

Envisioning a healthy future

Africa's shifting burden of disease

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Summary

Africa has the highest prevalence of communicable diseases in the world. In 2015, more than three times as many people died from AIDS in sub-Saharan Africa, and more than ten times as many people died from malaria as in the rest of the world combined. Non-communicable diseases are also increasing on the continent. This paper uses the International Futures forecasting system to explore the effects on human development of Africa's achieving targets 3.3 and 3.4 of the Sustainable Development Goals: respectively, eradication of selected communicable diseases, and a reduction in premature deaths from non-communicable diseases by one-third by 2030.

AFRICA SUFFERS FROM a disproportionate share of deaths and disability caused by communicable diseases when compared to other developing regions. A high prevalence of communicable disease is a strong indicator of underdevelopment in itself, but it is also an important obstacle to advancing human development. Given that infectious – or communicable – diseases tend to more heavily affect vulnerable populations, such as women during childbirth and infants, the effect on life expectancy in Africa has been extraordinary.¹ In 2015, sub-Saharan Africa had the lowest average life expectancy at birth for males (58 years) and females (60 years) among all developing regions in the world.²

The Millennium Development Goals (MDGs) focused the world's attention on reducing the burden of communicable diseases between 2000 and 2015. The MDGs specifically focused on malaria, HIV/AIDS and tuberculosis (TB) as outlined in MDG 6.³ African countries achieved notable reductions in these causes of death during this period but most still failed to meet the MDG targets. However, the MDGs did not take into consideration heterogeneity among African nations in terms of income levels, education levels, technological progress and levels of average life expectancy at birth. Although most African countries did not meet the MDG targets, many still reduced deaths from those

diseases and raised life expectancies significantly. For example, despite a large population and high levels of poverty Ethiopia increased its average life expectancy by 13 years between 2000 and 2015.⁴

The Global Burden of Disease (GBD) report first published in 1997 by the World Health Organization (WHO), forecast the global epidemiological transition from communicable diseases to non-communicable diseases from 1990 to 2010.⁵ The report identified living standards in society – especially income levels – as a key factor influencing disease transitions. During the MDG period, average income levels increased in many African countries.⁶ Rising incomes are correlated with a decrease in the prevalence of communicable diseases and also a growing number of deaths from non-communicable diseases such as diabetes, cancers and heart disease.

The trend of rising incomes in Africa, along with its impact on the burden of disease, is expected to continue if not accelerate in the near future. A World Bank report claims that by 2030 non-communicable diseases are expected to cause more deaths in Africa than communicable diseases.⁷ A major cause of this is the growing number of deaths from cardio-vascular disease among people under 70 years of age in sub-Saharan Africa.⁸ Rapid unplanned urbanisation is also contributing to an increase in the incidence of non-communicable diseases in Africa by leading to changes in lifestyles; these include unhealthy dietary habits, reduced physical activity and increased tobacco consumption.⁹ These changes are associated with rising risk factors for non-communicable diseases such as hypertension, diabetes and obesity.¹⁰

African countries have a number of economic and demographic characteristics that make addressing disease patterns important, but also complicated



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With the introduction of the Sustainable Development Goals (SDGs), Africa now has a new set of ambitious targets for reducing the prevalence and death rates of certain diseases. Target 3.3 of the SDGs aims to end the prevalence of HIV/AIDS, TB and malaria by 2030; and target 3.4 aims to reduce premature mortality from non-communicable diseases by one-third during the same period. African countries have a number of economic and demographic characteristics that make addressing disease patterns important, but also complicated. Along with the disproportionate number of communicable disease deaths, a larger percentage of the populations in African countries – particularly sub-Saharan African countries – tend to be aged between 15 and 30 than the rest of the world.¹¹ A major challenge for African countries has been to overcome the severe impact of early mortality, and to ensure that this relatively younger population makes the transition to a healthy and productive working-age population.

The SDGs, like the MDGs, do not take into consideration heterogeneity in levels of development among countries. This is especially important for Africa, given the extent of diversity across countries on the continent. Because of this

heterogeneity, the relative mortality targets vary significantly across countries. For example, Ethiopia (99 million) has roughly twice the population of South Africa (54 million). However, to achieve SDG 3.3 both countries will have to reduce deaths from the communicable diseases outlined in that target by about the same amount.¹²

Non-communicable diseases are relatively difficult and costly to prevent due to multiple paths of causation

To account for this diversity across countries, the authors created country groups based on average life expectancy in 2015. Life expectancy was selected because it is a basic indicator of health and social development that can also account for the mortality impact of different types of diseases. Moreover, the WHO identified life expectancy as the overarching indicator to monitor progress towards meeting the health targets of the SDGs.¹³ This paper will investigate Africa's current development trajectory, and analyse the prospects of achieving SDG targets 3.3 and 3.4. It will also explore alternative futures where progress toward these goals has advanced beyond the current development trajectory.

The paper uses the International Futures (IFs) forecasting system to explore SDGs 3.3 and 3.4 (see below) and to assess long-term development outcomes associated with the achievement of these goals in Africa. As part of the African Futures Project (AFP) the Frederick S. Pardee Center for International Futures (Pardee Center) and the Institute for Security Studies (ISS) have been collaborating for several years on a series of policy briefs and research papers that cut across various dimensions of human development and wellbeing. This paper draws heavily on the health volume of the Patterns of Potential Human Progress series, published by the Pardee Center, as well as the findings of an AFP paper that forecast the impact of malaria eradication in Africa.^{14,15}

Key concepts

SDGs 3.3 and 3.4 are:

- 1) *Target 3.3* – By 2030, end the epidemics of AIDS, TB, malaria and neglected tropical diseases and

combat hepatitis, water-borne diseases and other communicable diseases.

- 2) *Target 3.4* – By 2030, reduce by one-third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and wellbeing.

Premature mortality applies to any death that occurs before the age of 70.¹⁶

Communicable and non-communicable diseases are defined using the disease classifications of WHO found in the 10th Revision of the International Classification of Diseases (ICD), as shown in Table 1 below.¹⁷ Three unifying factors characterise communicable diseases: they are preventable (often at low cost); they have an outsized effect on vulnerable populations (especially the very young and women giving birth); and they present a high risk of infection to others.^{18,19} Non-communicable diseases on the other hand are relatively difficult and costly to prevent due to multiple paths of causation, and predominate in the later stages of epidemiologic transitions because of their tendency to accumulate as an individual reaches an older age.²⁰

Table 1: List of select communicable and non-communicable diseases taken from the GBD report²¹

Communicable diseases	Diarrhoeal disease Malaria Respiratory infections HIV/AIDS
Non-communicable diseases	Malignant neoplasms Cardiovascular disease Digestive disease Chronic respiratory disease Diabetes Mental health

Prevalence of disease refers to the number of living people affected by a particular disease in a population for a given period of time. Prevalence reflects the combined effects of prior disease incidence – i.e. prevalence is the sum of those who contracted the disease less those who recovered and those who died.²²

Incidence of disease is the number of new cases of a particular disease among a group at risk during a given period of time.²³

Mortality is defined by WHO as the number of deaths for a given region at a given time and a given cause.²⁴ The underlying cause of death is defined as ‘the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury’, in accordance with the rules of the ICD.²⁵

Morbidity or disability is defined by the GBD as the time spent by an individual in a diseased state or disability caused by the existence of the diseased state.²⁶

The impact of morbidity

It is important to note that the SDGs do not incorporate morbidity or disability into their targets, and only address mortality. Alternatively, the Global Burden of Disease (GBD) study does incorporate the impact of morbidity into its findings by employing disability adjusted life years (DALYs) as its metric of choice. This is important because non-communicable diseases are more chronic in nature, and more frequently manifest themselves in the form of disability (or morbidity) than do communicable diseases.²⁷ A World Bank report (based on the GBD) on the burden of disease in Africa found that a larger percentage of healthy years in Africa were lost to disability in 2010 than in 1990.²⁸ Considering morbidity is therefore important for understanding the deeper impacts, as well as the changing nature of the burden of disease in Africa.

