*Chapter 1*

Confronting massive demographic and environmental challenges

This chapter examines the demographic and environmental challenges that lie ahead in six East African states as the first step in identifying key parameters that will shape the future of social protection in the region. The six countries – Ethiopia, Kenya, Mozambique, Tanzania, Uganda and Zambia – exhibit similar demographic trends. However, differences exist between them that will have important implications not only for their population in the future but also for their broader development.

The world's last and largest population boom

According to population projections published by the United Nations in 2015, the population of sub-Saharan Africa is projected to increase from 1 billion in 2016 to 2 billion in 2046 and reach fractionally below 4 billion in 2100 (UN DESA, 2015a). By 2100, sub-Saharan Africa will account for 35% of the world's total population, up from 13% in 2016 (Figure 1.1).

Figure 1.1. **Global population size by region, 1950-2100**
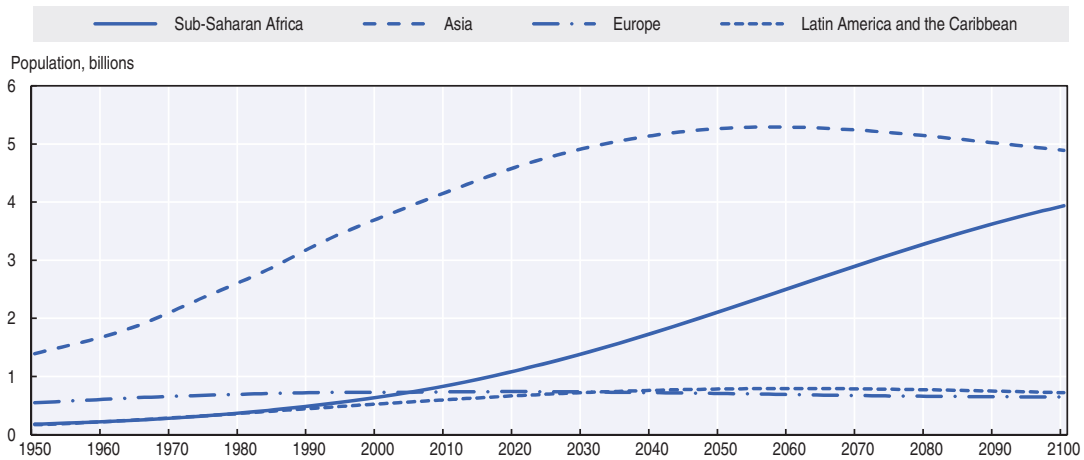
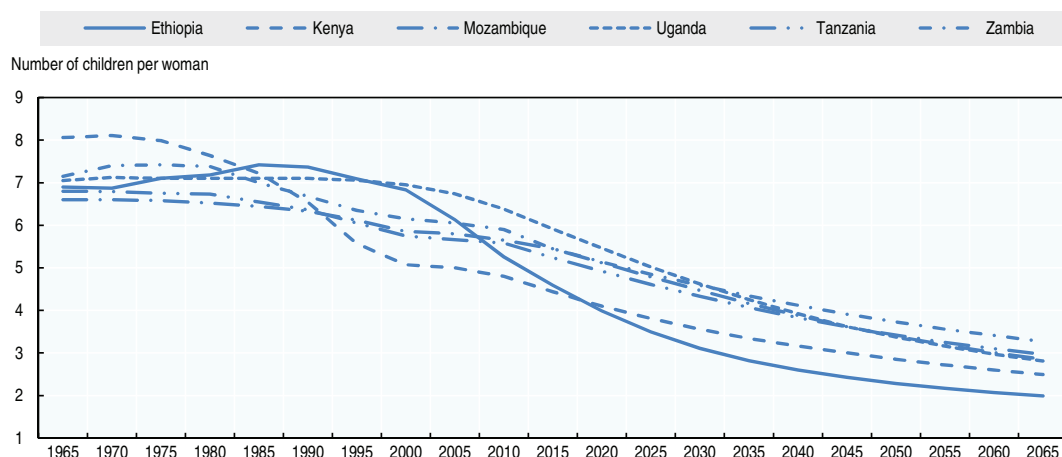*Source*: UN DESA (2015a), World Population Prospects: The 2015 Revision.

In 2010-15, East Africa's annual population growth rate was 2.8%, more than double the 1.2% growth rate for the world as a whole. Due to a combination of high fertility rates and significant increases in life expectancies across the six countries, rapid population growth is projected to continue between 2015 and 2065 for all the sample countries. The populations of Zambia, Uganda, Tanzania and Mozambique will more than treble in size, while Ethiopia's population will register the slowest growth but will still double over this timeframe (Figure 1.2). These growth rates will have a bearing on the rate at which governments in the region can meet demand for improved basic services and the provision of public infrastructure (Foster and Briceño-Garmendia, 2010).

Figure 1.2. **Population size of the six sample countries, 2015 and 2065**
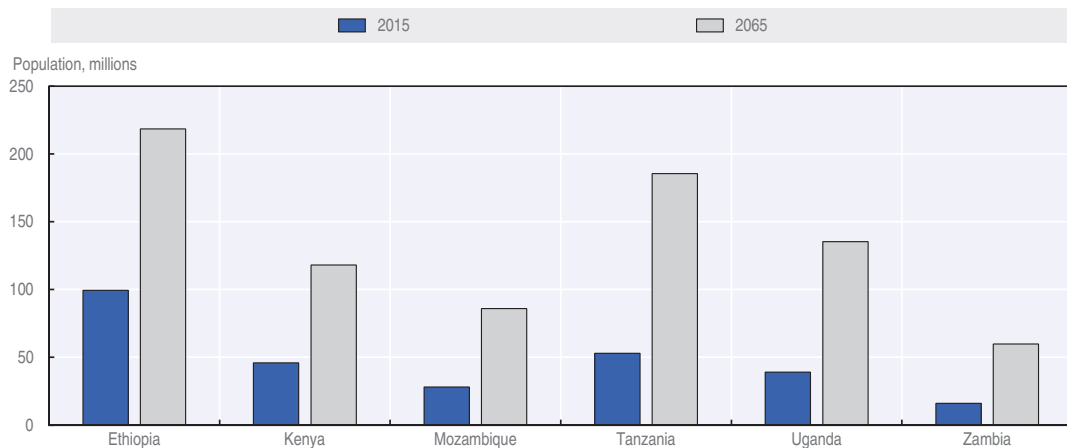
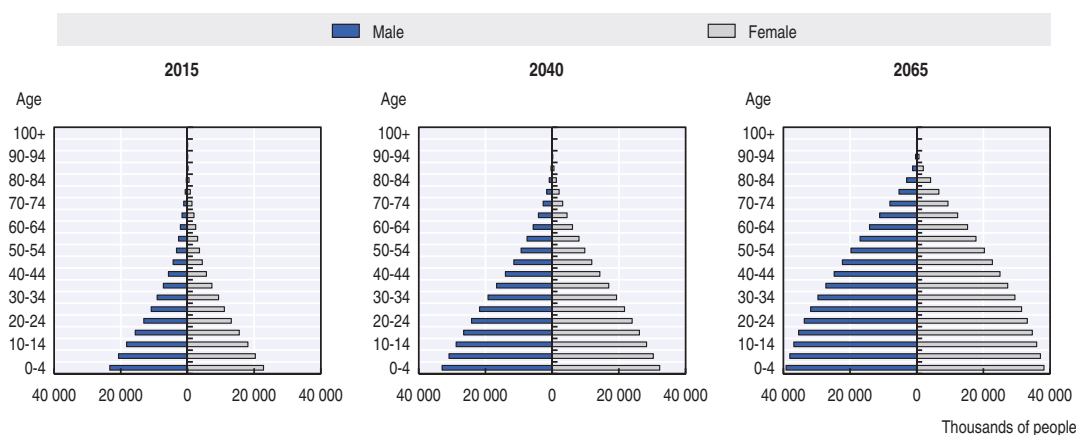*Source*: UN DESA (2015a), World Population Prospects: The 2015 Revision.

