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Urban poverty, food security and climate change

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ACRONYMS

APHRC	African Population and Health Research Center
CCAFS	Climate Change, Agriculture and Food Security
FAO	Food and Agriculture Organization of the United Nations
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IIASA	International Institute for Applied Systems Analysis
IMECHE	Institution of Mechanical Engineers
IPCC	Intergovernmental Panel on Climate Change
SREX	IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation
UNDESA	United Nations Department of Economic and Social Affairs
UNFPA	United Nations Population Fund
UNDP	United Nations Development Programme
WFP	World Food Programme
WIEGO	Women in Informal Employment: Globalizing and Organizing

ABSTRACT

The high and volatile food prices that triggered a renewed interest in food security since the 2008–09 crisis are expected to continue due to several factors that include the impacts of climate change. Current policy prescriptions focus on food production; however, a broader approach based on food systems is more appropriate as it encompasses all aspects of food production, storage, distribution and consumption, all of which will be affected by climate change and especially by the growing frequency and severity of extreme weather events. As most low-income groups in both rural and urban areas are net buyers of food, access and affordability are central concerns. There is also a need for more attention to urban food security. While more than half of the world's population now live in urban centres and on average benefit from higher incomes and better living conditions than rural residents, there is also considerable inequality between wealthier groups and the residents of low-income and informal settlements. Low and irregular incomes are the root cause of urban food insecurity, but inadequate housing and basic infrastructure and limited access to services contribute to levels of malnutrition and food insecurity that are often as high if not higher than in rural areas. They also increase exposure and sensitivity to the impacts of climate change and affect the ability to build resilience. Effective policies need to address urban food insecurity in both its income and non-income dimensions, and their impact on gendered disadvantage.

Introduction

The steady increases in food prices that culminated in the spikes of 2007–08 have brought food security back on the global policy agenda. Climate change, population growth, inefficient markets, the unsustainable use of natural resources and consumption patterns converge in putting pressure on current and future food availability and access. But while there is a growing interest in food systems that encompass all dimensions from production to final consumption, most policy prescriptions focus on addressing rural food production and tend to neglect the crucial importance of access and affordability for low-income groups and more specifically for poor urban residents.

Food insecurity is closely connected to poverty; throughout the world, rural poverty remains deeper and more widespread than urban poverty. With the rapid urbanisation of low- and middle-income countries, however, poverty is increasingly located in urban areas and this will continue as virtually all global population growth in the next three decades is expected to be in cities and towns of Africa and Asia. Given urban residents' dependence on food purchases, food insecurity will increasingly become an urban issue. Low-income urban residents in low- and middle-income countries are also likely to be the most vulnerable to the increase in the frequency and severity of extreme weather events such as heat waves, floods and cyclones. This, in turn, will have a negative impact on their incomes, both by increasing expenditure and reducing their ability to earn; it will also exacerbate non-income dimensions of poverty related to inadequate living conditions. In addition, the links with relatives and kin in home areas that often provide safety nets for both rural and urban households, including transfers and exchanges of food and cash, are likely to be affected by the disruptions caused by environmental change.

The adverse impacts of the food prices crisis on low-income urban residents have been described extensively; there is also a growing literature that examines the consequences of climate change on agricultural production and, to a lesser extent, on transport and storage systems. To date, however, there have been few attempts to understand the links between climate change and urban food insecurity, albeit with some notable exceptions (Ziervogel and Frayne, 2011; Frayne *et al.*, 2012). One obvious reason for this is that shocks and stresses of various kinds — economic, political, and environmental — and at different scales — global, national, city-wide, community-wide and at the household and individual levels — are ever present in the lives of people living in low-income urban settlements. Such shocks and stresses interact and have a cumulative effect that makes it difficult to attribute their impacts to any specific event. The aim of this paper is to build on current understandings of urban poverty and urban food insecurity to explore how the impacts of climate change are likely to exacerbate current and future challenges. The focus is on purchased food rather than own production through urban and peri-urban agriculture, although the latter is an important topic — so much so that it deserves much more space than can be accommodated in this paper. The paper also deals very briefly with the other important issue of rural–urban linkages; this is also a topic that deserves specific attention, and is the focus of another Working Paper in this series.

Food security and food systems: concepts and definitions

Food security has been a development and equity concern for many decades. As Amartya Sen pointed out over three decades ago, 'starvation is the characteristic of people not *having* enough food to eat. It is not the characteristic of there *being* enough food to eat' (Sen, 1981). The definition that is still most widely used was coined at the 1996 World Food Summit. It states that 'food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life' (FAO, 2006). The most notable difference

between this definition and pre-1996 ones is the shift from a narrow focus on food production to a broader conceptualisation that encompasses four key dimensions: availability, access, utilisation and stability. The emphasis now is thus not only on food supply but also on physical access and affordability, and safety and nutritional balance, as well as socially and culturally determined preferences (FAO, 2003).

Table 1: Dimensions of food security

Physical AVAILABILITY of food	Food availability addresses the “supply side” of food security and is determined by the level of food production, stock levels and net trade.
Economic and physical ACCESS to food	An adequate supply of food at the national or international level does not in itself guarantee household level food security. Concerns about insufficient food access have resulted in a greater policy focus on incomes, expenditure, markets and prices in achieving food security objectives.
Food UTILIZATION	Utilization is commonly understood as the way the body makes the most of various nutrients in the food. Sufficient energy and nutrient intake by individuals is the result of good care and feeding practices, food preparation, diversity of the diet and intra-household distribution of food. Combined with good biological utilization of food consumed, this determines the nutritional status of individuals.
STABILITY of the other three dimensions over time	Even if your food intake is adequate today, you are still considered to be food insecure if you have inadequate access to food on a periodic basis, risking a deterioration of your nutritional status. Adverse weather conditions, political instability, or economic factors (unemployment, rising food prices) may have an impact on your food security status.

For food security objectives to be realised, all four dimensions must be fulfilled **simultaneously**.

Source: FAO, 2008

Food security is the outcome of effective food systems. These encompass all activities from farm to plate: the manufacturing and distribution of inputs, agricultural production, primary and secondary processing, packaging, storage, transport and distribution; marketing and retail; catering; domestic food management; and waste disposal. Importantly, food systems also include the outcomes of these activities and their governance (Vermeulen *et al.*, 2012). The current, unprecedented transformations in food systems range from how food is grown and livestock reared to the growing concentration in the marketing and retail sectors with transnational food companies and supermarkets rapidly gaining control of increasing shares in high-income but also middle- and low-income countries (Maxwell and Slater, 2003). Trade liberalisation has clearly not lived up to its promise that more efficient markets would decrease hunger and malnutrition. Small, low-income countries dependent on imports bore the brunt of the 2007–08 food prices crisis, while even in high-income countries there is a sizeable proportion of the population that is food insecure (FAO, 2011; Vermeulen *et al.*, 2012).

There is not one global food system, but several systems operating at different levels. Global food systems revolve around food that is traded internationally as a commodity and often

include industrial processing, whereas local food systems tend to involve shorter chains. Any given food system operates within and is influenced by social, political, economic and environmental contexts. While the food industry is highly fragmented and competitive, there is a rapidly growing concentration in some food systems, for example for commodities such as coffee and cocoa, and in seed supply (Vermeulen *et al.*, 2012). At the retail level, there is also rapidly growing concentration: supermarkets' share of retail increased from 5 to 10 per cent in 1990 to 50–60 per cent by the late 1990s in South America, Central Europe and South Africa; and to 20–50 per cent in Mexico, Central America and Southeast Asia (Reardon and Timmer, 2012). In South Africa, consolidation and corporate concentration of the food sector goes hand in hand with increased foreign direct investment. Production is dominated by large privately owned commercial farms and agribusinesses, while processing is controlled by a small proportion — 5 percent — of companies in this sector, and fresh produce markets decline in importance while supermarkets take over (Crush and Frayne, 2011). On the other hand, local food systems play a major role in food security, often in parallel and in competition with global food systems and the 'supermarketisation' of food retail. In urban centres of low- and middle-income countries, informal sector vending plays a critical role in ensuring access to food for low-income residents, as described later in this paper — although in many cases they are connected to formal wholesalers and retailers from whom they purchase their goods.

