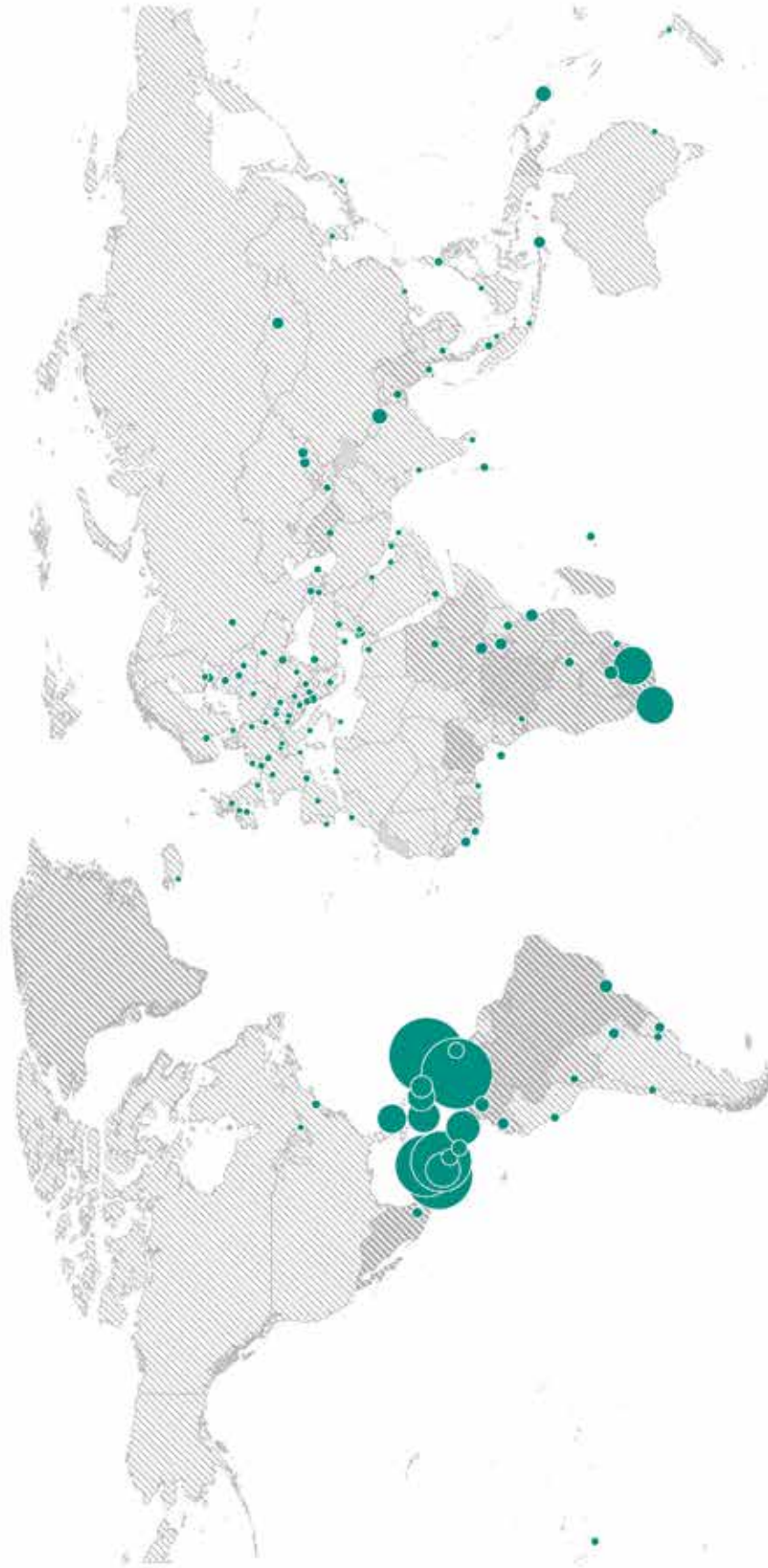
KEY MESSAGE • Poor safety and urban violence come at a significant cost to the health of urban residents and the societies where they live.