Working age population can be expressed as either the absolute number of people between the ages of 15 and 65, or the proportion of the total population that falls within those ages.

Stunting is defined as a low height for age ratio. More specifically, stunting is a height for age ratio two standard deviations below the median height for age ratio of the reference population.²⁹

Years of life lost (YLLs) are the number of healthy years lost by an individual due to premature death. YLLs are calculated by ‘multiplying the number of deaths by the life expectancy at the time of death in a reference population’.³⁰ The life expectancy for the reference population in the GBD study is 86 years (the average for Japanese women and the highest in the world). So the YLLs represent the age at which a person died, subtracted from 86.³¹ Global average life expectancy at birth was 72 years in 2015, while in Africa it was 62.

Years of life lost to disability (YLDs) are the number of healthy years lost by an individual on account of morbidity. This is calculated by multiplying the number of cases of a particular disease and weighting them on a scale of 0.0 to 1.0, where 0.0 represents ideal health and 1.0 represents ‘a state of health equivalent to death’.³² YLDs use the same reference age (86 years) as YLLs.

Disability adjusted life years (DALYs) are the total healthy years of life lost due to disease (disability) and death. In other words, DALYs are the sum of YLLs



CHILDREN UNDER THE
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and YLDs. The metric is used to observe the impact of disease in terms of both mortality and morbidity, and is also how the burden of disease is measured in the GBD.

Level of development is defined in this paper as the average gross domestic product (GDP) per capita at purchasing power parity (PPP), level of adult literacy, level of technological progress, and level of average life expectancy at birth. The GBD identified GDP per capita, literacy levels and technological progress as indicators of the level of development and living standards in society.³³ Average life expectancy at birth is a basic indicator of health and social development in the Minimum National Social Data Set endorsed by the United Nations Statistical Commission and also accounts for the mortality impact of diseases, and hence has been included as an indicator of development.³⁴

Disease and human development

Diseases act as obstacles to human development by causing death and disability within the population. While observing the impact of disease reduction through DALYs and mortality rates is helpful, diseases tend to have other negative effects on human development. Communicable diseases have a heavy impact on vulnerable populations such as women during childbirth and the very young. For example, malaria disproportionately affects infants and small children, with children under 18 accounting for 90% of malaria-induced deaths worldwide.³⁵ Therefore, reducing malarial deaths decreases infant mortality. Reducing infant mortality, while inherently desirable, also has secondary effects, including lowering fertility rates in the long term.

Communicable diseases have a heavy impact on vulnerable populations such as women during childbirth

The demographic transition is a process whereby countries move from having high birth rates and high death rates toward an older, more stable population structure characterised by low fertility rates, low infant mortality and other improved health outcomes.³⁶ Sub-Saharan Africa has the lowest percentage of working-age people relative to its overall population

among the world's developing regions. This means fewer workers must support a larger proportion of the population (mainly children) than in other world regions.³⁷ Fertility rates have declined much more slowly in sub-Saharan Africa than elsewhere, although the trend varies greatly across countries. The result is that the continent is unable to benefit from its large working population and consumer class, and is progressing more slowly through its demographic transition than other developing regions.

Fertility rates have declined much more slowly in sub-Saharan Africa than elsewhere

Reducing communicable diseases will facilitate sub-Saharan Africa's progress through its demographic transition. Decreasing deaths from communicable diseases will lead to lower levels of infant mortality and this will help reduce fertility rates in the long run.³⁸ Slowly but steadily declining fertility rates will thereby slow population growth. The combination of reduced infant mortality and declining fertility rates means that a larger percentage of the population will mature to working age, which will eventually lead to a demographic dividend. A demographic dividend occurs when a population has a high percentage of working-age people relative to the number of dependents (children and the elderly) in society. So, while reducing communicable diseases increases the size of the population in the short term, it will not necessarily lead to an unsustainable increase in the population over the long term.

Increasing the share of working age people relative to the overall population is one of the most fundamental ways that disease reduction affects economic development. Healthier populations typically live longer and add more value to the economy over the course of a lifetime than do people living with a disease.

A crucial point to consider though is that focusing exclusively on eliminating deaths from communicable diseases will shift the disease burden toward non-communicable earlier than otherwise expected. Over the long term this may leave African health systems unprepared for diseases that are more difficult to treat

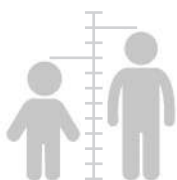
and manage. Even though the nature of these types of disease is different, they do share a relationship in certain situations.

Children affected by communicable diseases such as respiratory infections and diarrhoeal diseases during the early stages of life are significantly more susceptible to stunting.³⁹ Stunted children are more prone to early-onset non-communicable diseases such as heart disease. Not only does stunting pose serious health problems, but it also impairs cognitive development and has a negative impact on the economic potential of those affected.⁴⁰ Even if communicable diseases are not fatal in the early stages of life, they can demonstrably alter the future wellbeing of the person they affect. Reducing the prevalence of communicable diseases will lower the rate of stunting in the population and lessen the probability of early-onset non-communicable diseases.

Poorer sections of the community tend to underreport non-communicable diseases, which makes them more difficult to diagnose and manage

Along with the relationship between stunting and non-communicable diseases, researchers have uncovered other connections between communicable and non-communicable diseases. One study found that people with HIV are at higher risk of premature death from cardiovascular disease.⁴¹ This relationship between communicable and non-communicable diseases is also persistent across types of non-communicable diseases. For instance, according to a report published in the Transactions of the Royal Society of Tropical Medicine and Hygiene, infectious diseases were a factor in 26% of cancer cases in the developing world in 2015.⁴²

Compared to communicable diseases, non-communicable diseases are more chronic in nature, meaning that they progress slowly and persist for long periods of time.⁴³ Because non-communicable diseases persist in their host for longer periods of time, they tend to have a heavier impact on morbidity than communicable diseases. Morbidity reduces the number of healthy years lived by a person and impedes the productivity of the working population. Moreover, poorer sections of the community tend to underreport non-communicable diseases, which makes them more difficult to diagnose and manage. This leads to further problems in preventing and detecting the onset of these diseases. Therefore a reduction in non-communicable diseases is expected to increase the productivity of the working population by increasing the number of healthy years available. A reduction in deaths from non-communicable diseases will also increase average life expectancy, particularly if the incidence of these diseases is high in the younger population. Reducing deaths from non-communicable diseases also improves the infant mortality rate by reducing deaths from respiratory and cardiovascular disorders specific to the perinatal period.⁴⁴



CHILDREN AFFECTED BY COMMUNICABLE DISEASES DURING EARLY STAGES OF LIFE ARE SIGNIFICANTLY MORE SUSCEPTIBLE TO STUNTING

Observing the impact of these diseases in monetary terms is extraordinarily difficult and beyond the scope of this research. However, as mentioned in the key concepts section, communicable diseases are generally easier to prevent and eradicate than non-communicable diseases.⁴⁵

Progress during the Millennium Development Goal period

The MDGs aimed to ‘halt and reverse the spread’ of HIV/AIDS, malaria and TB by 2015.⁴⁶ Africa succeeded in reducing the prevalence of HIV/AIDS from 5.6% in 2005 to 4.7% in 2013, and reduced the number of AIDS related deaths by 40% over the same period. Africa also reduced new malaria cases by 34% and deaths from malaria by 54% since 2000.⁴⁷ While Africa made substantial progress during the MDG period, most countries on the continent failed to meet MDG 6, which specified reduction targets for these diseases. Africa still accounts for the vast majority – in cases and deaths – of HIV/AIDS, malaria and TB worldwide.⁴⁸

Although most African countries did not meet the disease target of the MDGs, many countries significantly increased average life expectancy between 2000 and 2015. For example, average life expectancy in Africa increased by more than eight years. This was two years longer than the next largest increase of any developing region (South Asia) over the MDG period.