Figure 1.3. **Fertility rates across sample countries, 1965-2065**

Source: UN DESA (2015a), World Population Prospects: The 2015 Revision.

The sample countries are at an early or mid-stage in the fertility transition (Muhoza, Broekhuis and Hooimeijer, 2014).[1] As shown by Figure 1.3, their fertility rates have declined significantly since the 1970s (though at different rates in different countries). However, there is evidence that the decline might be stalling. Goujon, Lutz and KC (2015) identify Kenya, Mozambique, Tanzania and Zambia as countries where the fertility decline has stalled, while Bongaarts (2008) concludes the same about Ethiopia and Uganda (using a slightly different methodology). The cause of this stalling is the subject of considerable speculation but cannot be identified with much certainty given the numerous determinants of fertility and the fact that fertility rates differ significantly within the same country depending on income level, education and place of residence. The variation in fertility across and within the six countries can be attributed in significant part to the complex impact of HIV/AIDS in shaping individuals' reproductive choices (Ezeh, Mberu and Emina, 2009).

Figure 1.4. **Aggregate population pyramids for the six sample countries, 2015, 2040 and 2065**

Source: Authors' calculations based on UN DESA (2015a), World Population Prospects: The 2015 Revision.

The age structure of the populations will change dramatically. In 2015, children aged 0-14 made up 44.6% of the population across the sample countries; by 2065, this figure will fall to 29.2%. Over the next 50 years, today's younger cohorts will work their way up the age pyramid (Figure 1.4), shifting the bulge from youth (15-24 years) to working age and then to old age. Rapid growth in the elderly population will start no later than 2035 and will be reinforced by rising life expectancies. Average life expectancy at birth in 2010-15 was 60.5 in East Africa, which is higher than Middle and West Africa but lower than other regions in the world, all of which have life expectancies above 70 years. By 2060-65, life expectancy at birth is expected to exceed 70 years in all the sample countries.

Dependency ratios represent the proportion of individuals who are aged either 14 and under or 65 and older as a proportion of the working age population. An increase in the proportion of "producers" relative to "consumers" in an economy offers the potential for a demographic dividend, provided that the workforce is employed productively. Across the sample countries, the large number of children aged 14 underpins the high dependency ratio evident in 2015, whereby there were only slightly more individuals of working age than dependants in the entire population. If the decline in fertility rates resumes across the six countries, this will reduce the size of the child population relative to the working age population and will produce a significant decline in the dependency ratio between 2015 and 2065 (Figure 1.5), though this decline will decelerate as today's youth cohort reaches retirement age. The dependency ratio will fall fastest and furthest in Ethiopia and slowest and least far in Zambia; Ethiopia's dependency ratio is projected to start rising from around 2055 onwards due to growth in the elderly population.

Figure 1.5. **Dependency ratios in the sample countries, 1965 to 2065**
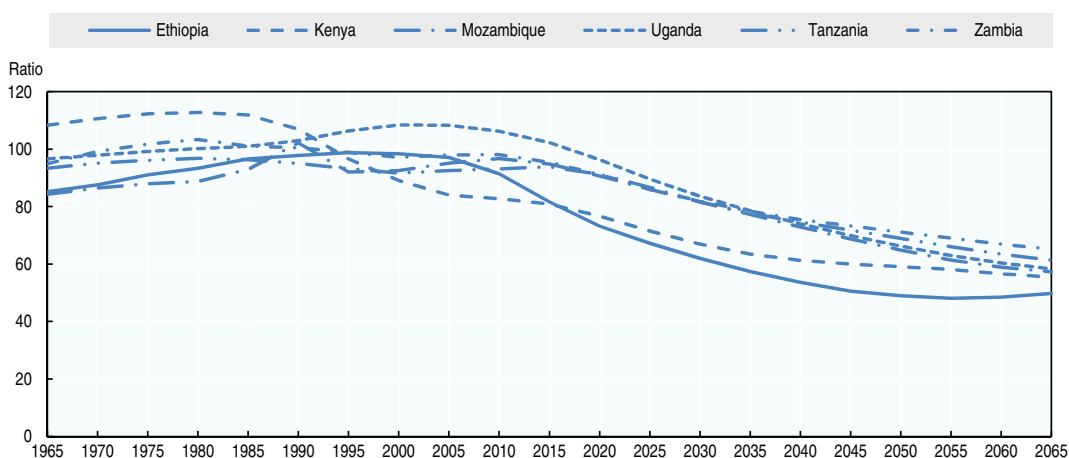
Source: UN DESA (2015a), World Population Prospects: The 2015 Revision.

Today's youth will be the largest cohort ever to enter the labour force

All age groups grow in absolute terms over the projection period but in relative terms there will be important variations between age cohorts. To illustrate the dynamics of different age cohorts, this section disaggregates the age distribution into four groups: childhood (aged 0-14); youth; (15-24); working age (25-59); and elderly (aged 60 and above). The distinction between the "youth" and the "working-age" cohorts is acknowledged to be artificial due to the high labour force participation rate among young people across the region: Sub-Saharan Africa is the only region in the world where the labour force participation rate of the youth (aged 15-24) did not decline between 2007 and 2014 (ILO, 2015).