Safety has always been a top concern for city leaders. Not coincidentally, safety and security are among the chief concerns of their constituents. They have been found to be among the three most important factors that make a city an appealing place to live and work (344). The attractiveness of the city as a place to live, or visit, is just one of its many features influenced by the reality or the perception of safety of the city. Safety is intertwined with a city's economic vitality and social fabric. It underpins many of the basic functions of the city from transportation and infrastructure to the delivery of education. Safety in cities is also a health concern, as it is crucial to protect urban residents from physical and mental harm. As discussed above, the lack of safety of city roads is a significant source of injury and death in cities. In addition, safe drinking-water and safe passage to schools are important determinants of children's health and outcomes. Threats and hazards to our health abound and can take many forms in urban environments. Among these, one of the most significant sources of concern and disruption for urban societies is the threat of violence.

In many countries across the world, violence and crime remain chronic issues in cities. Across the developing world's cities, 60% of all urban residents are estimated to have been victims of crime (345). As much as 70% of these victims are residents of cities in the Latin American and African regions. These regions are also home to many of the most violent cities in the world, as depicted in Figure 35. However, cities plagued by violence are by no means restricted to developing countries. Three of the 50 most violent

Figure 35.
Distribution of murder

Source: Igarapé Institute 2012
(348).



cities in the world are in the USA (346). In some higher-income cities, overall rates of violence can mask intra-city rates that can be up to several multiples of the broader city, and more closely resemble rates seen in more fragile cities. For example, the intra-urban region of south-central Los Angeles has historically had murder rates that were many multiples of the city average. It has since improved its murder rate significantly, but it is still high (347).

BRA

Levels of urban violence vary widely between and within cities, with some of the world's largest cities also among its safest. Megacities such as Cairo, Egypt, and Jakarta, Indonesia, have remarkably low rates of fatal violence and, in Tokyo, fatal violence is nearly non-existent when juxtaposed against its size (349). Similarly, large cities such as Bogotá, New York City and Sao Paulo have all seen remarkable drops in violent crime despite dense and growing populations. Indeed, Sao Paulo has transformed itself from being one of the world's most dangerous cities to one that has reduced violence by 74% between 2001 and 2008 (350).

CHN

Why then do some cities, or parts of cities, experience more violence than others? Urbanization by itself cannot explain urban violence. As discussed previously, some of the largest cities in the world are also among its safest. Moreover, rapid urbanization is not necessarily predictive of violence either. China is among the most rapidly urbanizing countries in the world, and its violent crimes rates are relatively low. However, where cities experience violence, evidence implicates social exclusion, poverty, poor educational outcomes and inequality as key risk factors for violence in urban areas (351). Urban environments can be places of profound inequality, where these risk factors can aggregate (352) and cluster in space. Rapid urbanization can exacerbate inequalities by straining city governments' ability to deliver basic services that are protective against violence and crime.

EGY

There is clearly nothing inevitable about violence in the urban environment. However, in varying degrees, the threat of violence is a daily reality for cities everywhere. Whether it is a city concerned with chronic violence, or a city with very rare incidence, the impact of violence and fear of violence on society is a serious concern for city leaders. Fortunately, much can be done to prevent and reduce violence. This chapter concerns urban safety and health, of which there are many facets, but here focuses specifically on violence and violence reduction.

IDN

THE BURDEN OF VIOLENCE AND CRIMES IN CITIES

Approximately 526 000 people lose their lives to violence every year (353). The scale is roughly equivalent to the number of people losing their lives to malaria or influenza in a given year. Roughly 90% of these deaths happen in countries that are officially in a state of peace. In other words, the overwhelming majority of violence is perpetrated in places that are ostensibly not at war. In fact, there was more loss of life from 2000 to 2014 due to interpersonal homicide than in all of the wars during that period combined.

Much of this violence has become concentrated in urban areas, even in countries where the population is not substantially urban (349). There are, of course, notable exceptions. In fact, cities are also home to many factors that are protective against violence (354). There is also variation depending on the type of violence. A 10-country WHO study indicated that violence against women was more prevalent in rural areas than in urban areas (355). These figures also do not take into account the toll of nonfatal violence and its consequences for its victims, their families and their communities.

Certain communities in cities suffer from an aggregation of risk factors, including poverty and comparatively worse education, infrastructure and other crucial city services. In Rio de Janeiro, for example, low-income areas have been found to have more than twice the homicide rate of wealthier areas, and more than four times the rate of tourist areas (356).