Understanding food systems is important in the context of urban food security. Food insecurity in urban areas is not triggered by food shortages but rather by the inability of urban households to secure access to food. Periods of food insecurity are thus more likely to be related to periods of low earnings, especially for casual labourers, fluctuations in food prices, and high expenditure on other non-food items such as heating, housing and health, all of which are exacerbated by extreme weather events. To some extent, this is also the case in rural areas, and increasingly so, although rural food insecurity is still more often linked to seasonal cycles (Tacoli, 2011). But extreme weather events are a major threat to low-income urban residents, especially those who live in informal settlements where environmental hazards tend to be more concentrated than in rural areas (Dodman *D et al.*, 2013; UN-Habitat, 2011; Wilbanks *et al.*, 2007). Moreover, urban consumers rely on a combination of food sources, some of them local and others from distant locations, and on different food systems, each with its own set of specific social, economic and political relations. As a result, climate change affects urban food security in multiple locations and at various scales (Battersby, 2012).

The current global dimensions of food insecurity

Progress in reducing global chronic malnutrition has slowed down since the major spikes in food prices in 2007 and 2008, and recent estimates put the total number of chronically undernourished people in the period 2010–2012 at 870 million; all but 20 million live in low- and middle-income countries. But while in 1990–92 and 2010–12 the number of chronically undernourished people as a proportion of the total population declined in Southeast and East Asia and Latin America, it increased disturbingly in South Asia (from 32.7 to 35 per cent) and sub-Saharan Africa (from 17 to 27 per cent) (FAO *et al.*, 2012). Moreover, these figures only consider chronic undernourishment and do not capture the impacts of shocks such as the food prices spikes, which include widespread malnutrition brought about by individuals and households having to change the quantity and quality of their food intake to adjust to increases in prices; if these are taken into account, a much greater proportion of people in the world do not eat sufficiently to lead a healthy life (Johnston and Bargawi, 2010). While there is growing concern that food production will need to increase substantially in the next four decades to feed the world's growing population (Godfray *et al.*, 2010), there is nonetheless a consensus that 'there is enough food in the world today for everyone to have the nourishment necessary for a healthy and productive life' (<http://www.wfp.org/hunger/faqs>).

There are multiple reasons that explain this paradox. The first is the high dependency on purchased and often imported food among both rural and urban residents. Over the past decade, rising global food prices have triggered short-term spikes and increased volatility. At their peak in 2008, food prices were three times higher than in the early 2000s. While this was a short-term event, prices have remained high compared to five years earlier, and spiked again in August 2010 (von Braun and Tadesse, 2012). The factors underpinning recent and current global food prices are complex and include slowing agricultural productivity, extreme weather events affecting production, the conversion of food crops to biofuel production, and increasing speculation in commodity futures — that is, the prices of food sold for delivery and payment at a specified future date. Recent research also shows that, worldwide, roughly 30 to 40 per cent of food is lost to waste (Godfray *et al.*, 2010). This is a staggering amount. In low- and middle-income countries, the majority of this loss is due to inefficient harvesting, transport and storage. In contrast, in high-income countries waste is produced mainly by households and retailers: overall, between 30 and 50 per cent of what has been bought is thrown away by the purchaser (IMECHE, 2013).

In addition, population growth increases the total demand for food, while income growth influences consumption patterns, usually with an increase in high-priced goods such as meat (Stage *et al.*, 2009; von Braun and Tadesse, 2012). These trends are likely to intensify: climate change and increased biofuel production as a mitigation effort are seen as major risks for long-term food security, especially in combination with population growth.

The impacts of climate change on food systems

Climate change amplifies the environmental and socio-economic drivers of food insecurity, as its impacts are deeply affected by poverty and inequality. Over time, climate change will affect all four components of food security: availability, access, utilisation and stability (FAO, 2009; Vermeulen *et al.*, 2012). Currently, attention focuses mainly on availability, that is, on production. However, climate change's impacts on incomes and livelihoods and thus on access is equally important for the vast and growing majority of people, and in particular for low-income groups in both rural and urban areas, who purchase their food rather than produce it. The majority of the food consumed in urban areas comes from rural regions or is imported, and therefore disruptions in production, transport and storage affect urban food supplies and prices (Ziervogel and Frayne, 2011). In other words, in terms of availability, urban food security is affected not only by the local impacts of climate change, but also on impacts that take place in other locations and indeed globally, especially with regards to imported foods.

Changing climatic conditions will affect crop growth and livestock performance, the availability of water, fisheries and aquaculture yields and the functioning of ecosystem services in all regions (Foresight, 2011). Saltwater intrusion threatens some of the major food-producing regions in the world that are located in mega-deltas, where also much of the world's population lives (Beddington *et al.*, 2012). Impacts are expected to be very unevenly distributed geographically. Regions that depend on rainfed irrigation will be more heavily affected, as seasonally arid and tropical regions already are. Overall, these are also the poorest regions in the world, and the ones that have least contributed to climate change. But there is also growing recognition that rather than changes in average temperature and precipitations, greater risks to food security may be posed by changes in year-to-year climate variability and extreme weather events, which also tend to be more frequent and intense in tropical regions (Gornall *et al.*, 2010).

Yet there is still a great deal of uncertainty about the precise impacts of climate change on agricultural productivity in the next few decades. In part, this is because food systems and food security are the outcome of a complex and large set of climatic and environmental

factors as well as socio-economic and technological factors. The ability to adapt to changing climate conditions will certainly become increasingly important and will largely determine their impact on overall production. At the same time, climate change mitigation policies may have significant impacts on food availability: biofuel production based on agricultural commodities increased more than threefold between 2000 and 2008. If this trend continues, it will have a considerable negative impact on food security (FAO, 2009). Food production and supply will also be affected by climate change impacts on urban areas through disruptions of urban demand for agricultural produce and disruptions of the goods and services provided by urban-based enterprises to agricultural producers (Satterthwaite *et al.*, 2010).

After food is produced in rural agricultural areas it must travel to urban areas through transport infrastructure networks and be stored and distributed through formal and informal systems before it finally reaches consumers. Each of the points along this chain is affected by direct or indirect climate impacts. As the frequency and severity of extreme events changes, areas where transport infrastructure had previously been adequate may start to experience problems.

So far there has been little detailed research on the impacts of climate change on transport infrastructure, and the work that has been done has been concentrated in the US, Canada and Australia (see for example Caldwell *et al.*, 2002; Changnon, 2006; Meyer, 2008; and for a review, IPCC SREX 2012). The problems identified are likely to be worse in countries where there is no regular maintenance and transport infrastructure is already old and under strain. Road surfaces may be affected by increased temperatures and flooding, which could cause short-term disruptions; it is also likely that the lifespan of surfaces will be shortened by increasing temperatures (Chen *et al.*, 2010). Railways are also vulnerable to extreme temperatures, which could affect the steel and joints in the systems (Meyer, 2008). The anticipated replacement rate of road and rail only every 20 or so years may be too long as conditions change — though this is only relevant in contexts where there are sufficient resources and motivation to do so. Roads that are not surfaced will experience further disruption from increased precipitation. Coastal infrastructure such as ports, freight villages and storage areas, key nodes in international (and sometimes national) supply chains, are particularly vulnerable to sea-level rise and extreme events, and coastal inundation could result from storm surges and river floods (IPCC SREX 2012).