Figure 1.6. **Children (aged 0-14), as a percentage of total population and absolute number between 2015 and 2065**
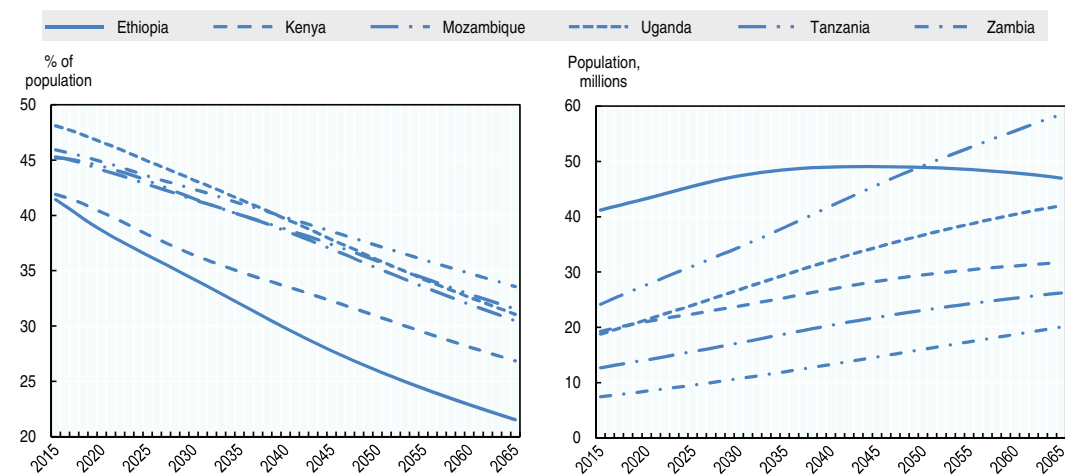

Source: Authors' calculations based on UN DESA (2015a), World Population Prospects: The 2015 Revision.

The size of the infant and school-aged cohorts relative to the population as a whole has peaked but in absolute terms the number will continue to rise. Children aged between 0 and 14 currently comprise between 40% and 50% of the population in all the sample countries. This proportion is projected to decrease throughout the survey period (Figure 1.6) as a result of the decline in fertility rates. However, in absolute terms, the number of children will increase steadily over the projection period (fastest in Tanzania and slowest in Ethiopia), imposing significant and sustained pressure on the region's education systems.

In 2015, the youth cohort (defined as individuals aged 15-24) accounted for around 20% of the total population across the sample (Figure 1.7). This proportion will grow in all countries for the next 10-20 years (with the exception of Ethiopia, where it will peak sooner) before declining slowly over time. With educational enrolment among this group presently low and unemployment high relative to the economy as a whole, it is widely acknowledged that this cohort represents a significant and urgent challenge to policy makers. By 2050, the size of the youth cohort will grow by 123.8%.

Figure 1.7. **Youth (ages 15-24), as a percentage of total population and absolute number between 2015 and 2065**
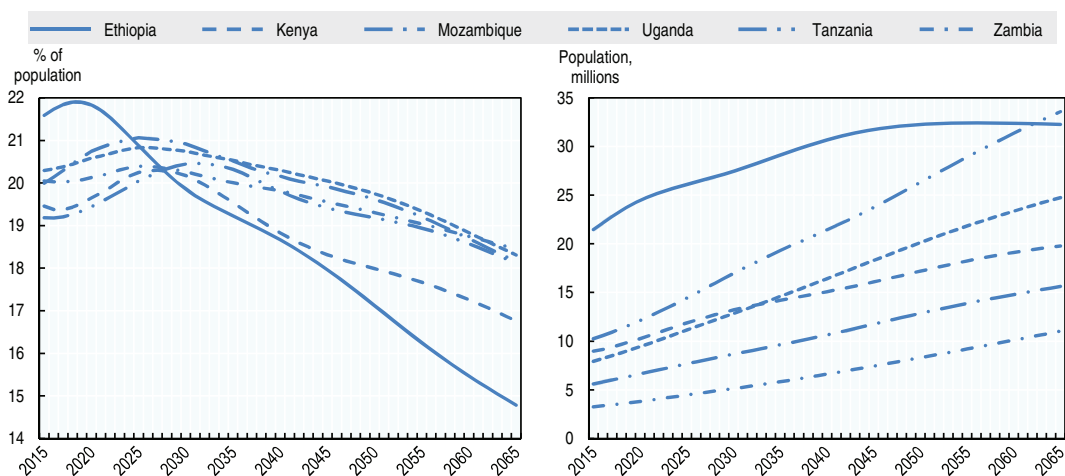
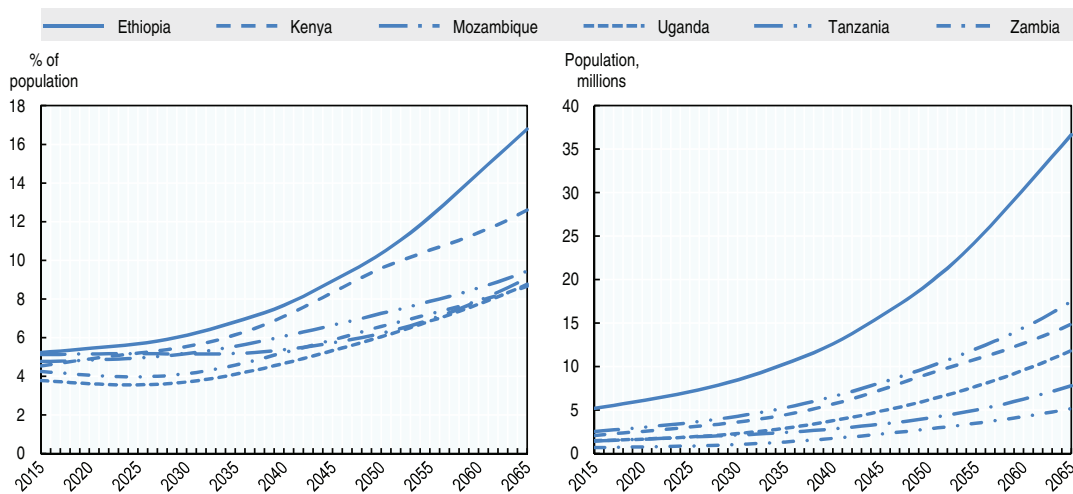*Source*: UN DESA (2015a), World Population Prospects: The 2015 Revision.

Figure 1.8. **Working age adults (aged 25-59), in each country between 2015 and 2065 in absolute terms and as a percentage of total population**
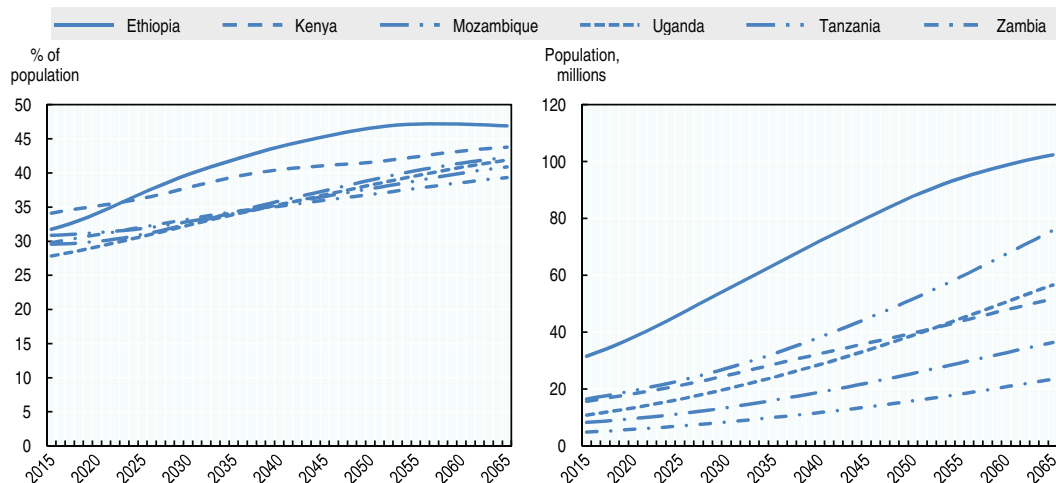
Source: UN DESA (2015a), World Population Prospects: The 2015 Revision.