This is particularly acute in informal settlements and slum areas, which often lay beyond the reach of formal city services. In the Philippines, compared to non-slum residents, slum dwellers experience higher levels of gender-based violence, wherein female slum dwellers have an elevated risk of being attacked by someone who is not their partner (357). Rates of physical and sexual violence against women in cities in India, both inside and outside their homes, are commonly twice as high in slums than in wealthier areas (358). In Cape Town, the violent crime rates have declined from their peak, but they continue to be concentrated in the poorest districts of the city. The slums in Khayelitsha and neighbouring Nyanga and Guguleta townships accounted for 44% of Cape Town’s total homicides in 2009–2010 (359). According to census data, these districts also suffered from unemployment rates as much as 80% higher than the city average, comparatively lower incomes for those who had employment and up to 57% of households living in informal housing. Figure 36 shows that these settlements are spatially clustered towards the right side of the core of Cape Town.

Figure 36.
Map of Cape Town districts by crime level

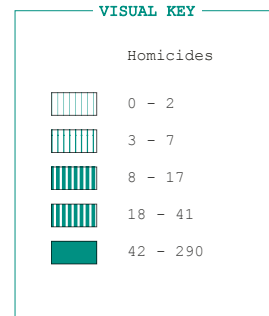
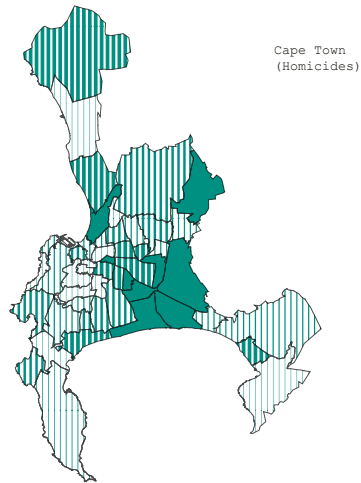
Source: South African Police Service, Crime Statistics 2003–2010, compiled by the Strategic Development Information and GIS Department, City of Cape Town, 2010, cited in United Nations Office on Drugs and Crime 2011 (359).

MOUNTING A RESPONSE TO VIOLENCE IN CITIES

WHO estimates that homicide rates have declined 16% overall since 2000 (360). Consolidating these gains and continuing to reduce the impact of violence in cities requires that cities commit to understanding the root causes of violence in their communities. These can range from deep-seated factors, rooted in the deprivation of communities and resident’s exposure to violence to more proximate triggers such as alcohol abuse or access to firearms. Understanding these root causes can then inform the city’s response, ensuring that action is local relevant, timely and responds to the true nature of the issue.

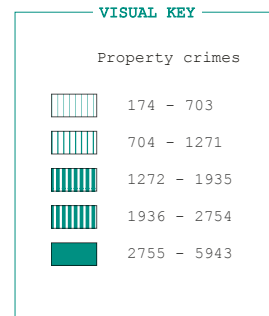
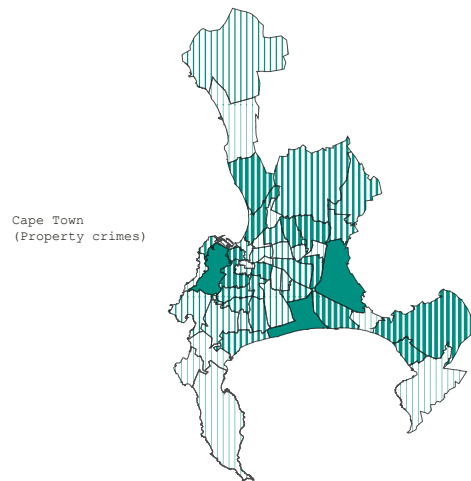
Cities must first develop the capacity to collect and analyse data on violent events. Even at the country level, the data systems required to collect and analyse data on violence is lacking. An estimated 60% of all countries do not have usable data on homicide from civil and vital registration systems (360). For many of the countries where these data do exist, they are often not paired with much-needed complementary data that feed additional information about victims, perpetrators and other circumstantial data into the analysis. Furthermore, too many violent acts go unreported, particularly those perpetrated against women, children and older adults, making survey-based data critical to understanding the nature of violence.