Food waste is a major reason for food insecurity. In low- and middle-income countries, the majority of this loss takes place before food reaches consumers because of inefficient harvesting, transport and storage. In India, it is estimated that 35–40 per cent of fresh produce is lost because wholesalers and retailers do not have refrigerated storage facilities (Godfray *et al.*, 2010). Reducing food losses in low- and middle-income countries requires investment in improving transport infrastructure and storage facilities. Food storage may be affected both by damage to the storage structures themselves or by damage to such services as electricity for refrigeration. Commercial buildings such as warehouses are often in areas that may be prone to flooding, as well as having lightweight roofs that may allow water in (IPCC SREX 2012). Electricity systems are vulnerable to storms (especially strong winds and lightning). Storage facilities also rely on water for cooling systems and severe droughts may also be a hazard (Rübbelke and Vögele, 2011). Sewerage systems may also be affected by flooding and periods of intense rainfall in urban areas causing overflow and hygiene risks to food in storage (Douglas 2009). Even produce that does not require refrigeration, such as rice, is lost in great quantities to pests and spoilage. In China, the rice loss figure is about 45 per cent, while in Vietnam rice losses between the field and the table can be as much as 80 per cent of production (IMECHE, 2013). As an indirect impact of climate change, pests and diseases are expected to increase in the next 10–15 years, with clear implications for food security (Gornall *et al.*, 2010).

The immediate consequences of these trends are essentially food price increases and volatility, affecting all consumers. It has also been noted that volatility — that is, short-term price fluctuations — has a more detrimental impact than gradual increases as it is largely unpredictable, making it difficult for low-income groups that rely on irregular incomes to adjust. It also affects small-scale producers who are discouraged from investing in farming (von Braun and Tadesse, 2012; FAO, 2011).

Urban centres and their residents face specific sets of risks. The 2007 IPCC report shows that the direct and indirect impacts of current and likely future climate change affect hundreds of millions of urban dwellers. The risks they face include more severe and frequent storms, floods and heatwaves, constraints on fresh water and food supply, and higher incidence of water-borne, food-borne and vector-borne diseases (Wilbanks *et al.*, 2007). The increased frequency of extreme weather events is already taking place: in the Philippines, the five most devastating typhoons ever recorded have all occurred since 1990, affecting 23 million people. And in 2010 alone, 178 million people worldwide were affected by floods (Jha *et al.*, 2012). In a large number of cities in Asia and Africa, floods have become an annual occurrence.

The highest risks related to climate change in urban areas are concentrated among low-income groups in low- and middle-income countries; in part, this is due to these countries' and regions' higher levels of exposure to climatic change due to their geographical location. More, however, is also due to considerable deficits in infrastructure and services that are crucial to support resilience to extreme weather events. This is especially the case for low-income and informal settlements, which are often located in areas exposed to floods and landslides, where housing is especially vulnerable to wind and water hazards, and where in many cases there is virtually no provision for sanitation, surface water drainage and waste collection (UN-Habitat, 2011; Revi, 2008; Satterthwaite *et al.*, 2010).

Climate change exacerbates these environmental hazards; from a food security perspective, the impacts are multiple and interrelated: high food prices and poor health combine to create widespread levels of malnutrition among the residents of low-income and informal settlements, as described later in this paper. This, in turn, increases sensitivity to climate-induced events and decreases the resilience of the worst-affected groups and especially children and women. In other words, while the root cause of urban food insecurity is income poverty, this is exacerbated by insufficient and sometimes completely lacking basic infrastructure and services.

Urban and rural, or net food buyers and net food producers?

Increases in food prices affect net food buyers, that is, those individuals and households that produce less than what they consume. One widely held assumption is that rural residents have been relatively less affected by the price hikes of 2008. But more detailed examination shows that this is not necessarily the case. In Guatemala, a country where almost half the population lives in urban centres, with high levels of dependence on food imports and a high rate of rural landlessness, it was the rural poor who were most affected by the prices crisis. Even among farmers — even some large farmers — there is a large dependence on purchased food. Most marginal farmers are highly dependent on buying their food (reaching 80 per cent for maize and 85 per cent for beans). As a result, virtually all marginal and small-scale farmers were as severely affected as urban non-farmers and rural non-farmers. Only large commercial farmers benefited from increases in food prices as they were able to sell at higher profits; this group, however, makes up just 4 per cent of the total population (De Janvry and Sadoulet, 2010).

Box 1 below shows the complex impacts of price increases in Vietnam, which have affected not only net buyers of food but also producers through increases in the cost of inputs and

price differences between export commodities such as coffee and staples such as rice. These examples suggest that even a focus on production needs to take into account the broader context of food systems and the impacts on the access and affordability dimensions of food security.

Distinguishing between net food buyers and net food sellers is helpful in identifying the root cause of food insecurity — income poverty. It also helps dispel assumptions on differences between rural and urban areas based on the supposed greater ability of rural residents to rely on own production. Very small-scale and marginal farmers are often unable to produce sufficient food for their families; landless and land-poor rural households are also often the poorest of the poor and therefore suffer most from increases in food prices (FAO, 2011).

BOX 1: The impacts of the 2008 rice price fluctuations on different groups in Vietnam

Rice surplus producers (Dien Bien): In theory, this group benefits when rice prices increase. However, input prices for fertilisers, insecticide, labour costs and agriculture services also increased, affecting production. While the price of rice increased by 50–60 per cent (the price of husked rice also increased similarly), fertiliser prices went up by 60–100 percent. The price of rice declined from June to August 2008, while fertiliser prices kept rising, increasing this gap.

Group experiencing rice shortages (Quang Tri): This group is often concentrated in the mountainous areas, where ethnic minorities face unfavourable conditions in terms of land and irrigation. In principle, this group has to buy rice and faced risks when the price increased. While the price of selling fresh tapioca to factories increased by 45 per cent, the price of buying rice from the lowland increased by 70 per cent. As a survival strategy, this group can generate income for buying rice by selling other crops such as maize, or by seeking work as labourers, sometimes involving migration.

Export and processing commodities producers (Dak Lak): This group is often concentrated in the areas with favourable conditions for commodity production (e.g. maize, coffee, fisheries, etc.). The prices of commodities depend on global markets. This group can still be engaged in some rice production, but are net buyers. Fluctuation in the prices of production inputs (fertilisers, gasoline, seeds, etc.) and commodities affected these households in several ways. While the prices of selling dry maize increased by 30 per cent and dry coffee beans by more than 20 per cent, people still had to pay a 60 per cent higher price for rice and 70–100 per cent more for various fertilisers (potassium increased 150 per cent).

Net rice buyers (Hanoi, Ho Chi Minh City): These include urban residents, landless farmers and rural non-farming households. This group faced risks when rice prices (and prices of other foods and services) increased. The level of impacts on this group depended on their income from non-agriculture work. Incomes and job security strongly affected the food security of the urban poor and near poor in the context of price increases.