Figure 1.8 shows the number of working age adults across the six countries. This cohort accounted for around 30% of the population in 2015 across the six countries and will continue to grow strongly until 2065, although this growth levels off towards the end of the timeframe relative to the population as a whole. Ethiopia is the only country where the working-age population will exceed 60% of the population as a whole. The rapid growth in the working age population – both in relative and absolute terms – will drive a significant change in the composition of the global workforce. In 2015, sub-Saharan Africa accounted for 11% of the world's working-age population (age 15-59); in 2065, it will account for 28%.

Figure 1.9. **Adults aged over 60 in each country between 2015 and 2065 in absolute terms and as a percentage of total population**

Source: UN DESA (2015a), World Population Prospects: The 2015 Revision.

By 2065, the present youth cohort will have reached retirement age. As Figure 1.9 shows, the proportion of the population aged over 60 grows slowly at first before rising rapidly between 2030 and 2040 – especially so in the case of Ethiopia and Kenya, where the relative size of the elderly population is projected to double between 2030 and 2065. The focus on expanding contributory social protection arrangements today reflects this challenge, distant though it may seem: guaranteeing an adequate retirement income in the future requires that workers set money aside for the majority of their career.
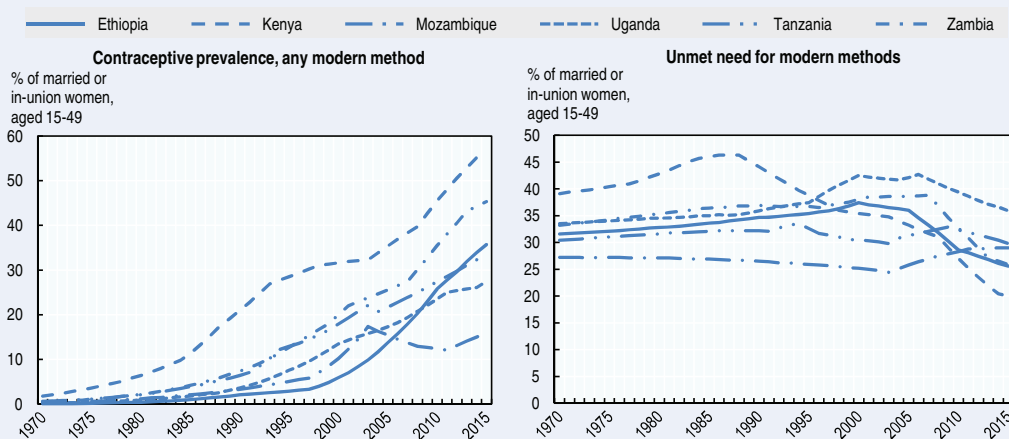
It is worth remembering that, while there is scope for the fertility rate to decline, the ageing of the population is inevitable (barring catastrophe). Indeed, any success the region achieves in reducing the fertility rate faster than was projected by the United Nations in 2015 (Box 1.1) will be tempered by the fact that such a reduction would accelerate the ageing of the population.

> ### Box 1.1. **The pace of development is likely to determine future fertility trends**
>
> Accelerating the fertility decline is an explicit policy goal across all six countries, each of which has published at least one population policy.[a] Fertility is negatively correlated with a number of key developmental variables such as income growth, female education, female labour force participation, falling mortality (in particular infant mortality) and urbanisation – variables which are often positively correlated with each other.
>
> However, the determinants of reproductive behaviour are not solely economic – social and cultural factors can play a very important role. The complex determinants of fertility are reflected by the significant variation that exists within countries. In Ethiopia, for example, the total fertility rate (TFR) in Addis Ababa is 1.5, compared with 5.5 in rural parts of the country and 7.1 in Somali – one of three regions where the TFR increased between 2005 and 2011 despite the overall decline nationally (Federal Democratic Republic of Ethiopia, 2014).
>
> #### Figure 1.10. **Family planning indicators, 1970-2015**
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>
>
> *Source*: UN DESA (2015a), World Population Prospects: The 2015 Revision.
>
> Many countries have shown that increasing availability and access to family planning services can contribute to lowering the TFR (Cleland, 2006; USAID, 2012). The evidence from East Africa is encouraging. Figure 1.10 (left-hand panel) captures the percentage of women of reproductive age (between 15 to 49 years old) who are currently married or in a civil union and using modern methods of contraception. This indicator has risen sharply across all the sample countries since the early 1990s (earlier in the case of Kenya). There is wide variation between countries, with Kenya having the highest estimated prevalence of modern contraception in 2015 (at 56.0%) and Mozambique the lowest, at 16.0%.

> Box 1.1. **The pace of development is likely to determine future fertility trends** (cont.)
>
> The East African average for all forms of contraception was 40% in 2015, which is low relative to Northern and Southern Africa (53% and 64% respectively) but high relative to Middle and Western Africa (23% and 17% respectively). Unmet need for modern contraception methods (right-hand panel of Figure 1.10) reflects the percentage of married or in-union women of reproductive age who are not using any method of contraception but would like to stop or postpone childbearing. Unmet need is lowest in Kenya and highest in Uganda, while Zambia is the only county where the trend is currently increasing. Eastern, Western and Middle Africa have the highest unmet demand for contraception globally.
>
> *Note*: See Ethiopia (1993), Kenya (1967, 1986, 2012); Mozambique (1999); Zambia (1989, 2007) Tanzania (1992, 2006), Uganda (1995, 2008, 2011).
> *Sources*: Cleland (2006), "Family planning: the unfinished agenda"; Federal Democratic Republic of Ethiopia (2014), *Population Stabilization Report*; USAID (2012), *Three Successful Sub-Saharan Africa Family Planning Programs: Lessons for Meeting the MDGs*, USAID/Africa Bureau, USAID/Population and Reproductive Health, Ethiopia Federal Ministry of Health, Malawi Ministry of Health, Rwanda Ministry of Health.

The demographic transition will be accompanied by changing health needs

The demographic transition that will occur in East Africa will be accompanied an epidemiological transition. The combined effect of these two trends is an increase in the size of the older population with an increasing risk of chronic diseases. The epidemiological transition is also linked to changes in behaviour (such as nutritional practices) as well as to environmental factors such as increased exposure to traffic-related air pollution in a context of rapid urbanisation. An increase in chronic conditions affects health policies – the response to health problems becomes less about cure and more about *ex ante* prevention and *ex post* disease management. Social protection will thus focus less on mitigating the (health and financial) consequences of sudden illness and more on long-term support for health (and social) services which can keep chronically ill people healthy, functional and productive.