These capacities are important at the national level, but crucial at the local level, where the impact is felt, where the root causes can be observed and where the response must be mounted. One approach to building this type of capacity was pioneered in Colombia when the country’s first violence observatory was established to pull together and analyse data on violence in the city of Cali. The model has since been replicated in cities and states across Colombia (Box 20). Similar efforts are taking off across the region and spreading to other parts of the world.

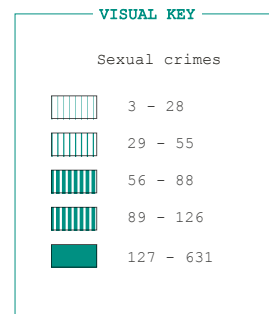
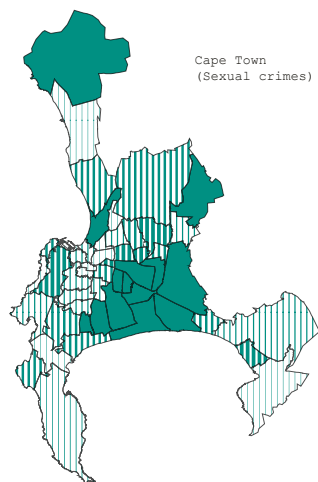


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<p>Box 20.</p>	<p>Using epidemiology to reduce violence</p>
<p>Between 1983 and 1994, during the height of an epidemic of violence in Cali, Colombia, the city’s homicide rate ballooned from 23 to at least 120 per 100 000 inhabitants (361). At such a rate, Cali would place the near the very top of today’s most violent cities (346), but at the time it was not even the most violent city in Colombia. The leading cause of death in Colombia at the time was homicide. Victims included people of all ages, but particularly young men, with suspects rarely identified. In response to the outbreak of violence, the mayor, an epidemiologist by training, set up a violence observatory – a health research think tank focused on understanding urban violence. The observatory reviewed and standardized the variables that different institutions gathered about the victims and their assailants and the facts surrounding each case, reporting weekly to the mayor and other local authorities.</p> <p>With enough relevant data, standardized and</p> <p>housed in one place, analysts could look at trends of when, how and by whom violence occurred in the city. They found that 80% of the homicides were committed using firearms. Homicides predominantly happened on weekends, late at night, often in the presence of alcohol. The observatory found that most of the perpetrators were younger, and mapping the crimes helped to identify higher-risk neighbourhoods. The mayor’s administration put a curfew on alcohol sales on weekend evenings, and banned the possession of firearms during these periods. Younger adults were given an earlier curfew on weekends. The districts of the city where these policies were implemented were able to reduce homicide by 35%. The murder rate had dropped to 80 per 100 000 people by 1997. By 2014, the city had managed to reduce its murder rate further to 56 per 100 000.</p> <p style="text-align: right;"><i>Source: Toro 2014 (362).</i></p>	

When cities have developed the analytical capacity to understand violence in their environment, local evidence can then drive the design of interventions. Interventions must be proactive and address not just the proximate causes, but also the risks that often become entrenched in communities and cities, and can transcend generations. The roots of the different types of violence share many of the same underlying risk factors. Poor educational outcomes, economic inequality, unemployment and social and physical exclusion are among the many risk factors that can pool in communities and place people at risk. Nowhere is this more strongly felt than in the many informal settlements developing in the world’s cities. Millions of people live in informal settlements, having moved there, or having been born there, looking for better prospects in the city for themselves and their families. However, as discussed previously, these can be places of profound exclusion. This is true in the physical sense, as these settlements are typically on the fringes of the city. It is most evident from a social perspective as these settlements are all too often deprived of the services of the city and the opportunities enjoyed by their peers living elsewhere in the city. These environments can aggregate risk factors for violence, and as the evidence presented earlier indicates, they can be associated with elevated levels of violence and victimization. As the determinants of violence are intersectoral in nature, so must be the



Metrocable - Línea J

Source: Metrocable - Línea J by Edgar Jiménez is licensed under CC BY 2.0, <https://creativecommons.org/licenses/by/2.0/legalcode>

response to violence. Cape Town is piloting one such approach, which is a whole-of-government response to turn these vulnerable settlements into liveable communities in order to reduce violence and improve livelihoods (Box 21).