Source: Hoang Xuan Thanh *et al.*, 2013 (forthcoming)

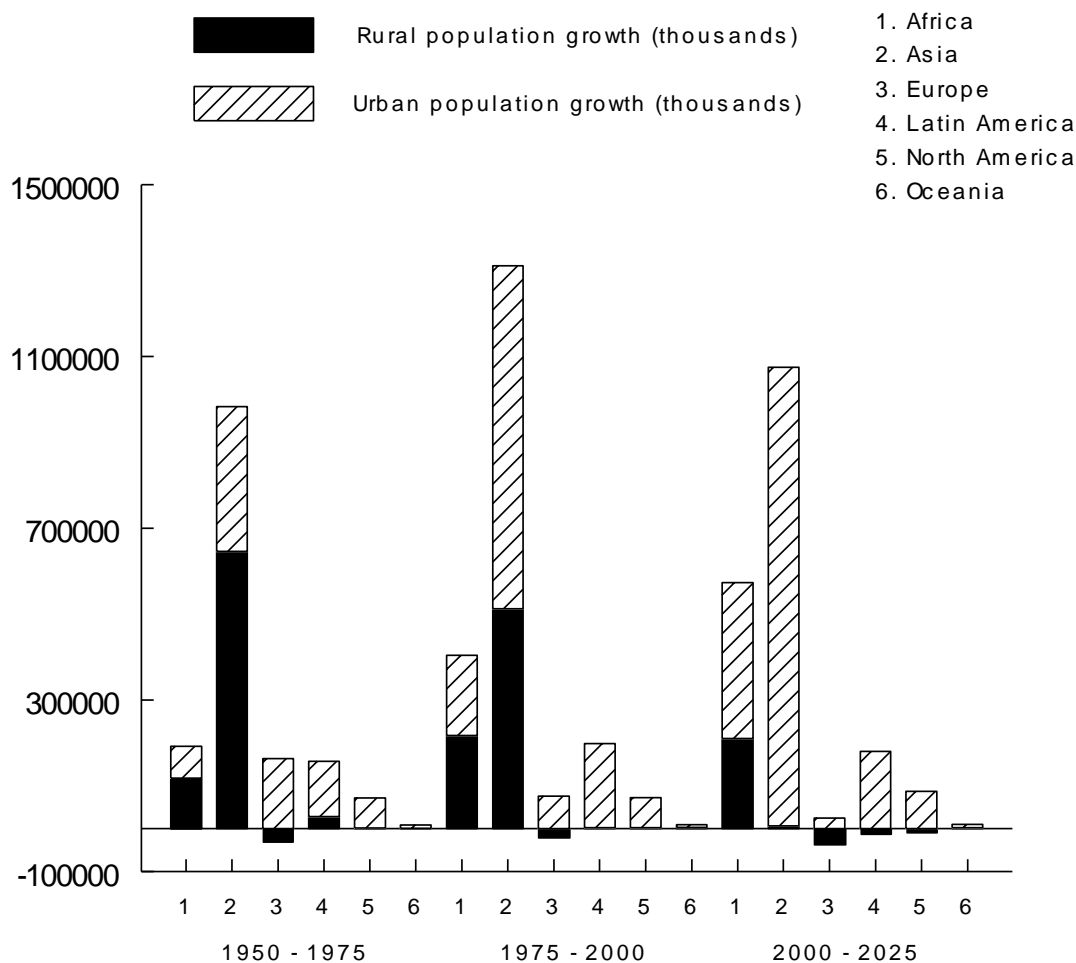
The impact of urbanisation on food prices

In many cases, urbanisation is implicitly assumed to lead to changes in consumption behaviour and dietary patterns that are resource intensive, such as greater consumption of meat, and therefore have a negative impact on increasingly scarce natural resources. A review of the relationship between urbanisation and food prices suggests, however, that there is little evidence to support this view (Stage *et al.*, 2009). The term urbanisation is often

used to include urban population growth, urban expansion, income growth and cultural change. But conflating all these dimensions can be problematic and of little help to understanding the role of urbanisation in food security.

In demographic terms, urbanisation is a much simpler concept, which refers to the share of the total population living in areas classified as urban, while the rate of urbanisation is the annual percentage increase in this level. As noted earlier, virtually all global population growth in the next four decades is projected to be in urban areas of Africa and Asia (see Figure 1).

Figure 1: Population growth in urban and rural areas of main world regions, 1950–2025



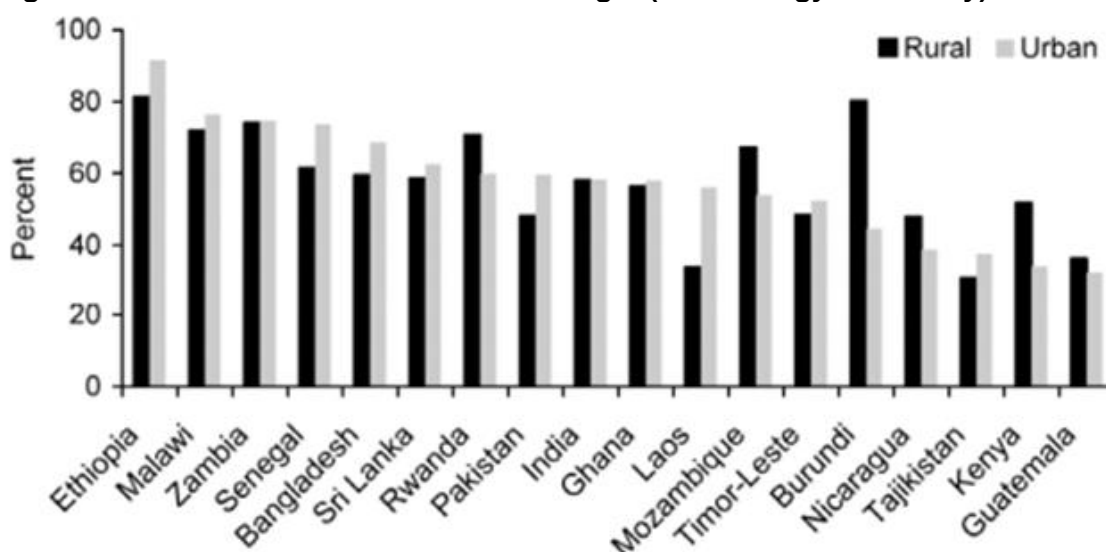
Source: UN Population Division, 2008

Countries define urban areas in different ways. Criteria may vary considerably and include one or a combination of the following: population size, typically between 5,000 and 20,000 inhabitants; density, between 400 and 1,000 people per square kilometre; administrative function; and percentage of the adult population engaged in non-farm activities (Tacoli and Satterthwaite, 2003). This makes international comparisons problematic, and to add to the confusion, criteria can be changed within the same country at different points in time. For example, it has been estimated that in China the urbanisation level in 1999 would have been 23.9 per cent according to the pre-1982 definition, 73 per cent according to the 1982 definition and 30.9 per cent according to the 1990 definition (Liu *et al.*, 2003).

This is important because, although there is no doubt that a rapidly growing proportion of the world's population now lives in settlements classed as urban, which are generally larger and denser than rural ones, 'urban' is not really a homogenous category. Indeed, while half the world's population now live in urban areas, it is worth keeping in mind that only a small proportion (around 10 per cent) live in mega-cities while over 50 per cent live in small towns which, in some cases, are more akin to large villages than cities (UNDESA, 2010). Another important point is that while urbanisation is closely interrelated to economic growth (Satterthwaite, 2007), there is often more inequality in urban than in rural areas.

Disaggregating income growth and urbanisation is helpful in understanding to what extent urbanisation may be one of the drivers of food insecurity. Urban centres usually have more diversified food markets, and even small towns usually play an important role as market nodes for food producers in surrounding areas. So there is no doubt that urban residents have access to a wider variety of food than most rural residents. The shift towards more expensive and land-intensive food is not however a consequence of urbanisation per se: for example, Vietnam's data from living standards surveys between 1993 and 2004 — a period during which the whole country experienced rapid economic growth — show that higher incomes, rather than urban or rural location, are correlated to increased expenditure on meat, fish and other 'luxury' foods. Similarly, the expenditure of rural and urban residents on meat, eggs, fish and milk and milk products in Sri Lanka, India, Ghana, China and Tanzania suggests that expenditure on such items increases when incomes are higher, and not on whether consumers live in rural or urban areas (Stage *et al.*, 2009). Indeed, the incidence of hunger is not necessarily lower in urban centres. As Figure 2 shows, in 12 out of 18 selected low-income countries, food insecurity measured as food-energy deficiency is higher in urban areas.