The health transition is often associated with a decrease in the burden of communicable diseases, though it is argued that the prevalence of communicable diseases does not decrease as fast as chronic conditions increase, leaving many countries facing a "double burden" of disease (Dye, 2014). Across sub-Saharan Africa, there has been considerable progress in controlling communicable diseases: the number of deaths from malaria (which is heavily concentrated in sub-Saharan Africa) has fallen from an estimated 839 000 deaths in 2000 to 438 000 in 2015 and there has also been a clear drop in diarrheal diseases and lower respiratory infections (such as pneumonia). However, communicable diseases remain a burden on public health systems while emerging diseases, epidemics and pandemics can quickly wipe out some of the gains achieved in terms of health outcomes, as was shown by the 2014-16 Ebola crisis in West Africa.

HIV/AIDS remains one of the major health challenges in the sample countries. Annex 1.A2 shows prevalence rates since 2000 and years lost to AIDS disability as a percentage of years lost to disabilities of all kinds. Ethiopia appears to be the least affected, followed by Tanzania, Kenya, Uganda; Mozambique and Zambia have the highest prevalence rates. Reported trends vary too: since 2001, the trend has been downward in Ethiopia, Kenya and Tanzania, up in Uganda, and rising to a plateau in 2009 in Mozambique and Zambia.

Years lost to AIDS disability as a percentage of years lost to all disability in the 15-19 age group is no more than 5% in all six countries. The percentages rise among the 30-59 age group, exceeding 12% in Mozambique and Zambia. Prevalence rates and disabilities due to HIV will most probably continue to climb because of increased access to antiretroviral therapy (ART) treatments, which extend the life expectancy of people with HIV but cannot cure them. On the other hand, new WHO guidelines which have increased the recommended CD4 count[2] at which to provide antiretroviral drug treatment are seen as an important evolution in reducing the incidence of disability among people living with HIV (Eaton et al., 2014).

East Africa's rapid urbanisation is shifting the incidence of poverty

Africa is urbanising fast: according to UN projections, Africa is expected to be 56% urban in 2050, versus 40% in 2014.[3] In 1990, Africa was the region of the world with the smallest urban population, at 197 million; by 2020, it will have the second-highest number after Asia (560 million versus 2.2 billion respectively) (AfDB, OECD and UNDP, 2016). Figure 1.11 shows historic and projected urban population growth in sub-Saharan Africa relative to North Africa and Latin America and the Caribbean. While Latin America's cities are expected to keep growing between now and 2050, the population in rural areas is projected to fall; Sub-Saharan Africa is the only region where rural populations will also show strong growth in the future.

Figure 1.11. **Urban and rural populations by region, 1950-2050**
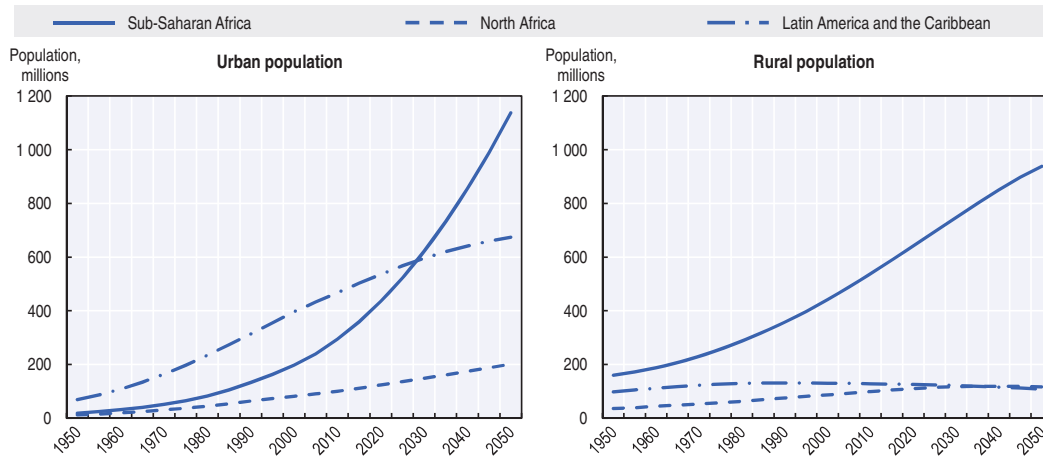
Source: UN DESA (2014), World Urbanization Prospects: The 2014 Revision.

East Africa is the least urbanised region in the world. Some 25.6% of the East African population lived in urban areas in 2015, the lowest level of any region globally and also significantly below Middle Africa (44.0%) and West Africa (45.1%). The global level of urbanisation was 54.0% in 2015. In that year, Ethiopia and Tanzania were the most urbanised of the sample countries, while Zambia and Mozambique were the least urbanised (Figure 1.12). However, this is partly attributable to different definitions of 'urban' across the countries.[4]

Figure 1.12. **The level and growth rate of urban populations across the sample countries - historic and projected**
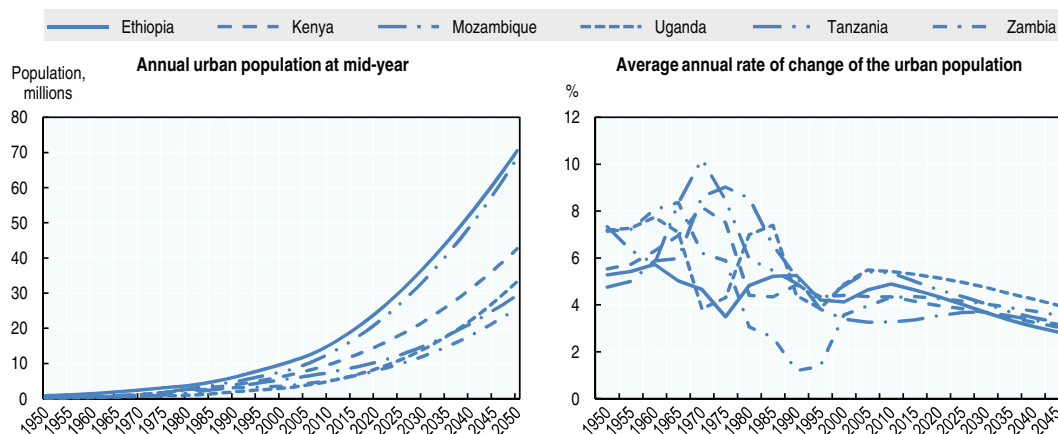
Source: UN DESA (2014), World Urbanization Prospects: The 2014 Revision.

There has been rapid growth in urban populations across the sample since 1950, most notably in the 1960s and 1970s (Figure 1.12). The UN expects rapid urbanisation to continue until at least 2050: according to its latest projections, urban populations will be more than three times higher in 2050 than in 2015 in Mozambique, Kenya and Ethiopia, more than four times higher in Zambia and Tanzania and more than five times higher in Uganda (UN DESA, 2014). Over the same period, rural populations will increase as well, with growth ranging between 47% in Ethiopia to 110% in Uganda. As a result, only in Tanzania and Zambia will the urban populations be larger than the rural populations by 2050 (Figure 1.13).