Individual countries in Africa made huge leaps in life expectancy. The largest gains during this period were in Malawi and Zambia, where life expectancy at birth rose by roughly 17 and 16 years respectively from 2000 to 2015. Other large improvements during the MDGs were made by Tanzania (15 years), Ethiopia (14 years), Sierra Leone (14 years) and Botswana (13 years). But life expectancy also fell in three countries during this period, largely due to the HIV/AIDS epidemic in Southern Africa. In Swaziland, average life expectancy fell by four years during the MDGs, and in Lesotho and South Africa life expectancy decreased by two years.⁴⁹

Factors beyond the epidemiological profile of the nations in question influenced the progress that was achieved during this period. Countries that achieved significant progress during the MDG period were characterised by strong political will, effective health systems that

ensured timely reporting and treatment of diseases, and community participation in the healthcare systems.⁵⁰ These countries significantly improved their ‘horizontal health systems’ or ability of health systems to provide prevention and care for general health problems that target the drivers of disease more directly.⁵¹ For example, the Ethiopian Health Service Extension Program, which was launched in 2003, included broad packages and objectives such as ensuring a proper and safe excreta disposal system, ensuring a proper solid and liquid waste disposal system, water supply safety and a healthy home environment.⁵²

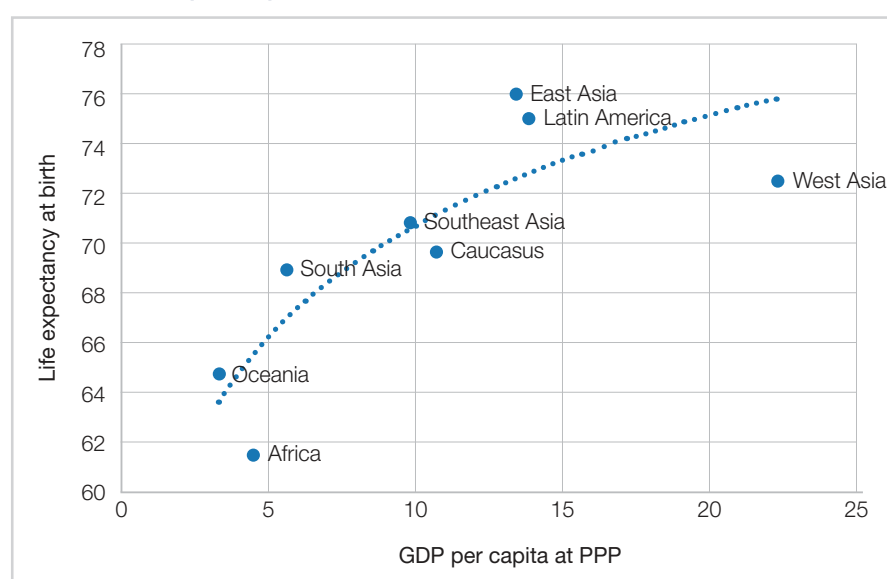
The SDGs have embraced a more ambitious set of targets that address communicable and non-communicable causes of mortality. However, the SDGs also fail to take prevailing levels of development across different countries into account. Moreover, some of the health targets in the SDGs are less than clearly defined. Although SDG 3 mentions combating other tropical and water-borne diseases, it does not provide quantifiable targets.⁵³ On the basis of the historical number of deaths from water-borne diseases, mainly diarrhoea, Global2030, an organisation that monitors progress on the SDGs, has suggested that the number of deaths from water-borne diseases should be reduced by 43.4% by 2030.⁵⁴ Given that the SDGs do not mention numerical targets for other communicable diseases, the authors determined that a reasonable goal for reduction of these diseases would be 30% by 2030.

Africa still accounts for the vast majority – in cases and deaths – of HIV/AIDS, malaria and TB worldwide

Similarly, SDG 3.4 specifically mentions a reduction in premature deaths from non-communicable diseases such as cardiovascular disease, cancers, diabetes and other non-communicable diseases by one-third, but only mentions a ‘promotion’ in mental health and wellbeing. The Open Working Group (OWG) on the Sustainable Development Goals suggested in a working paper that to keep the target reasonable, mortality from mental health should be reduced by 10% by 2030.⁵⁵

In addition to neglecting country-specific levels of development, the SDGs also do not identify any targets with respect to average life expectancy at birth. Despite making substantial progress over the MDG period, sub-Saharan Africa has the lowest life expectancy among the world's developing regions. This makes life expectancy a critical health outcome for Africa. A regional report on the SDGs for Africa published by the United Nations Economic Commission for Africa (UNECA), African Union (AU) Commission and African Development Bank (AfDB) mentions that Africa should aim to raise the average life expectancy to between 70 and 80 years by 2030.⁵⁶ This is slightly more ambitious than the African Union's Agenda 2063, which set a life expectancy target of 75 years by 2063.⁵⁷ Figure 1 shows Africa's average life expectancy relative to its GDP per capita compared to other developing regions in the world. Despite having a slightly higher GDP per capita than Oceania, life expectancy in Africa is roughly four years lower.

Figure 1: Life expectancy in the world's developing regions relative to GDP per capita



Source: International Futures 7.22.



SUB-SAHARAN AFRICA HAS THE LOWEST LIFE EXPECTANCY AMONG THE WORLD'S DEVELOPING REGIONS

The remainder of this paper will explore how the burden of disease shifts over time and how it is expected to evolve on Africa's current development trajectory. After unpacking the drivers of disease and the Current Path scenario, the paper will analyse some of the outcomes of disease eradication in Africa across a number of human development indicators such as average life expectancy at birth, GDP, GDP per capita (PPP) and the number of people living in poverty.

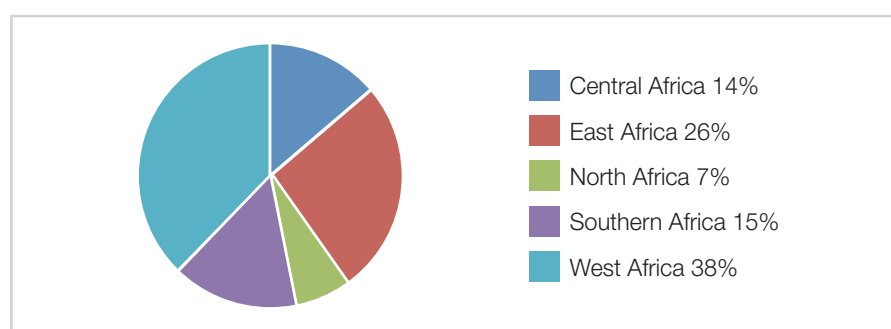
Africa's disease burden in 2015

African regions suffer different disease burdens due to many factors including, but not limited to, population age distributions, per capita health spending and income distributions. The types of diseases most prevalent in different African

regions also vary widely (e.g. high prevalence of respiratory infections in West Africa or HIV/AIDS in Southern and East Africa).

As a region, West Africa suffered from the highest number of DALYs (331 million years) on the continent in 2015. Despite West Africa having a slightly smaller population (349 million) than East Africa (356 million), West Africa experienced about 100 million more DALYs in 2015.⁵⁸ As a continent, Africa lost 872 million productive years to disease related death and disability in 2015. Figure 2 below shows the distribution of DALYs across the continent. Appendix 3 lists the countries in each of these regions.