Figure 2: Rural and urban incidence of hunger (food-energy deficiency)



Note: The hunger incidences represent the sum of the incidence for the subjacent, medial and ultra hungry.
Source: Ahmed *et al.*, 2007

Urban expansion and the loss of agricultural land

Urbanisation is often conflated with the expansion of built-up areas and the loss of agricultural land. To some extent this is inevitable: most cities tend to be located in areas with fertile soils, and in many cases it is precisely such fertility and the availability of fresh water that determine the location of urban centres (Satterthwaite *et al.*, 2010). Overall, urban built-up areas represent a very small proportion of global land area at 0.5 per cent

(Schneider *et al.*, 2009) and only in Europe does this exceed 1 per cent. Other estimates suggest 2.7 percent, taking into account open land of various types within urban boundaries (McGranahan *et al.*, 2007). The higher density of urban centres compared to rural settlements means that urban populations tend to occupy less land. But there are significant variations in the average urban built-up areas per person. This is summarised in Table 2 below, which suggests that as with consumption, wealth rather than urbanisation is the main factor behind urban expansion (Angel *et al.*, 2005; Stage *et al.*, 2009).

Table 2: Estimates of average built-up area (in m²) per person for different regions, income groups and city size groups, 1990–2000.

Category	1990	2000	Annual change (%)
Developing countries	105	125	1.7%
Industrialized countries	280	355	2.3%
Region			
East Asia & the Pacific	65	105	5.1%
Europe	190	230	1.9%
Latin America & the Caribbean	145	145	0.3%
Northern Africa	100	110	0.8%
Other developed countries	360	435	2.0%
South & Central Asia	55	75	2.7%
Southeast Asia	40	60	4.4%
Sub-Saharan Africa	105	150	3.6%
Western Asia	155	170	1.0%
Income category			
Low income	65	85	2.6%
Lower-middle income	80	115	3.3%
Upper-middle income	155	170	0.7%
High income	280	350	2.2%
City population size			
100,000– 528,000	170	210	2.2%
528,000–1,490,000	130	165	2.5%
1,490,000–4,180,000	145	165	1.3%
More than 4,180,000	170	185	0.8%
Global average	155	185	1.7%

Source: Angel *et al.*, 2005.

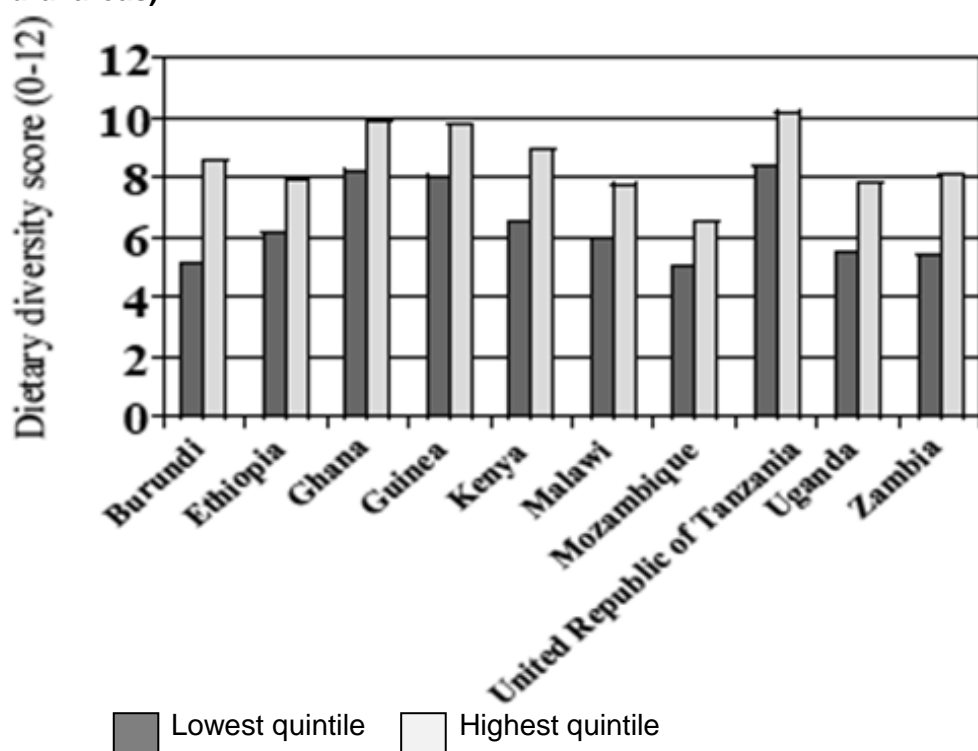
Wealth and the changing nature of economic activities, with the delocalisation of manufacturing and investment in smaller centres, are also at the origin of profound changes in the form of urban centres and the emergence of urban sprawl in high- and middle-income countries. In Mexico City, for example, between 1990 and 2000 the population of the core city declined by 2.1 per cent annually on average, while that of the suburbanised zones increased by 2.8 per cent. In the last two decades, Buenos Aires, Santiago and Mexico City have experienced a polycentric urban expansion of first- and second-order urban localities sprawling along major highways and functionally linked to the main city (Romero-Lankao, 2007). Urban sprawl (and the increased use of the private sector it involves) increases emissions, while densely built-up urban centres are typically more energy efficient (Hoorweg *et al.*, 2011).

The health impacts of urban food insecurity

Comparisons of the nutritional status of children in rural and urban areas almost invariably show that urban children are better off than their rural counterparts, although differences diminish when stunting and underweight are taken into account (Ruel and Garrett, 2004). However, aggregate figures tend to underplay inequalities within locations. Urban centres typically concentrate wealthier and better-educated groups, but while much poverty is still located in rural areas, urban populations are highly unequal with regard to incomes, education and access to basic services. Dietary diversity — the number of foods and food groups consumed over a set period of time — is a useful indicator of food security because of its strong correlation with nutritional status. Figures 3 and 4 below compare the dietary diversity of the highest and lowest income quintiles in rural and urban areas in a number of sub-Saharan African countries. The results suggest that in both areas income plays a critical role.

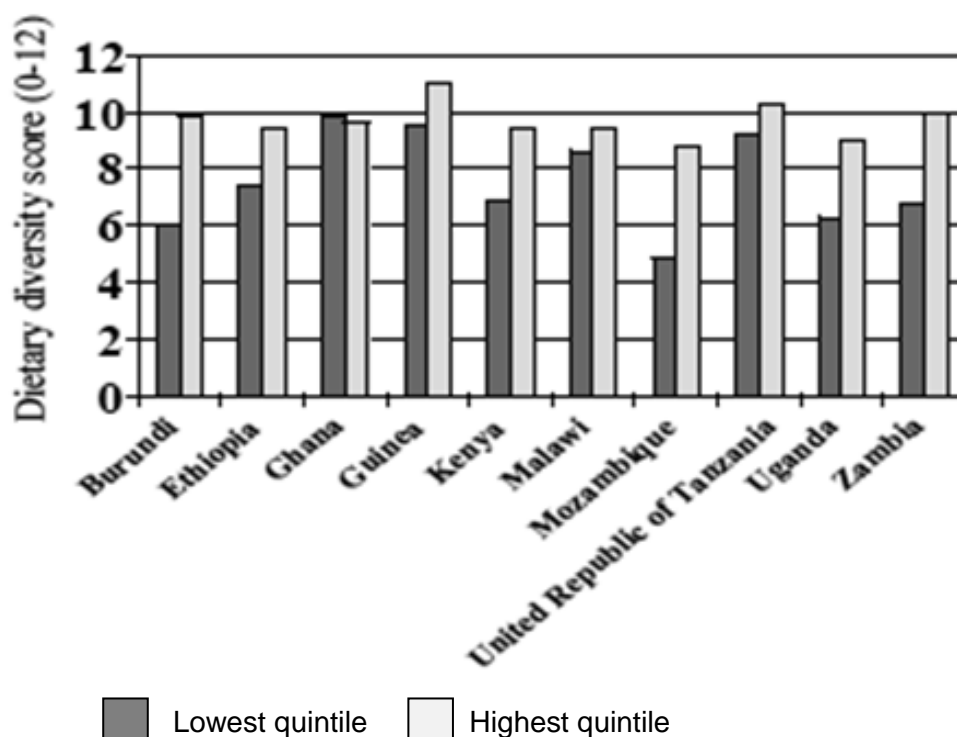
As net food buyers, low-income urban residents and a substantial proportion of rural residents share similar challenges in securing sufficient food for a healthy diet. Urban residents do however face additional constraints that affect their food security. In many cases these relate to non-income dimensions of urban poverty. Diarrhoeal disease is a good indicator of overall environmental hygiene and food safety, and is in many cases linked to malnutrition. The higher prevalence of diarrhoeal episodes among low-income urban populations is closely related to unhealthy living environments. In informal settlements, lack of clean water and sanitation facilities, often extreme over-crowding, open sewers and stagnant water lead to concentrated exposure to pathogens, which are also spread by pests such as flies, mosquitoes and rats (Kennedy, 2003).