Figure 1.13. **Urban and rural populations, 2015 and 2050**
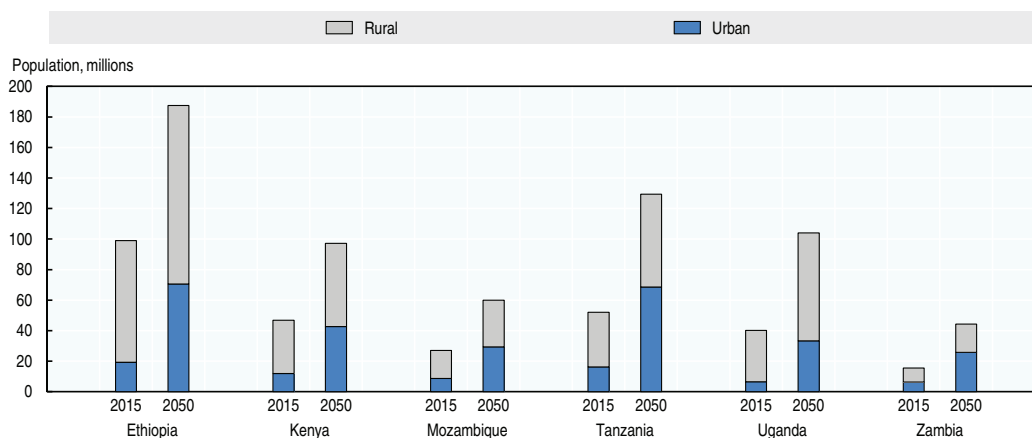
Source: UN DESA (2014), World Urbanization Prospects: The 2014 Revision.

As discussed in the 2016 African Economic Outlook, "Africa's urban growth has to a large extent taken the form of urban villages, diffusing urban growth in smaller towns" (AfDB, OECD and UNDP, 2016). These "urban villages" exist at the interface of rural and urban areas and are the residence of 82% of Africa's population. This form of urbanisation raises important challenges regarding infrastructure, governance and the provision of basic services in cities which, in certain cases, have not yet been built. The financial and

administrative challenges associated with African urbanisation are likely to be immense. The blurring of urban and rural is reflected by the fact that about 40% of African urban dwellers are engaged in some form of agricultural activity (FAO, 2012). At the same time, rural livelihoods tend not to depend solely on agriculture, even in the least developed countries (UNCTAD, 2015).

Poverty in sub-Saharan Africa is often considered a predominantly rural problem: in 2012, the poverty rate in rural areas was 46%, versus 18% in urban areas, and the absolute number of poor people residing outside cities was far higher (Beegle et al., 2016). Higher levels of urbanisation are associated with lower poverty and higher GDP per capita globally (Kariuki et al., 2013), suggesting that the rapid pace of urbanisation in Africa will play an important role in accelerating the decline in poverty. Rural poverty rates are higher than urban rates across the six sample countries (Figure 1.14); the disparity is greatest in Zambia and smallest in Ethiopia and Mozambique.

Figure 1.14. **Poverty rate in urban versus rural areas**
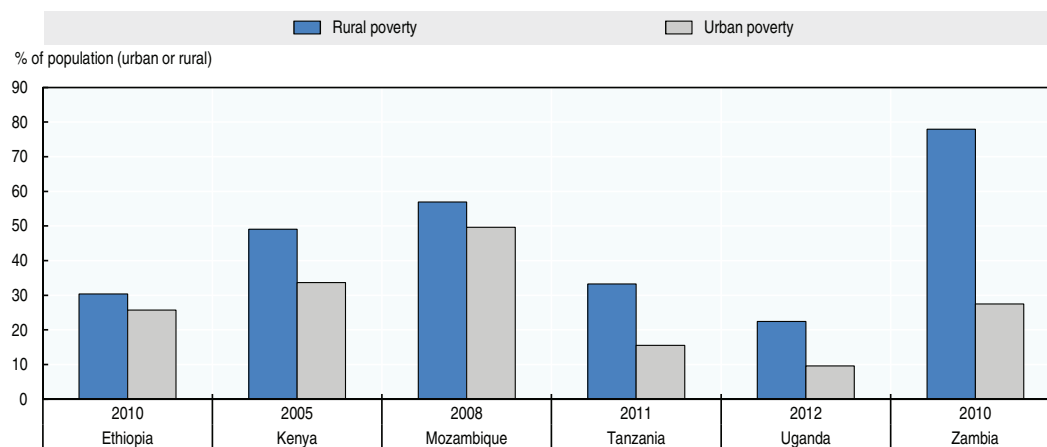
Source: World Bank (2016), World Development Indicators (database).

Yet urban poverty dynamics will evolve as the nature of African urbanisation changes. Ravaillon, Chen and Sangraula (2007) find that the urban share of countries' extreme poor is rising across the world, with the trend particularly pronounced in sub-Saharan Africa. A binary distinction between rural and urban is also not very instructive. As the World Bank and the IMF note (2013): "[P]eople and poverty are located along a continuous "settlement" spectrum ranging from sparsely populated rural areas, to small towns to small cities, to megacities". Outside Africa, urban poverty is lowest in the largest cities while the incidence of poverty and the total number of poor people is higher in smaller cities. In Africa, however, the urban poor are concentrated in the largest cities, in part because these currently account for such a large share of the total urban population. As Africa's smaller towns develop, it is possible that urban poverty trends in the region will converge with trends evident elsewhere in the world.

Some 55% of sub-Saharan Africa's urban population lived in large-scale informal settlements (slums) in 2014 – a decline from 70% in 1990 but still almost twice the level for the developing world as a whole (UN-Habitat, 2016). Five of the six sample countries exceeded this level: Mozambique registered the highest proportion (80.5%) and Kenya the lowest (54.7%) in 2015 (UN-Habitat, 2015). Urban poverty is concentrated in these areas: half of slum-dwellers live below the absolute poverty line (AfDB, OECD and UNDP, 2015). A defining characteristic of slums is the absence or poor quality of services, housing and

infrastructure, implying that multi-dimensional poverty levels in such areas might be similar to rural areas. As the African Economic Outlook (AEO) 2015 notes, "the deprivations faced by the rural and urban poor are similar" (AfDB, OECD and UNDP, 2015). At the same time, there are major structural differences between urban and rural poverty. The cost of living is higher in urban areas and the seasonal dynamics of poverty are likely to differ (Kaminski, Christiaensen and Gilbert, 2014), while there is also likely to be greater pressure on shared services in urban areas.

Health outcomes in slums are a particular concern. Although infant and maternal mortality rates are typically significantly lower in urban areas than rural in sub-Saharan Africa, this does not hold in Tanzania, where infant, child and maternal mortality are higher in urban areas than rural (United Republic of Tanzania, 2015). It is likely that a similar tendency might exist in slum areas across the other sample countries (Olack et al., 2014). Urban residents are subject to a range of different health risks than rural dwellers, most notably air pollution. Moreover, incidence of HIV/AIDS differs between rural and urban areas: Magadi (2013) finds that the prevalence of HIV in sub-Saharan Africa is higher among the urban poor than among those living in urban areas who are relatively well-off, which contrasts with the finding that poverty is associated with a significantly lower rate of HIV infection in rural areas.