<p>Box 21.</p>	<p>A comprehensive approach to violence prevention</p>
<p>In response to the unusually high incidence and health burden arising from interpersonal violence in South Africa’s Western Cape Province, particularly in urban areas, the provincial government adopted an Integrated Provincial Violence Prevention Policy Framework in August 2013. The policy framework outlines a comprehensive, intersectoral whole-of-government and whole-of-society response to violence, rather than focusing on the criminal justice approach that is more typical in South Africa. It includes a suite of short-term evidence-based interventions such as reducing the availability and harmful use of alcohol and guns. These are combined with longer-term interventions that aim to address structural factors to improve the quality of life</p> <p>and access to means for whole communities; and the engagement of all citizens to address complex social factors and norms that are associated with violence. Despite pressure from industry groups, stricter gun control legislation has led to a significant decline in homicide. This has also been the case with alcohol legislation, where conflicting intra-departmental priorities and competing policies and directives for more liberalized trade have thwarted attempts to apply public health-centred policies. Longer-term interventions include the Cape Town’s flagship Violence Prevention through Urban Upgrading project that aims to reduce social exclusion. The project’s three core aspects are: (i) the restructuring of the built environment to form safe and integrated human settlements and</p>	

improve access to basic amenities (e.g. water, electricity and social services); (ii) building social and community cohesion, participation and engagement to address root causes of crime and violence; and (iii) the integration of planning and implementation of activities across all levels of government and civil

society. Evaluation is complicated by the many concurrent dynamics affecting violence and safety, but promising early results have seen the uptake and replication of this model in five other municipalities in the province.

Source: Matzopoulos and Myers 2014 (363).

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While slum settlements represent a more formal expression of exclusion in urban areas, many communities within the formal city share many similarities with the level of exclusion and depravity. Social inclusion refers to the capacity for individuals and groups to participate equally in society, and fostering the concept has been seen to prevent at least some forms of violence and victimization, which helps overall community cohesion (352). This can be further strengthened when citizens are helped to overcome the inequality or disadvantage they were born into, and by promoting equality of opportunity in employment and education. Life skills programmes have successfully been used to target at-risk youth and provide them with the necessary skills to make the most of opportunities. For example, between 2003 and 2006, the Abrindo Espaços Open Schools Programme, involving 5306 schools in Sao Paulo resulted in criminal acts being reduced by 45.5% through a mixture of sports, cultural and leisure activities and work-focused training (349). Creating access to better opportunity and designing communities to be more liveable can have profound effects on the incidence of violence. Broader approaches addressing both the physical and social environment in communities marred by exclusion is required to redress inequities and tackle the burden of violence and crime. The city of Medellin, Colombia, managed to reduce violence dramatically in one of its more marginalized communities by taking such an approach. Box 22 describes how a broader approach to community development, inclusiveness and safety can help to reduce violence.

Box 22.

Reducing violence by reducing exclusion

Medellin is Colombia's second largest city, and for two decades was one of the most violent cities in the world, with homicide the leading cause of death since 1986. In 2002, before intervention, Medellin's homicide rate was more than three times the highest homicide rate in the USA. In 1999, the city government responded

with a development programme designed to reduce physical and social exclusion of targeted communities. A new public transportation system known as the Metrocable was installed to connect impoverished neighbourhoods with the city centre. A parallel programme sought to improve the infrastructure of marginalized

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communities with improved lighting, streets and walkways, schools, libraries, business development programmes and increased police patrols and presence.

The government's principal motivation for bringing effective public transportation to remote areas of Medellin was to improve residents' access to jobs and attract new businesses to impoverished neighbourhoods. Reducing levels of violence, generating collective efficacy and increasing community members' willingness to rely on police seem to have been subsequent benefits of the dynamics set in place by the investment in public works. There was indeed a life-saving bonus beyond their intended area of impact:

homicide dropped 66% more in intervention neighbourhoods than in similar high-crime neighbourhoods, and reports of violent crimes declined 74% more in intervention neighbourhoods. This was one of the first natural experiments on neighbourhoods and violence, and the research findings have potential policy implications for cities elsewhere. They indicate that it is possible, even in LMICs, to harness municipal resources to implement structural interventions that will have an important impact on risk behaviours that place a significant burden on the health of populations.

Source: Cerdá et al. 2012 (364).