Figure 3: Socio-economic differentials in household dietary diversity in selected countries of sub-Saharan Africa - Difference between the lowest and highest quintile (Rural areas)



Source: Ruel and Garrett, 2004, p. 244

Figure 4: Socio-economic differentials in household dietary diversity in selected countries of sub-Saharan Africa - Difference between the lowest and highest quintile (Urban areas)



Source: Ruel and Garrett, 2004, p. 244

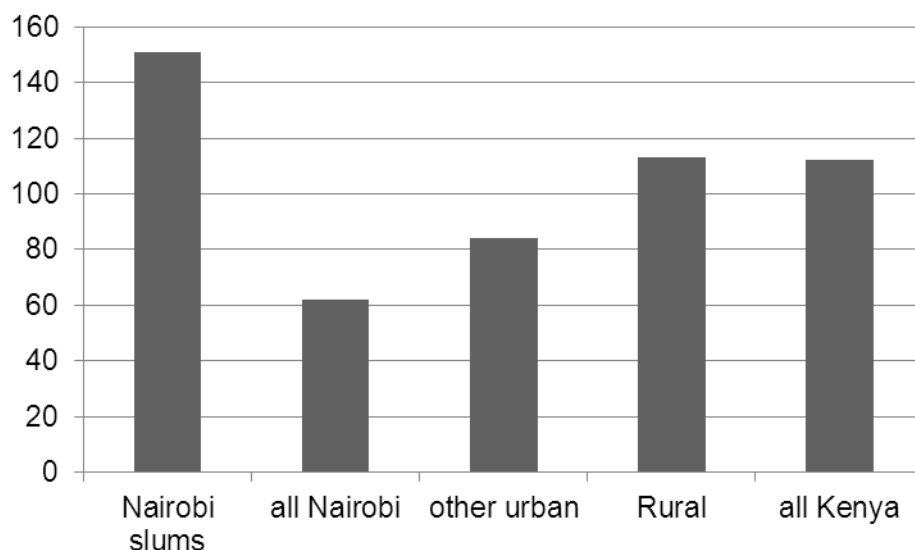
Table 3: Diarrhoea prevalence in lower and upper urban socio-economic groups

Country/year	Prevalence of diarrhoea in the past two weeks	
	Urban Low SES	Urban high SES
Tanzania, 1991-2	18.2	7.0
Ghana 1993	19.4	13.6
Senegal 1992-3	15.7	11.9
Zambia 1991	26.3	11.9

Source: Kennedy 2003

Infant and under-five mortality rates reflect this bundle of disadvantage, which includes low nutritional status, high rates of disease and inadequate access to health services. Figure 5 shows how mortality rates in Nairobi's slums are significantly higher than the average rates for the whole city and, more strikingly, are also higher than those in rural areas.

Figure 5: Infant and under-five mortality rates in Kenya



Source: APHRC, 2002

As with infant and child mortality rates, in most urban centres the differences in the prevalence of malnutrition between wealthy and poor neighbourhoods can be substantial. Informal settlements typically have rates that are several times higher than the city average. Table 4 below shows that in many low and middle-income nations, a very high proportion of children — in many cases one-third — are stunted, or chronically malnourished. In 2005, over half the children in the poorest income quartile of the urban population were stunted and 47 per cent underweight. This proportion was even higher in two of the wealthiest states, Delhi and Maharashtra (Agarwal, 2011). Such findings are disturbing as chronic malnutrition lays the foundations for life-long disadvantage, as it is likely that many of these children will experience challenges in their cognitive development and possibly in their future employment opportunities.

Table 4: Percentage of urban children stunted

Percentage of urban children stunted	Nations and year of survey
>35%	Timor-Leste 2009–10, Malawi 2010
30–34.9%	Zambia 2007, Benin 2006, India 2005–06
25–29.9%	Sao Tome and Principe 2008–09, Nigeria 2008, Guatemala 2008, Niger 2006, Bangladesh 2007, Tanzania 2010
20–24.9%	Congo Democratic Republic 2007, Sierra Leone 2008, Kenya 2008–09, Mali 2006, Egypt 2008, Liberia 2007, Uganda 2006, Nepal 2006, Cambodia 2010, Namibia 2006–07, Albania 2008–09
15–19.9%	Swaziland 2006–07, Maldives 2009, Ghana 2008, Haiti 2005–06
10–14.9%	Bolivia 2008, Jordan 2007, Azerbaijan 2006, Guyana 2009 Nicaragua 2006

Source: Mitlin and Satterthwaite, 2013

At the same time, there is growing evidence that the persistence of malnutrition among low-income groups often goes hand in hand with a rapid rise in overweight and obesity in what is termed the ‘nutrition transition’ (Popkin, 1999). Research in Bogota, Colombia, shows that while children in low-income areas have high levels of wasting (12.6 per cent), almost 30 per cent are overweight (Prain, 2010). In Egypt, 16.2 per cent of urban children suffer from stunting; at the same time, around 70 per cent of women and almost half of men are overweight or obese (Sabry, 2009). While this is a consequence of changes in lifestyle, with the reduction or disappearance of physical exercise, it is also the result of dietary changes and the growing reliance on food with high levels of fats and sugar and the decline in consumption of nutrient-rich food such as fresh fruit and vegetables.

The impacts of climate change health are both direct and indirect. The increased frequency of extreme weather events such as floods and heatwaves in urban settlements with little if any sanitation and typically inadequate clean water supplies and waste collection increase their residents’ exposure to water-borne, food-borne and vector-borne diseases. Such extreme weather events also contribute to higher food prices by affecting different elements of food systems — from production to distribution and storage, and retail and consumption. Insufficient access to food, in turn, increases vulnerability to infectious diseases while the higher incidence of ill-health contributes to malnutrition. The provision of adequate basic infrastructure, especially water and sanitation, is an essential part of attempts to break this vicious circle.

Income poverty and food insecurity

The root cause of urban food insecurity is income poverty. Urban residents rely primarily on food purchases, and any decline in incomes and/or increases in food prices can have catastrophic consequences. In recent research on how the food, fuel and financial shocks affected low-income groups in the period 2008–2011, food security emerged as the most severe cumulative impact (Heltberg *et al.*, 2012). A large majority of low-income urban residents rely on informal sector activities and casual labour that only provide low and irregular earnings. In low-income nations, it is estimated that informal employment accounts for half to three-quarters of all non-agricultural employment (Chen, 2010). Since 2008, the economic crisis has had a devastating impact on informal sector workers following increases in the cost of food, fuel and transport and increased competition from workers laid-off from formal sector jobs (Horn, 2011), as described in Box 2 below.