At present, the evidence base for understanding and addressing urban poverty is limited by the poor quality of data from these areas, particularly slums. Lucci and Bhatkal (2014) find that censuses and household surveys carried out in slums suffer from low coverage, low levels of detail and low frequency. Improving household surveys to better reflect what mechanisms exist for poor and vulnerable urban residents is required. Enumerators from within slums need to be involved in carrying out these surveys and satellite imagery can be used to provide additional information about spatial distributions.

Rural-to-urban migration is considered an integral part of the development process (Lewis, 1954): surplus labour in rural areas is attracted by higher wages paid by the urban-based industrial sector. By encouraging working-age household members to find higher-paid work in towns and cities, rural households diversify income sources and can offset localised economic shocks. Remittances also enable recipient families to hold more productive capital and are thus a means of overcoming capital market imperfections (Rutaremwa, 2011). However, migration fragments households, diminishing the capacity of its members to pool income and care for each other. This undermines the role that households and social networks can play in providing informal support and is creating space and demand for formal, public social protection arrangements.

The dynamics of future migration flows are uncertain

The UN population projections used in this study do not anticipate migration to be a major determinant of population change in the sample countries. They expect net emigration across the six countries between 2015 and 2065 of a modest size.[5] In terms of annual rates per 1 000 home population, Tanzania and Uganda are projected to have the largest net emigration over the 50-year period, followed by Zambia. The projected rates for Kenya, Mozambique and Ethiopia are very low, at less than 1 in 5 000 each year. The implication is net emigration of just under 5 million from the six countries in the next 50 years, and just under 8.5 million from East Africa as a whole. By way of comparison, more than 40 million people moved from Europe to the "New World" between 1850 and 1913.

Intra-African migration could exacerbate the population boom in the six sample countries. Movement between countries within sub-Saharan Africa accounts for almost 65% of migration in the region (World Bank, 2011). This movement is most often linked to

the search for employment but might also relate to the vagaries of state formation that cut across ethnic boundaries or are driven by conflict and political unrest. There exists significant movement between the sample countries, with migration channels identified from Zambia to Tanzania, Uganda to Kenya and Tanzania to Kenya. Tanzania is also a favoured destination for migrants from the Democratic Republic of Congo and Burundi. Conflict or climate change could lead to significant movement of people between the six sample countries or net immigration to the six sample countries from neighbouring states in East and Middle Africa.

The very low level of emigration projected by the UN is based on an extrapolation of existing trends. It appears very conservative given the unprecedented rate of population growth across the sample countries. Between 2005 and 2050, the number of individuals aged 15-39 (the cohort most likely to emigrate) is projected to rise by 176 million, an increase of 316%. Assuming constant average labour force participation rates across the six countries (at 80% on average), a higher bound estimate of the surplus labour or potential supply of migrants from East Africa could stand at 140 million. The negative impact of population growth in terms of employment availability and incomes might serve as a significant push factor for migration, compounding the incentive to migrate associated with the better living standards potentially available in wealthier countries. At the same time, the demographic trends of wealthier countries are likely to serve as a pull factor: population ageing is projected to reduce the size of the economically active working age population in 25 Western European states and territories by 66.3 million between 2005 and 2050 (Koettl, 2010). This reduction is expected to be sharpest during the period 2010-30.

Koettl (2010) describes the disparity in population trends between low- and high-income countries as an opportunity for "demographic arbitrage", which benefits both the receiving nations (by increasing the size of their workforce) and the sending nations (by alleviating pressure on their own labour markets and reducing the possibility of an ageing crisis once the youth bulge reaches retirement). Relative to other regions in sub-Saharan Africa, East African migrants are more likely to leave the continent and thus take advantage of this opportunity: according to World Bank data, 41% of East African migrants leave Africa, versus 24% from West Africa, 39% from Middle Africa and 28% from Southern Africa (World Bank, 2011). However, this arbitrage is reliant not only on policies within Europe that allow for the large-scale movement of labour but also on migrants possessing the type and level of skills required by the receiving countries.

Climate change poses a massive threat to livelihoods

Africa is the continent most vulnerable to climate change. Current models indicate that climate change will affect both temperatures and rainfall levels in East Africa. According to the International Food Policy Research Institute, temperatures in the region will increase by between 1.3°C and 2.1°C by 2050 while rainfall will either increase or remain the same across the region on average but might decrease significantly in Ethiopia (IFPRI, 2013). East Africa will also be vulnerable to the extreme weather events associated with climate change such as droughts and flooding that have a much faster impact.

Climate change has been overwhelmingly driven by emissions from high-income countries yet its consequences are overwhelmingly endured by low-income countries. Africa's population growth has been a relatively minor contributor to climate change so far but this is likely to change over the next 50 years. As economies in the region grow wealthier and consumption rises, so too will emissions. The growth of cities and a shift away from agriculture towards industry are likely to compound this effect. Moreover, population pressures will reduce the region's resilience to climate change through a number of channels.

Deforestation and over-grazing, both closely associated to the challenge of feeding rapidly-growing populations, result in soil erosion and desertification, both of which render land unproductive over time and reduce its resilience to climate shocks (Stephenson, Newman and Mayhew, 2010). East Africa's Lake Victoria is not only shrinking as a result of climate change, but it is also suffering from a rapid loss in biodiversity as a result of pollution and over-fishing; its ability to sustain livelihoods and to provide food for neighbouring countries is diminishing.

The impact of climate change will not only be felt inland. Sea-level rises and associated coastal erosion are a major concern for residents of coastal areas in Kenya, Tanzania and Mozambique. Mozambique is also highly vulnerable to tropical cyclones, which are linked to increases in water temperatures associated with climate change. The consequences of climate change in coastal areas affect not only economic activities in these areas but also diminish the natural defences that protect inland areas from the impact of rising sea levels. On a regional level, the damage inflicted on both inland and coastal areas risks instigating large-scale migration crises.

East Africa's capacity to feed itself and meet its needs in terms of water provision will be further strained. East Africa is already one of the most food insecure regions in the world: 28% of the population suffered severe malnutrition in 2014/15 versus an average of 26% for sub-Saharan Africa as a whole. Some 44% of children in Eastern Africa are stunted, the highest proportion in Africa (FAO, 2017). The World Food Programme's hunger and climate vulnerability index classifies vulnerability in these dimensions to be very high in Mozambique, Kenya and Ethiopia and high in the other sample countries (WFP, 2015).

These challenges are likely to be exacerbated by rapid population growth and by the urbanisation projected for the period ahead. Urbanisation is typically associated with higher demand for food, which puts greater strain on domestic agricultural production (AfDB, OECD and UNDP, 2016).

Climate change will cause acute shocks (in the form of natural disasters) and a gradual deterioration of conditions both in-land and in coastal areas. In both cases, poor households are the most vulnerable, and the adverse impacts can be long-lasting: Ethiopian households that suffered during the 1984/85 drought continued to experience 2-3% less annual per capita income growth in the 1990s (del Ninno, Coll-Black and Fallavier, 2016).