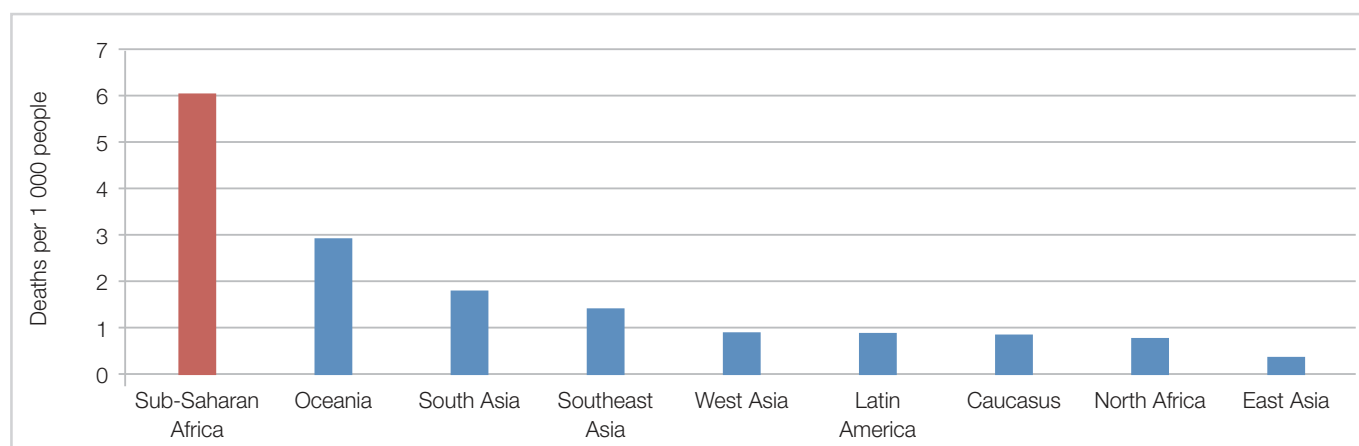
Figure 2: Distribution of DALYs in African regions in 2015⁵⁹



Source: International Futures 7.22.

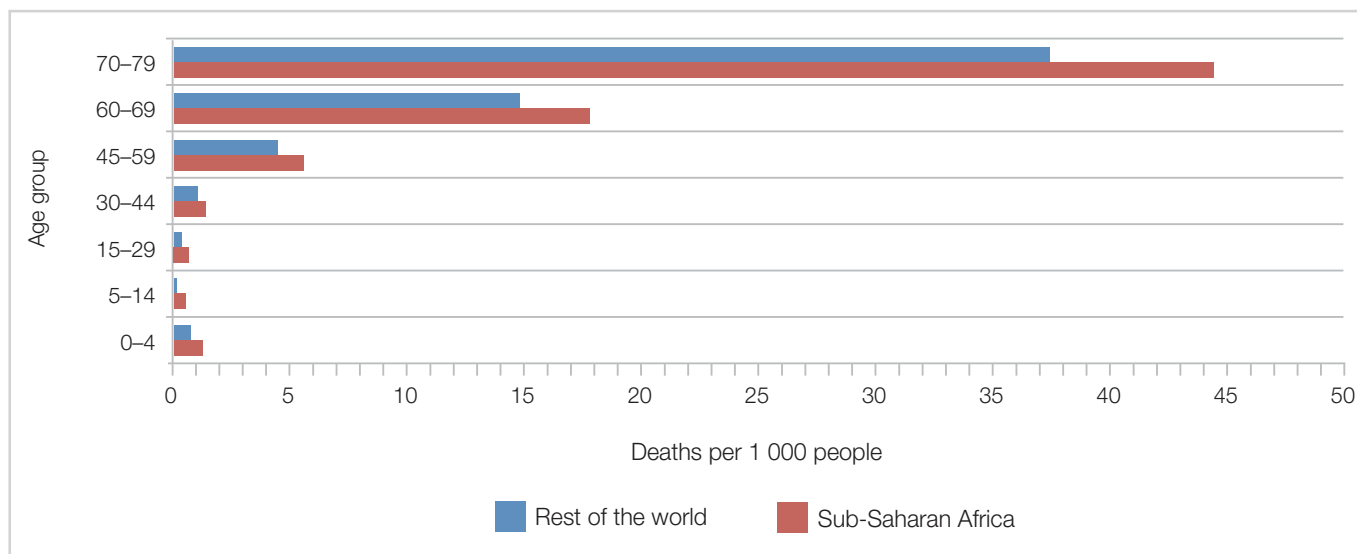
In 2015, according to the International Futures model (IFs), 57% of all deaths in Africa were from communicable diseases. For all the other developing regions in the world, deaths from communicable diseases constituted 18% of all deaths. Globally, Africa accounts for nearly half (49%) of total deaths from communicable diseases, despite representing only 16% of the world's population. Figure 3 shows the distribution of deaths per 1 000 people from communicable diseases among the world's developing regions. The graph shows that people in sub-Saharan Africa are at least twice as likely to die from a communicable disease as people in other developing regions.

Figure 3: Analysis of deaths from communicable diseases in Africa compared to other developing regions in 2015



Source: International Futures 7.22.

Figure 4: Premature age-specific deaths from non-communicable diseases in sub-Saharan Africa compared to the rest of the world in 2015



Source: International Futures 7.22.

Although communicable diseases place a massive burden on human development in Africa, the incidence of non-communicable diseases is increasing rapidly. In 2015, 3.7 million people died from non-communicable diseases in Africa; of these, 2.2 million of were defined as premature deaths. Premature deaths from non-communicable diseases constituted 20% of all deaths in Africa in 2015. Comparing age-specific mortality from non-communicable diseases in sub-Saharan Africa to the rest of the world shows that, when looking at premature deaths, sub-Saharan Africa has higher rates of death from non-communicable diseases in all age groups (Figure 4). So in addition to the overwhelming burden of communicable diseases in sub-Saharan Africa, there is also a high burden of premature deaths from non-communicable diseases.

Most countries in Africa will have to make significant progress to achieve the SDG targets for health. Using 2015 figures, Africa would have to avoid four million deaths from communicable diseases, mostly from TB (1.2 million), AIDS (1.1 million) and malaria (600 000) to achieve SDG 3.3. To meet the SDG for non-communicable diseases, Africa would also have to postpone more than 700 000 premature deaths from non-communicable diseases to achieve the necessary one-third reduction specified by the target for SDG 3.4.

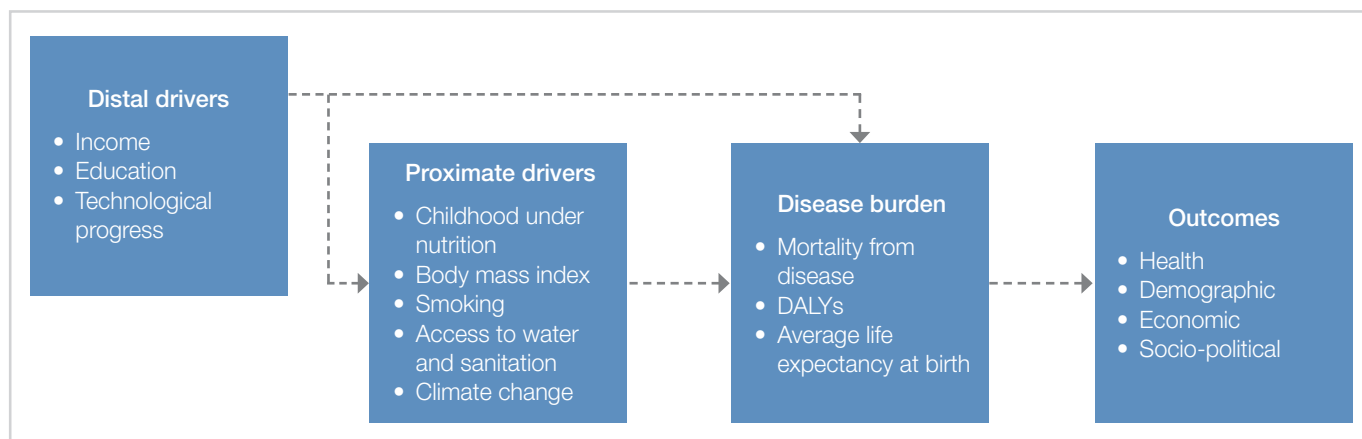
Drivers of disease

Long-term (distal or deep) and short-term (proximate) drivers affect the disease burden and associated health outcomes. Distal drivers are those that change over a long period of time and are associated with the social determinants of health. They are systemic and draw from sectors outside of the immediate purview of health.⁶⁰ Examples of these drivers include levels of education, access to basic services and level of income, which affect the disease burden over the long term because they take a long time to change



THE INCIDENCE OF
NON-COMMUNICABLE
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RAPIDLY IN AFRICA

Figure 5: Diagram showing the drivers of disease



Source: Authors' conception based on the IFs health model.⁶¹

for an entire population. The GBD identified income levels, education, and technological progress as proxies that drive the incidence and prevalence of diseases over time.