Table 5: Food expenditure as a proportion of total income by income tercile in 11 southern African cities

All in %	Total	Lowest Income Tercile	Middle Income Tercile	Highest Income Tercile
Harare	62	66	66	55
Lusaka	55	55	57	52
Cape Town	54	59	55	48
Maputo	52	53	52	51
Msunduzi	52	58	54	45
Johannesburg	50	61	47	42
Blantyre	47	57	47	36
Maseru	46	48	47	44
Gaborone	45	49	49	38
Manzini	44	48	43	42
Windhoek	35	46	36	24
Total	49	55	51	44

N=5,096

Source: Crush and Frayne, 2010

Expenditure on food represents an often extraordinary proportion of low-income households' total expenditure. Research in 11 southern African cities shows that, albeit with great variations between cities, food purchase is the most important expenditure for most households, and that it is greater among poorer households (Crush and Frayne, 2010). The same research suggests that four out of five poor urban households do not have enough to eat at any given time (Frayne *et al.*, 2010).

Box 2: Impact of the current economic crisis on urban informal-sector workers

Research between January and June 2009 by WIEGO (Women in Informal Employment: Globalizing and Organizing) on the impacts of the economic crisis among home workers, street vendors and waste pickers in 14 urban centres in 10 countries across Africa, Asia and Latin America shows how vulnerable these workers are. Increases in costs of raw materials, gas, electricity and transport can have a devastating impact when profit margins are extremely slim. To compensate, home workers increase their work rate if they can, but this does not result in higher incomes and is made more difficult by competition from new entrants in the sector.

Street vendors selling cooked food and snacks have been affected by higher food and fuel prices, higher market fees and economising by factory workers, the majority of their clients. Waste pickers are affected by both a decline in recyclable waste, as people consume less and small businesses close down, and by reduced demand in international markets, to which they are indirectly but strongly connected. Strategies to overcome these constraints are short term: traders can change stock, street vendors and waste pickers can travel to new and more distant locations, home workers can increase their working hours. But these strategies can increase risk and uncertainty.

The findings shed new light on the characteristics of the informal sector and dispel some persistent myths about it. Hence, far from ensuring flexibility and ease of entry to low-skilled workers and workers pressed for time, informal work often entails long hours, stiff competition and decreasing wages, with limited mobility and little opportunity to engage in alternative or additional activities.

Source: Horn, 2011

Research in one of Nairobi's largest informal settlements, Mathare, suggests similar patterns. Food is the single largest expense for residents, accounting for nearly half of household expenses. The high rate of joblessness and low wages, and the unpredictable nature of casual labour within informal settlements, lead to generalised food insecurity for residents (Muungano Support Trust *et al.*, 2012). What is perhaps even more extraordinary is that in all but one of the 'villages' (neighbourhoods) overall expenditure is regularly much higher than incomes, suggesting high levels of indebtedness (see also Cohen and Garrett, 2010). Clearly, any shock has devastating impacts on such stretched budgets. This is also the case in low-income areas of Colombo, Sri Lanka's capital city and Kitwe in Zambia, where 30 per cent and 20 per cent of households respectively report spending almost all their available income on food (Prain, 2010).

Table 6: Household monthly income and selected expenditure by village in Mathare, Nairobi

Village Name	Estimated or reported mean HH monthly income, Ksh	Mean HH monthly school fees	Mean Monthly health care expenses, Ksh	Mean monthly transport expense, Ksh	Mean monthly food expense, Ksh	Mean monthly electricity expense, Ksh	Mean monthly security expenses, Ksh	Mean monthly water expenses, Ksh	Mean monthly toilet expenses, Ksh	Estimated mean household expenses (excluding rent), Ksh
3A	7,500	1,618	758	1,507	6,642	333	1,338	425	483	13,104
3B	5,000	1,913	1,208	2,175	6,430	562	3,300	424	100	16,112
3C	10,000	2,057	371	877	7,286	448	2,033	362	130	13,564
4A	10,000	1,255	452	1,105	6,218	361	1,759	494	151	11,795
4B	9,282	968	561	1,793	5,775	385	2,650	461	72	12,665
Gitathuru	5,000	1,298	1,083	1,900	8,146	460	1,514	313	48	14,762
Klamutisya	5,000	1,313	1,504	2,813	5,500	476	67	527	50	12,250
Kosovo	15,000	2,111	722	1,261	5,434	308	1,352	421	324	11,933
Kwa Karuki	10,000	1,193	691	1,955	8,302	363	600	387	342	13,833
Mashimoni	5,372	2,270	673	1,288	6,158	333	1,950	469	306	13,447
Mabatini	6,767	1,860	1,486	3,000	9,600	580	100	588	150	17,364
No.10	12,500	1,621	370	775	10,555	358	154	306	67	14,206
Village 2	10,000	1,797	978	1,482	5,650	432	1,233	475	173	12,220
Mathare Valley	8,500	1,636	835	1,687	7,054	415	1,450	435	184	13,635

Source: Muungano Support Trust *et al.*, 2012

The higher proportion of income spent on food by low-income households reflects their limited financial resources. It also reflects the fact that there is a sometimes considerable difference in prices within cities and between different types of retailers. In Cape Town, such difference between supermarkets and small shops can be as high as 20–26 per cent (Battersby, 2012). In Egypt, although most poverty line studies take regional food price differences into account, they miss significant intra-city differences. The residents of Greater Cairo's *ashwa'iyat* (informal settlements) can pay much more for food than the residents of wealthier neighbourhoods. In part, this is because markets and supermarkets, where prices are lower, are not usually located near informal settlements and therefore buyers incur additional costs for transport. Food is also available locally in small shops and from street vendors, but supplies are usually bought through intermediaries, which increases prices. For low-income households depending on daily wages, food has to be bought on a daily basis in small quantities, which is typically much more expensive: for example, a 2 kg box of ghee costs 20 LE, while a small 80 gram pack costs 1 LE, or 20 per cent more (Sabry, 2009). In Madurai's low-income settlements, in the Indian state of Tamil Nadu, residents who rely on daily wages can afford significantly lower quality of food and smaller quantities than their neighbours who earn weekly wages, as income insecurity is much higher. They also rely mainly on local shops for their daily purchases because, although prices are higher, most of them offer credit facilities (Rengasamy *et al.*, 2001).

To cope with increasing food prices and income insecurity, low-income urban dwellers use a number of strategies. The most frequent is reducing the quality and quantity of food consumed, including reducing dietary diversity, while at the same time reducing non-food

expenditure including foregoing health care, and increasing work time (Frayne *et al.*, 2010; Heltberg *et al.*, 2012; Prain, 2010; Cohen and Garrett, 2010; Muungano Support Trust *et al.*, 2012, Hadley *et al.*, 2012; Ruel *et al.*, 2009). Reduced calories intake combined with the need to work longer hours can have long-term detrimental consequences, especially when shocks put an additional strain on pre-existing high levels of food insecurity and malnutrition. This can result in increased micronutrient deficiency disorders, higher incidence of disease, higher child and maternal mortality, poorer school performance and reduced worker productivity. It also disproportionately affects women, as they are often the last ones to eat and tend to forego food to ensure children have enough.

Some of the main policy prescriptions for food security revolve around the provision of formal social protection. The importance of such programmes has assumed increasing significance following the 2007–08 food price crisis. Governments and international organisations typically extend formal safety nets, and these can be either conditional, requiring beneficiaries to comply with specific conditions such as child education and nutrition, or unconditional, extending food and/or cash to particular groups without attached requirements. Subsidies can also be targeted or universal and are intended to augment the purchasing power of poor individuals and households or whole populations, respectively (FAO *et al.*, 2012). Examples of safety net programmes include the Hunger Safety Net Programme in Kenya, the Productive Safety Net Programme in Ethiopia, Bolsa Familia in Brazil and Progres-Opportunities in Mexico.