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Cities need to deploy strategies to intervene with vulnerable spaces and communities, however, they must also intervene with vulnerable people. Population-based strategies can intercede in “hot spots” and reduce overall levels of violence, but within these hot spots there are individuals for whom life experiences and environments may increase their vulnerability to commit or be the victim of violence. Evidence indicates that there are ways to intervene with vulnerable individuals and vulnerable situations to prevent violence, without incarceration. Dangerous situations can be defused. People can be trained to manage violent impulses. In addition to helping people to make better life choices by enabling them with better opportunities, it is also possible to help people to make better decisions when faced with a dangerous situation.

Recent experimental evidence suggests that cognitive behaviour therapy might provide one of the solutions. In Monrovia, Liberia, researchers recruited 999 of the highest risk men in the city – young men, engaged in criminal behaviours, with violent tendencies. Subjects were randomized into treatment groups and a control group, with treatment groups receiving cognitive behaviour therapy, approximately three months' wages in cash, or both. The rationale behind treating people with cognitive behavioural therapy was that managing beliefs and behaviours, emotions and impulsivity are fundamental life skills that can be developed. The programme taught participants to be aware of their patterns of thinking and behaviour. It worked on developing skills for self-control, including planning skills, as well the ability to conduct deliberate, unemotional decision-making. It tried to foster a positive, nonviolent, non-criminal self-image among participants. The results of the study were dramatic. Among men who received the treatment, drug dealing fell by one half and thefts fell by one third within a few weeks of completion. These effects began to diminish after one year, but among those who completed treatment and received cash, the effects were longer lasting. After one year, this treatment group was 44% less likely to carry a weapon, 43% less likely to sell drugs and reported lower aggression (365). While it is not clear that this kind of intervention would work everywhere or for every individual at risk, the results are still highly

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encouraging. First, the experiment raises the possibility that adults can be trained with life skills to control violent behaviour. Second, it indicates that when given the tools to avoid risky behaviours and the means to move in a more positive direction in life, people can make the right choices. The study found that most of the men who received therapy invested the money in a business or saved the money. For cities using job training as crime prevention, it is worth considering whether other life skills might be a worthwhile complement.

Source: WHO/Anna Kari

Similar therapy programmes carried out among youth in Chicago, for example, BAM (Becoming a Man), have experienced similar results. BAM found that its programmes reduced violent crimes among at-risk youth by 40% during the school year and may have improved graduation rates by up to 8% (366). Similar to the Liberia approach, the Chicago programme gives at-risk individuals both life skills and the means to achieve better life outcomes (in Liberia, in cash; in Chicago, a high school diploma). More research is necessary to understand how to sustain the progress achieved in this programme, as the study indicates that impact faded with time.

Another successful programme originating out of Chicago suggests that violence can be prevented by identifying and diffusing situations before they become violent, and with treatment from trusted members of the community, for those at risk of committing violent acts. The programme is in part motivated by the premise that chronic violence is the result of the tendency for violence to beget more violence. Heightened tensions, motivations for revenge, the apparent or real absence of justice – these can all incite one violent act to provoke another, and so on. The premise of the programme is to interrupt the flow of violence within communities, and stop further continuation. As detailed in Box 23, the programme trains members of the community, who are trusted by at-risk individuals, with skills to seek out and diffuse potentially violent situations. Once these situations have been diffused, the programme operators can work with social workers to train individuals and their communities to be resilient against future violence.

In 2012, there were 500 murders in Chicago – with more murders than any other city in the USA, its murder rate was four times the national average. In 2000, the NGO Cease Fire (now Cure Violence) developed a programme of “violence interrupters”, community members who would intervene and stop the transmission of violence. Interrupters were hired from within violent communities, who would identify cases that could escalate to violence. They would also identify people close to the case, including those who might feel compelled to seek revenge, or otherwise provoke further violence. Trained in skills of persuasion, buying time, cooling people down and reframing, interrupters were trusted community members

whose job was to diffuse potentially violent situations. Once the violence had been interrupted, patients worked with outreach and social workers for up to 24 months. Community projects worked in parallel to change norms and create community resilience to violence. In its first Chicago community, Cease Fire reduced homicides by 67%. The approach moved to other neighbourhoods in Chicago, where evaluations showed reductions in homicides by an average of 38% more than in untreated neighbourhoods. It has since moved on to 23 additional USA cities, and eight other countries.