Proximate drivers affect the burden of disease more directly. The number of deaths (in adults and infants) directly affects the disease burden and therefore average life expectancy almost immediately. Average life expectancy at birth is an important health outcome from disease reduction as well as an indicator of the current disease burden prevalent in a region. For example, regions with a heavy incidence of communicable disease tend to have high infant mortality rates and a low average life expectancy, whereas regions with a high average life expectancy tend to have a heavier burden of non-communicable diseases. The disease burden has wide-ranging effects on the population, the economy, health systems, and a variety of other factors. A simplified diagram of the drivers of disease is presented in Figure 5.

Scenario analysis

This section presents Africa's likely progress on SDGs 3.3 and 3.4 on its current development trajectory up to 2030, followed by two alternative scenarios for disease reduction. The scenarios show some of the potential benefits to human and economic development from achieving SDGs 3.3 and 3.4; and they highlight the relevance of country-specific targets, as well as the importance of horizontal health management systems.

As a continent, Africa faces substantial challenges in isolating and addressing the key risks its health sector faces. Achieving SDGs 3.3 and 3.4 will be difficult because African countries must move urgently on both targets and the strategies required to combat these two groups of diseases are fundamentally different. Although many communicable diseases are preventable, either through vaccination (e.g. polio and smallpox) or else through relatively inexpensive interventions (e.g. condoms to prevent the spread of HIV), managing those diseases in practice is still a complex and



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expensive burden on health systems. Although an infectious disease such as HIV is in theory easier to prevent, it cannot be cured after incidence, and needs to be managed as one would a chronic disease. Moreover, prevention and treatment of non-communicable diseases require interventions that are either costly (e.g. better health reporting systems), time consuming (e.g. better health management) or both. These factors underscore the need for countries to embrace an integrated approach to health management that incorporates prevention, as well as treatment and management of all disease types.

The scenario analysis begins by presenting Africa's Current Path. The Current Path is a forecast based on past trends and represents Africa's likely development trajectory. Although the Current Path forecast generally shows continuity with historical patterns, it provides a structure that moves beyond a simple linear extrapolation of previous data. The Current Path assumes no major paradigm shifts or 'black swans' (events of extremely low probability but high impact). The Current Path presents Africa's prospects of achieving SDGs 3.3 and 3.4 on its present development trajectory. Appendix 1 of this paper explains Current Path in more detail.

Prevention and treatment of non-communicable diseases require interventions that are either costly, time consuming, or both

In addition to the Current Path, two additional scenarios, Africa Uninfected and Africa Enduring, are presented. Africa Uninfected considers a narrative wherein Africa achieves SDG 3.3 and eradicates deaths from communicable diseases such as HIV, malaria and TB by 2030. In addition to this, deaths from diarrhoea are reduced by 43.4% in accordance with the recommendations of Global2030. Given that SDG 3.3 mentions that countries must combat other communicable diseases as well, deaths from these diseases are reduced by 30% in this scenario. The second scenario, Africa Enduring, considers a narrative wherein Africa achieves SDG 3.4 and reduces premature deaths from cardiovascular diseases, cancers, diabetes and other non-communicable diseases by roughly one-third by 2030. Deaths from mental health are reduced by 10% in this scenario, in accordance with the recommendations of the OWG.

Country groups

Levels of development vary greatly among African countries. In 2015, life expectancy at birth ranged from a low of about 49 years (Swaziland) to a high of just over 75 (Algeria), while GDP per capita at PPP fluctuated from a low of US\$594 (Central African Republic) to a high of US\$24,470 (Seychelles).⁶² Because African countries start from such different baselines, they will experience very different development outcomes from disease reduction. To reflect the heterogeneity in development levels in Africa, countries have been

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(SWAZILAND)

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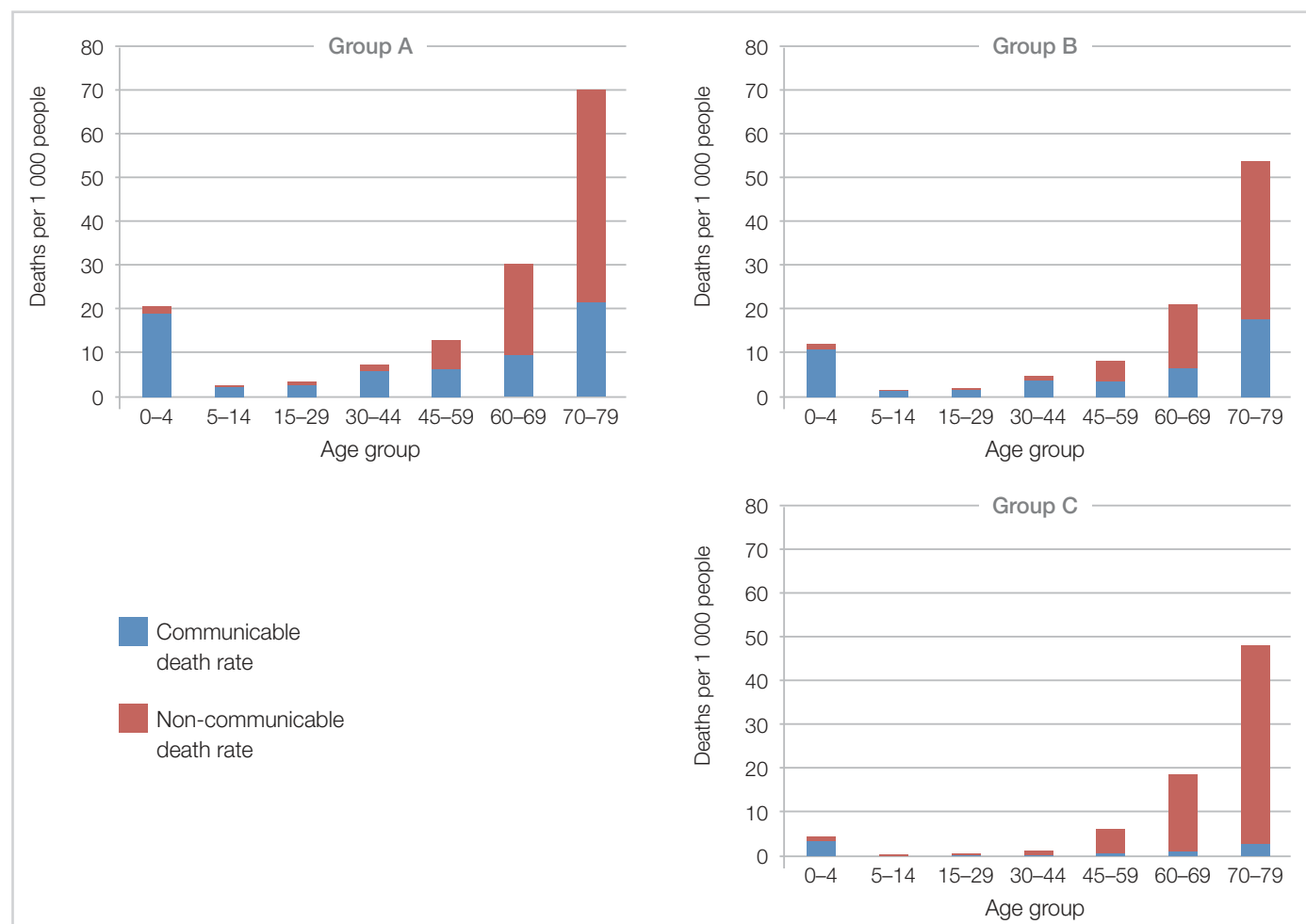
(ALGERIA)

also suffer more premature mortality from non-communicable diseases than other countries in Africa. This is a major cause of underdevelopment and low life expectancy (less than 60 years) in these countries. Examples of countries in Group A are Nigeria, Angola, and Côte d'Ivoire.