There are a growing number of reviews of these programmes and their impacts. Despite previous scepticism, they suggest that, albeit differentially, they have positive impacts on beneficiary households and communities, in particular in terms of child nutrition. Nevertheless, safety nets are insufficient or non-existent in many low- and middle-income countries, and almost 80 per cent of the world's poorest countries lack access to effective safety net coverage (FAO *et al.*, 2012). Effective policies and social protection mechanisms are also those which are in place before a crisis strikes, rather than those implemented in its aftermath, often with poor targeting and unfair distribution of benefits. Targeting extremely vulnerable groups is an important constraint in urban areas where people move frequently, and there are high variations in socio-economic conditions and food insecurity within the same neighbourhoods (Prain, 2010).

With the increase in extreme weather events these are clearly ever more relevant considerations for policy. As noted earlier, more frequent and severe floods are among the main impacts of environmental change in many low-income and informal urban settlements. In many cases, residents are forced to move out of their homes and seek refuge with family and friends in different neighbourhoods (Dodman *et al.*, 2013). It is all too easy in such circumstances for the people who need the most support to fall through the net of social protection mechanisms if these are not adapted to capture increased intra-city mobility as a result of shocks.

Own production of food by urban residents is a valuable strategy, but availability of land is usually limited — although there are major differences in this between urban centres. As a result, it does not appear to play a major role (Prain, 2010; Frayne *et al.*, 2010; Rengasamy *et al.*, 2001). Informal safety nets provided by kin and friends are also important. In many cases, these extend to rural areas, and food transfers are often an important element of these long-standing links (Potts and Mutambirwa, 1998). In the African Food Security Urban Network study of food security in 11 urban centres in southern Africa, one in three respondents received food from rural relatives (Crush, 2012). However, the sustainability of these support networks depends largely on conditions in rural areas, which are affected by a number of socio-economic factors as well as environmental change. In areas where local food production has declined because of changes in rainfall and temperature patterns, it is increasingly migrants who send food to their rural homes. A main reason for this is that food

is often cheaper in urban centres than in rural areas, especially in remote settlements not well served by distribution and retail systems (Balderrama Mariscal *et al.*, 2011). The implications of these changes in the direction of flows of food are important, as the impacts of climate change affect both urban and rural food security in multiple ways and not only through formal food systems but, perhaps more significantly for low-income groups, through largely 'informal' rural–urban linkages (Tacoli, 2013).

The non-income dimensions of urban poverty: space, time and food insecurity

In addition to the income-related challenges that low-income urban groups face daily in accessing food of sufficient quality and quantity, non-income dimensions can also have considerable impacts on their food security. These include lack of space and lack of time, and since food preparation is typically one of women's responsibilities as primary care-givers, they are also heavily gendered.

Lack of space in the home is an additional obstacle to buying food in larger quantities and thus more cheaply. In Greater Cairo, where poverty is assumed to be low and almost negligible compared to other Egyptian governorates, the majority of households in informal settlements are tenants. To keep rental costs at a manageable level, housing is often overcrowded, with shared bathrooms and residents forced to cook in the same room where they sleep (Sabry, 2009). This clearly makes storage of food extremely difficult, which is exacerbated by lack of refrigeration facilities. In Berta Gibi, a low-income community in Addis Ababa, all households are tenants living in dwelling units that belong to the state. Although rent is cheap, the 33 households share one latrine, one water tap and one kitchen. To bake *injera*, Ethiopia's staple, women have to queue sometimes for several hours (Tolossa, 2010). Perhaps unsurprisingly, purchasing cooked food from street vendors is a widely adopted strategy by the poorest urban groups whose incomes and living conditions make cooking their own food a challenge (Rengasamy *et al.*, 2001). In Nigeria, urban residents spend up to half their food budget on street foods, while in Accra this accounts for 40 per cent of low-income families' food purchases (Cohen and Garrett, 2010). Consumption of street foods also tends to increase when food and cooking fuel costs rise since their price usually goes up more slowly as a result of economies of scale in production (Cohen and Garrett, 2010). A similar growing reliance on purchases from vendors seems to be taking place in Mathare, where residents are switching to beans as a cheaper source of protein. However, beans notoriously require a long cooking time and it makes financial sense to purchase portions from food sellers. It also makes sense from a time perspective.

Time poverty is increasing for low-income urban groups. Working longer hours is a major strategy at times of economic crisis, especially for workers in the informal sector (Heltberg *et al.*, 2012; Horn, 2011). Its impact on time poverty, however, is more likely to affect women. For most low-income households, women's paid work is a necessity rather than a choice as their earnings are essential to make ends meet in the face of ever-rising costs of living in the city. But urban labour markets are typically segmented along gender lines, and although not all informal sector workers are women, women are more likely to be employed in it and to earn less than men (Chen, 2010). At the same time, women usually retain their responsibilities as primary carers which, especially in the absence of adequate housing and infrastructure, can be a very heavy burden. Providing childcare and looking after sick relatives as well as travelling to buy food and fuel more frequently and in smaller quantities, and cooking, translate into extremely long working hours, typically much longer than men's (Chant, 2010). Indeed, women have played an important role in absorbing at least part of the shocks that detonated with the food and fuel price hikes of 2008–09, possibly more so than in previous crises (Heltberg *et al.*, 2012). There are reasons to believe that this will continue as the impacts of climate change affect the lives of low-income urban residents; but they will do so at growing personal cost, unless there is greater recognition of the heavy and often

hidden burden that is exacerbated by inadequate living conditions and marginalisation on the labour market.

Conclusions

With half of the world's population estimated to live in urban areas, and virtually all population growth expected to be in urban areas of low- and middle-income regions, now is the time for policies to address the challenges but also take advantage of the opportunities of this momentous demographic, social and economic shift (UNFPA, 2007). Food security will continue to be one of the key challenges of this century, and climate change will act as a multiplier of the many underlying factors that underpin growing insecurity. Increasing and more volatile food prices will continue to affect all net food buyers, in both urban and rural areas. The current predominant focus on production, with little attention to consumption, has rightly been criticised for overlooking the importance of access to food in urban areas (Crush, 2012).

Underlying this is the persistent underestimation and misunderstanding of urban poverty, and the assumption that urbanisation is one of the drivers of food prices increases. This overlooks the scale and nature of urban inequality and conflates urbanisation with higher incomes. Clearly this is not the case. High food prices, combined with spiralling costs for other non-food essentials such as housing and water and with low and irregular earnings in informal sector activities, affect the food security of low-income urban residents as much and in some cases more than rural dwellers. As one of the main impacts of climate change on food system is an increase in prices, urban income poverty needs to be better understood and addressed.

An additional and important dimension of urban disadvantage is the very large number of residents of cities in low- and middle-income countries, in some case more than half of the total city population, who live in settlements with inadequate housing, limited or non-existent basic infrastructure and difficult access to basic services. These groups are especially exposed to the risks posed by climate change and extreme weather events. High incidences of malnutrition linked to low incomes and inadequate living conditions make them more vulnerable to a range of diseases such as water-borne, food-borne and vector-borne diseases linked to climate impacts; in turn, these aggravate malnutrition and ill-health and reduce the ability to adapt and build resilience to climate change. In addition to greater attention to access to food in urban areas, it is thus also necessary to understand the non-income aspects of food insecurity and integrate them in food policy. Clearly this also has a gendered dimension: it is women as the primary caregivers who bear the brunt of inadequate infrastructure and access to services, and who have to juggle paid and unpaid work in the face of growing and multiple challenges.

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