Source: Cure Violence (367).

SUMMARY

The effects of violence can be devastating, not only on the directly affected victims, but also as they ripple through families, communities and the city as a whole. Even nonfatal violence is known to cause lifelong ill-health, early death and social consequences for its victims and their families. In communities, violence can restrict mobility, deter investment, stigmatize neighbourhoods and constrain employment and educational opportunities

Violence comes at a significant economic cost to the city, the most obvious cost being the value of resources used to attempt to control it or treat its consequences in public and private expenditures. Violence and crime also have a high social cost. Being safe includes feeling safe – safe to simply take a walk in the park or neighbourhood and use public spaces, for example. A real or perceived lack of safety can isolate individuals and communities and change the way they interact with the urban environment. It affects their opportunities for work, education and recreation, and participation in political life. It also affects their health.

Reducing violence and improving safety in urban areas is a priority that cuts across issues and silos in cities. It is a challenge that affects the social fabric of the city, its economic vitality and the city’s ability to function and deliver for its citizens. Violence and poor safety present a strikingly high burden of preventable ill-health and mortality for cities and the world, which, importantly, can be mitigated and prevented. City leaders can do much to intervene, but as with so many health issues in cities, the challenges and the solutions cut across sectors and silos and require coordination of a multisectoral response.

For decades, city leaders everywhere have faced the challenge of accommodating growing urban populations and building prosperous societies around them. This is no small feat. Cities are complex systems of infrastructure and services, requiring nimble management of many moving parts. Shifting demographics make an already complex environment difficult to plan with everyone in mind.

In the worst of cases, surging populations in underresourced cities have left millions in unacceptable living conditions, in slum or slum-like housing with access to little or no city services. As noted, the outcomes in these environments are frequently poor. This section shows how the provision of safe water and sanitation has too often lagged behind the needs of the population. Unsafe water and sanitation can have devastating effects for individuals who are exposed, and in these unsafe environments,

SECTION 2 — CONCLUSION

waterborne disease can spread quickly throughout communities. It also explores the relationship between housing and air pollution, including both indoor air pollution from the use of unclean energy sources and outdoor air pollution that affects residents in poor housing environments. Many homes, even in cities, continue to have dirt floors, placing residents at further risk of ill-health. Even in higher-income cities, poor home construction may expose residents to hazardous materials and can fail to protect them from extreme temperatures. It explores how exclusion and inequity in cities undermines safety. Few places suffer from more exclusion and inequity than informal settlements.

In much of the world, cities have managed population growth, but in ways that are increasingly locking urban infrastructure

into unhealthy forms for the long term. With the convenience of motor vehicle travel in mind, many neighbourhoods have fallen into mono- or limited-function environments, where the needs of everyday life and green spaces are difficult to access without personal motorized transport. Many growing cities have become sprawling expanses dotted with such neighbourhoods, where limited demand and supply of highly connected, accessible mass transportation has bolstered the need for personal motorized transport. With diminished physical activity and poor nutrition, these have fuelled the dramatic rise in NCDs and in obesity. This section covers how this phenomenon has contributed significantly to millions of annual deaths from ambient and indoor air pollution, road traffic fatalities, sedentary behaviour and poor nutrition.

These 21st century health challenges for cities can be avoided in growing cities and can be remedied in existing built environments. Cities can plan for natural growth and migration. Investing in services and infrastructure for growing populations can be expensive. However, the benefits of enabling new city residents to be healthy and productive are a significant counterweight, particularly when coupled with avoiding the cost of having to redesign poorly planned or unplanned urban development. Even within existing city infrastructure, important steps can be taken to make cities healthier and safer. Existing city streets can be rebalanced for mass transport, walking and cycling. Existing neighbourhoods can also be rebalanced to be multifunctional with green spaces to make the places where we live, work and play safely accessible. By enhancing their disaster health risk management systems, cities can mitigate the impact of unpredictable events.

There are solutions for every city. City leaders can choose to enable people to live healthier, more productive lives. They can prioritize people and vibrant economies at the same time, priorities that can be mutually reinforcing. It requires city leaders to think beyond the health sector when they prioritize the health of their people. It entails city departments co-owning these priorities and working together on coordinated strategies with communities.