The countries in Group B are at a midpoint in their health development trajectory. These countries suffer from communicable and non-communicable diseases, although the transition towards non-communicable diseases is further along its progression than in Group A countries. In other words, Group B countries suffer from communicable and non-communicable diseases, but not as severely as Group A countries. While Group B countries still have a fairly large number of deaths from non-communicable diseases, they do not endure as much premature mortality from non-communicable diseases. Group B countries have an average life expectancy of between 60 and 70 years, which is above the average life expectancy for sub-Saharan Africa as a whole. Examples of Group B countries include Ethiopia, Eritrea and Ghana.

Group C countries have the heaviest burden of non-communicable diseases and a life expectancy over 70 years. Countries in this group are more

Figure 7: Mortality distribution by age groups



Source: International Futures 7.22.

economically developed than other African countries and further along in their transition toward non-communicable diseases. Examples of Group C countries include Algeria, Egypt and Morocco.

Figure 7 describes the mortality rates from communicable and non-communicable diseases by age group across all three country groups in 2015. Relative to the other country groups, Group A countries have a higher total mortality rate in every age category. Group A countries also have higher death rates from communicable diseases at earlier stages of life and higher death rates from non-communicable diseases from age 45 onwards. Group B countries currently have a high burden of communicable diseases, but are transitioning towards higher levels of non-communicable diseases. Group C countries are furthest along in their transition and have a higher burden of deaths from non-communicable diseases across all age groups except infants.

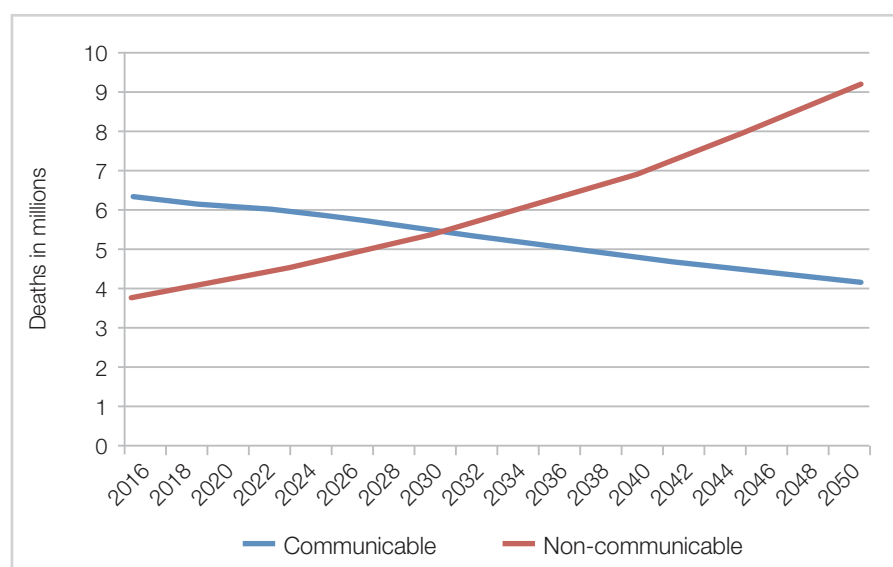
Scenario 1: Current Path

In Africa, about 6.4 million people died from communicable diseases in 2015. IFs forecasts that more people in Africa will die from communicable diseases than from non-communicable ones until the year 2031 on the Current Path. Figure 8 shows the progression of the disease burden in Africa on the Current Path.

Communicable diseases (SDG 3.3)

On Africa's Current Path, the annual number of deaths from communicable diseases is forecast to fall to roughly 5.5 million by 2030. Around 110 000 fewer people are expected to die from AIDS in 2030 compared to 2015 on the Current Path, and annual mortality from malaria decreases by roughly 161 000 deaths from 2015 levels. By 2030, annual mortality from diarrhoea decreases

Figure 8: Deaths in Africa from communicable and non-communicable diseases on the Current Path



Source: International Futures 7.22.

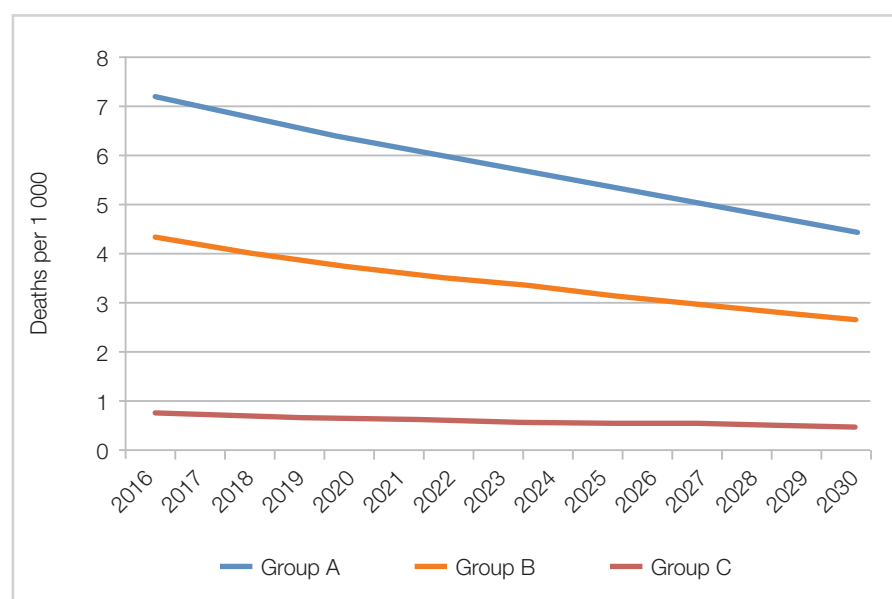
by about 169 000 deaths, and annual mortality from TB and other respiratory infections falls by approximately 118 000 deaths for Africa compared to 2015 on the Current Path. These annual mortality figures do not take into account population growth, so the actual prevalence of these diseases is declining much faster than these absolute numbers suggest.

The high number of premature deaths from non-communicable diseases in Africa in 2030 indicates another dynamic at play

The largest reduction in deaths from communicable disease is seen in Group A countries, where 606 000 fewer people are expected to die from communicable diseases in 2030 than did in 2015. No countries from Group A – the region where the incidence of life-threatening diseases is the highest – achieve all the targets set out in SDG 3.3 by 2030 though. Nigeria, the country with the highest number of deaths from communicable diseases in 2015, is only expected to reduce mortality from these diseases by three percentage points under Current Path. Although this decrease is underwhelming, it must be seen in the context of Nigeria’s expected population growth, which is forecast to grow by 80 million people by 2030, and more than double by 2050.