Hallegatte et al. (2017) identify five reasons why poor households are disproportionately affected by natural disasters: i) overexposure (poor households are more likely to live in areas or accommodation susceptible to regular events such as floods); ii) higher vulnerability (poor households typically suffer higher losses when natural disasters strike); iii) lower ability to cope and recover after an event (due largely to a lack of public support); iv) permanent impacts on education and health (a result of negative coping strategies); and v) *ex ante* changes to behaviour (vulnerability to natural disasters deters poor households from investing in livelihoods). Over the longer term, poor households are less able to move or diversify their livelihoods in response to deterioration in their livelihoods resulting from climate change.

Climate change affects the key determinants of health: access to clean air, food and safe drinking water and shelter. Its negative health impacts include the proliferation of communicable diseases: according to the World Health Organization, between 2030 and 2050, it is expected to cause approximately 250 000 additional deaths per year worldwide, from malnutrition, malaria, diarrhoea and heat stress (WHO, 2016). Given the heightened impact in sub-Saharan Africa and the fact that low-income countries are least able to mitigate these adverse health impacts, climate change will place East Africa's public health services under severe strain.

Notes

1. The fertility transition refers to the decline in fertility from an average level of four or more children per woman to an average of 2.1 children per woman, which is known as "replacement level" and is generally accepted to be the level of fertility required to keep their population constant (absent migration). Oppenheim Mason (1997) provides a useful summary of the historical literature on fertility.

2. CD4 stands for *cluster of differentiation 4* and is used to identify the number of a certain type of white blood cells which are depleted in the blood by the virus. The lower the level of CD4 count, the weaker is the immune system of the patient.

3. The figures quoted in this section come from the United Nations Department of Economic and Social Affairs *World Urbanization Prospects, 2014 Revision*. The population data are not strictly comparable with the 2015 *World Population Prospects* revisions but the discrepancy is not sufficient to undermine the validity of the urbanisation projections.

4. The United Nations *World Urbanization Prospects, 2014 revision* uses the same definition of 'urban' as each country uses (summarised in Annex 1.A3); among the six sample countries, no two definitions are the same, which makes cross-country comparisons of urbanization difficult.

5. Information on the six countries is set out in Annex 1.A1.

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Annex 1.A1. Net migration into the six countries

In the UN WPP methodology manual, it is noted that:

> "In preparing assumptions about future trends in international migration, several pieces of information were taken into account: (1) information on net international migration or its components (immigration and emigration) as recorded by countries; (2) data on labour migration flows; (3) estimates of undocumented or irregular migration; (4) and data on refugee movements in recent periods… Given the lack of suitable information on the age distribution of migrant flows, models were generally used to distribute the overall net number of male and female migrants by age group according to the dominant type of migration flow assumed… As a final step, it was necessary to ensure that the sum of all international migration added to zero at the global level for each 5-year estimation and projection period. This was achieved by an iterative process in which individual country estimates and projections were revisited and altered accordingly".

Net migration is the inflow of immigrants minus the outflow of emigrants. A positive number reflects a net inflow and a negative number a net outflow. The absolute number of migrants is shown in 10-year intervals as is the migration rate, expressed as the annual net number of migrants per thousand of the home population. The numbers for immigrants and emigrants are not published separately (UN DESA, 2015b).

Table 1.A1.1. **Net migration flows, in thousands of people**

Country	2015-25	2025-35	2035-45	2045-55	2055-65
Ethiopia	-120	-120	-120	-117	-105
Kenya	-100	-100	-100	-98	-88
Mozambique	-50	-50	-50	-49	-44
Tanzania	-400	-400	-400	-390	-350
Uganda	-300	-300	-300	-293	-263
Zambia	-80	-50	-50	-49	-44

Source: UN DESA (2015a), World Population Prospects: The 2015 Revision.

Table 1.A1.2. **Rates, per thousand of the population**

Country	2015-25	2025-35	2035-45	2045-55	2055-65
Ethiopia	-0.11	-0.09	-0.07	-0.06	-0.05
Kenya	-0.19	-0.15	-0.13	-0.1	-0.08
Mozambique	-0.16	-0.12	-0.09	-0.07	-0.06
Tanzania	-0.66	-0.49	-0.37	-0.29	-0.21
Uganda	-0.64	-0.48	-0.37	-0.29	-0.21
Zambia	-0.42	-0.2	-0.15	-0.11	-0.08

Source: UN DESA (2015a), World Population Prospects: The 2015 Revision.

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Annex 1.A2. HIV/AIDS

Table 1.A2.1. **HIV/AIDS**

Country	Year	AIDS deaths	HIV prevalence	AIDS YLD as a per cent of all YLD	
			aged 15-49	aged 15-29 (%)	aged 30-59 (%)
Ethiopia	2001	110 000	3.9		
Ethiopia	2005	120 000	2.6		
Ethiopia	2009	72 000	1.6		
Ethiopia	2012			0.6	1.6
Ethiopia	2013	45 000	1.2		
Kenya	2001	170 000	8.7		
Kenya	2005	150 000	6.6		
Kenya	2009	86 000	6.0		
Kenya	2012			3.5	8.3
Kenya	2013	58 000	6.0		
Mozambique	2001	39 000	8.8		
Mozambique	2005	73 000	11.1		
Mozambique	2009	72 000	11.3		
Mozambique	2012			5.0	12.1
Mozambique	2013	82 000	10.8		
Tanzania	2001	130 000	7.9		
Tanzania	2005	140 000	6.6		
Tanzania	2009	95 000	5.7		
Tanzania	2012			2.7	6.9
Tanzania	2013	78 000	5.0		
Uganda	2001	100 000	6.8		
Uganda	2005	78 000	6.2		
Uganda	2009	66 000	6.8		
Uganda	2012			3.0	7.9
Uganda	2013	63 000	7.4		
Zambia	2001	74 000	14.4		
Zambia	2005	68 000	13.7		
Zambia	2009	34 000	13.2		
Zambia	2012			5.0	12.5
Zambia	2013	27 000	12.5		

Source: WHO, Health Statistics and Information Systems.

Annex 1.A3. National definitions of urban, East African countries

Country	Last census	Definition
Ethiopia	2012	Localities with 2 000 inhabitants or more.
Kenya	2009	Municipalities, town councils, and other urban centres with 2 000 inhabitants or more. Due to substantial changes in the 1999 census delineations of urban areas, only the population for the "urban core" is considered to ensure consistency with previous censuses.
Mozambique	2007	In the 1997 and 2007 censuses: 23 cities and 68 towns/vilas.
Tanzania	2012	Urban areas are defined using several criteria and include all regional and district headquarters, as well as all wards with urban characteristics (i.e. exceeding certain minimal level of size-density criteria and/or with many of their inhabitants in non-agricultural occupations). No specific numerical values of size and density are identified, and wards are defined as urban based on the decision of the District/Regional Census Committees.
Uganda	2011	Gazetted cities, municipalities and towns with 2 000 inhabitants or more.
Zambia	2010	Localities of 5 000 inhabitants or more, with a majority of the labour force not in agricultural activities.

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