Only Algeria, Cape Verde, Djibouti, Mauritius, Tunisia, Seychelles and São Tomé and Príncipe are expected to achieve SDG 3.3 on the Current Path.⁶⁴ However, these countries also start off with a very low burden of

Figure 9: Deaths per thousand people from communicable diseases on the Current Path

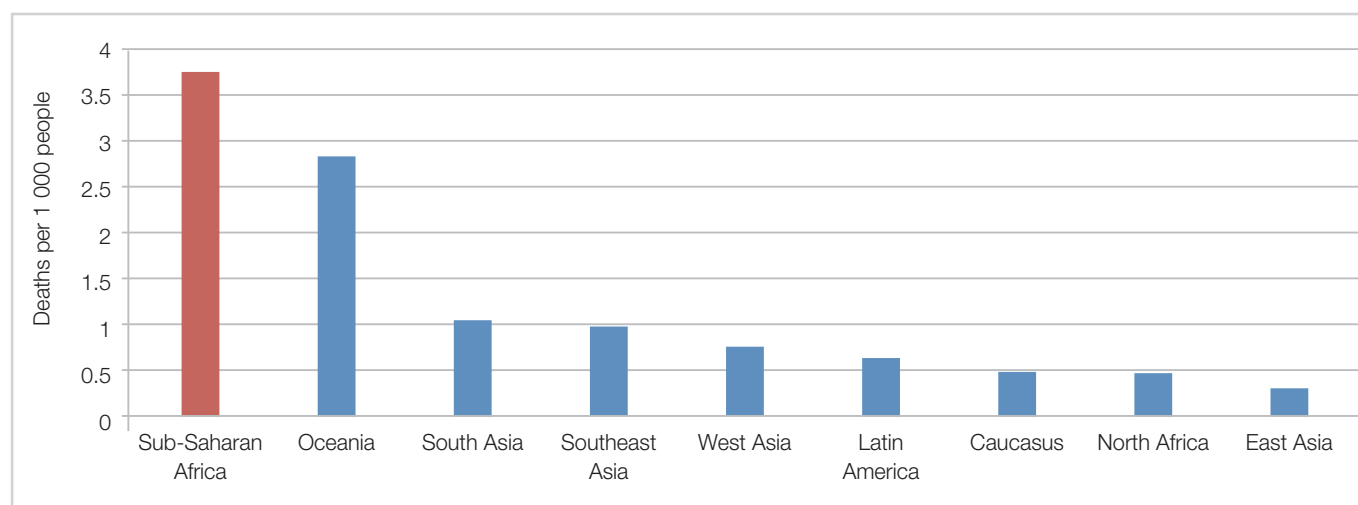


Source: International Futures 7.22.



NIGERIA HAD THE HIGHEST NUMBER OF DEATHS FROM COMMUNICABLE DISEASES IN 2015

Figure 10: Deaths per thousand people from communicable diseases in 2030 on the Current Path



Source: International Futures 7.22.

communicable diseases in 2015 and have relatively little progress to make compared to other African countries. Although many Group A and Group B countries are not likely to meet all the SDG 3.3 targets, a number of countries are expected to meet some of the targets and achieve significant mortality reductions by 2030 on the Current Path. The Democratic Republic of Congo (DRC), Mali, Mozambique, Niger, Burundi and Rwanda all achieve the diarrhoea mortality target on the Current Path. Botswana, Namibia and Swaziland are expected to completely eradicate deaths from malaria by 2030 on the Current Path. Rwanda, Zimbabwe and the Côte d'Ivoire are expected to decrease mortality from AIDS by 50% on the Current Path. Mali and the DRC are also expected to reduce deaths from TB by over 50% during this period. As seen in Figure 9, death rates from communicable diseases are expected fall in all groups to 2030, according to the Current Path forecast.

As a result of the mortality outcomes achieved during this period, two fewer people per thousand are expected to die from communicable diseases in sub-Saharan Africa in 2030 when compared to 2015. But, as Figure 10 shows, the mortality rate from communicable diseases in sub-Saharan Africa is expected to continue to be the highest among the world's developing regions in 2030.

Non-communicable diseases (SDG 3.4)

As deaths from communicable diseases decline during this period, mortality from non-communicable disease in the region is expected to rise. This is because reducing communicable diseases increases life expectancy and the risk of mortality shifts from infectious diseases to chronic diseases, which typically affect older segments of the population. However, the high number of premature deaths from non-communicable diseases in Africa in 2030 indicates another dynamic at play. This trend of increasing deaths from non-communicable diseases is not just due to an aging population,

but also because of the inter-relationship between communicable and non-communicable diseases. The countries with the highest rates of premature deaths from non-communicable diseases are also some of the countries most heavily affected by communicable diseases.

In 2015, 2.2 million people under the age of 70 died from a non-communicable disease in Africa, 285 000 of whom were infants. The highest premature death rates from non-communicable diseases on the continent were found in Swaziland, South Africa, Côte d'Ivoire, Sierra Leone and Nigeria, which are all Group A countries with high rates of communicable disease as well. In all of these countries, more than 30 people per thousand died prematurely from a non-communicable disease in 2015. In Africa, the absolute number of premature deaths from non-communicable diseases is expected to increase to three million deaths per year by 2030, despite a fall in premature death rates from these diseases in all African countries. This is due to sub-Saharan Africa's extraordinarily high fertility rates (4.8 births per woman in 2015), which drive rapid population growth. So while death rates are likely to fall, absolute numbers will continue to rise.

The highest premature death rates from non-communicable diseases in Africa were found in South Africa, Swaziland, Côte d'Ivoire, Sierra Leone and Nigeria

The population under the age of 70 in Africa is expected to increase by 461 million people between 2015 and 2030 on the Current Path, with Group A accounting for more than half (262 million) of this increase. With high levels of communicable disease and the fastest-growing population under the age of 70, Group A countries will continue to face the highest burden of premature mortality from non-communicable diseases in the years to come. In 2030, non-communicable diseases are expected to account for 26 premature deaths per thousand in Group A countries, compared to 19 premature deaths per thousand in Group B countries and 18 premature deaths per thousand in Group C countries.

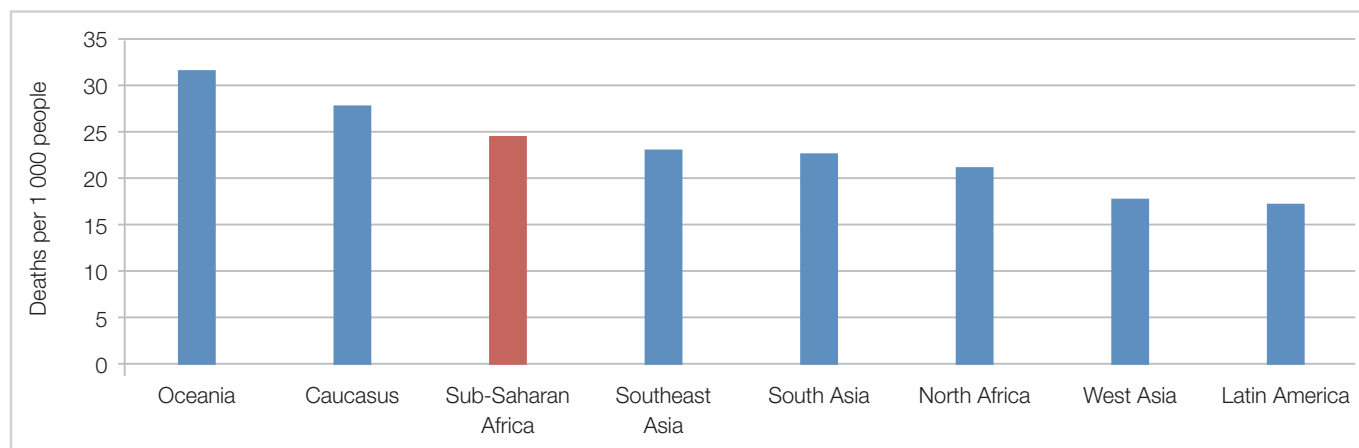
On the Current Path, no country is expected to achieve SDG 3.4. Group C countries are forecast to reduce overall death rates from non-communicable diseases by 15%, while Group A countries manage a 13% reduction and Group B countries an 11% reduction. Some individual countries do manage to achieve higher reductions in death rates compared to their group averages though. Egypt, Tunisia, Côte d'Ivoire and Ghana are all expected to achieve reductions greater than 16% by 2030.

Figure 11 shows that despite these improvements, sub-Saharan Africa is expected to have the third-highest rate of premature deaths from non-communicable diseases (after Oceania and Caucasus) among other developing regions in the world in 2030. This high premature death rate

2.2 million people

UNDER THE AGE OF 70
DIED FROM A
NON-COMMUNICABLE
DISEASE IN AFRICA IN 2015

Figure 11: Premature death rates from non-communicable diseases among the world's developing regions



Source: International Futures 7.22.

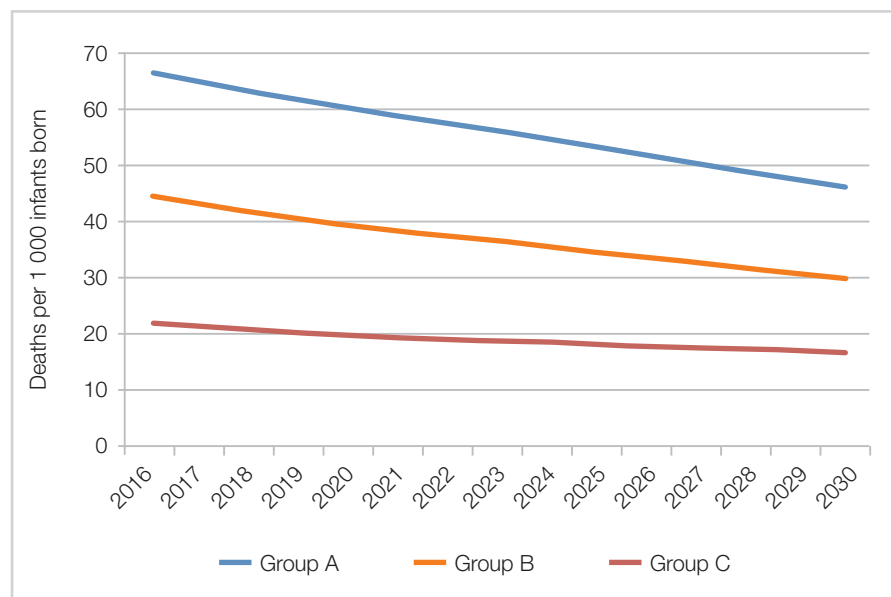
from non-communicable diseases – in addition to the high death rate from communicable diseases – is likely to place significant stress on Africa's health systems in the years to come. This is especially true for Group A countries. In terms of age-specific mortality, Group A countries continue to have a higher mortality rate across all age groups, relative to the other two groups.

Other outcomes on the Current Path

These reductions in mortality translate into large increases in life expectancy for each group. On the Current Path, between 2015 and 2030 life expectancy is forecast to improve by seven years for Group A countries, by six years for Group B countries and by two years for Group C countries. Despite this improvement, on the Current Path, in 2030 Group A countries still have a life expectancy that is six years lower than that of Group B countries and 13 years below Group C countries.

Along with improvements in life expectancy, African countries are expected to achieve significant progress in other health outcomes, including infant mortality. In 2030 on the Current Path, 20 fewer infants per thousand born are expected to die in Group A countries, while 15 fewer infants per thousand born will have died in Group B countries when compared to 2015. Despite making the most significant reductions, Group A countries are still expected to have the highest infant mortality rate in 2030, at about 45 deaths per thousand infants born. Figure 12 shows the fall in infant mortality on the Current Path across groups.

The Current Path forecast shows that despite making significant progress in a number of health metrics, very few countries meet SDG 3.3, and none meet SDG 3.4. On the Current Path, death rates from life-threatening communicable diseases continue to be high, and premature deaths from non-communicable diseases keep increasing. This is particularly relevant for Group A countries, which already have the highest death rates from communicable diseases, along with the highest premature death rates from

Figure 12: Infant mortality trends on the Current Path

Source: International Futures 7.22.

non-communicable diseases. The sections below present two alternative scenarios that reflect approaches to reducing mortality from communicable and non-communicable diseases in line with the suggestions of the SDGs. The scenarios are presented to underscore the human development outcomes that can be expected from advancing targets 3.3 and 3.4 more precipitously.

Scenario 2: Africa Uninfected

As the previous section showed, Africa is currently not on track to meet the major health goals of the SDGs by 2030, although some specific African countries will meet the targets. The Africa Uninfected scenario simulates an ambitious push towards eliminating deaths from the communicable diseases outlined in SDG 3.3 (AIDS, malaria and TB), along with a significant reduction in deaths from diarrhoea and other communicable diseases throughout Africa.

Health outcomes

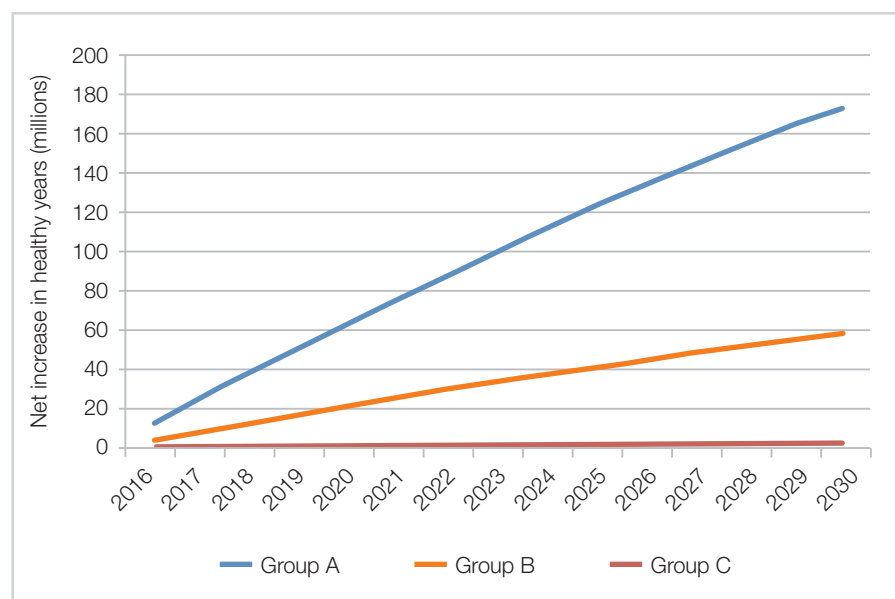
In Africa Uninfected, the eradication of communicable diseases adds 233 million healthy years to Africa's population by 2030 compared to the Current Path. This increase is attributable to the eradication of AIDS, which leads to a gain of 65 million healthy years for the continent by 2030. The eradication of respiratory infections (mainly TB) adds another 54 million healthy years compared to the Current Path. Figure 13 shows that Africa Uninfected adds more than 172 million healthy years to Group A's population, about 58 million healthy years to Group B's population and about three million healthy years to Group C's population by 2030 compared to the Current Path forecast.

Although this scenario adds 233 million healthy years to Africa's future compared to the Current Path, only about 26 million of those years come from reduced disability. This is because communicable diseases mainly manifest



AFRICA IS CURRENTLY NOT
ON TRACK TO MEET THE
MAJOR HEALTH GOALS OF
THE SDGS BY 2030

Figure 13: Net increase in healthy years under Africa Uninfected compared to the Current Path



Source: International Futures 7.22.

themselves in the form of mortality, rather than morbidity. Reducing infectious diseases adds 19 million healthy years to Group A's population that would have been otherwise lost to disability by 2030 on the Current Path. Similarly, seven million healthy years are added to Group B's population and 500 000 years are added to Group C's population by 2030 compared to the Current Path, by virtue of a reduction in disability from these diseases.

In 2015, acute respiratory infections accounted for 15% of total infant mortality, while malaria accounted for 12%

Given that communicable diseases primarily manifest themselves in the form of mortality rather than disability, the increase in healthy years is mostly due to a reduction in deaths from infectious diseases. In 2030 alone, there are about three million fewer deaths under Africa Uninfected compared to the Current Path. In Africa Uninfected, Group A countries avoid 21 million cumulative deaths from communicable diseases compared to the Current Path up to 2030. In Group B countries eight million fewer people die compared to the Current Path; and Group C countries see a reduction of 400 000 deaths by 2030 under Africa Uninfected compared to the Current Path.

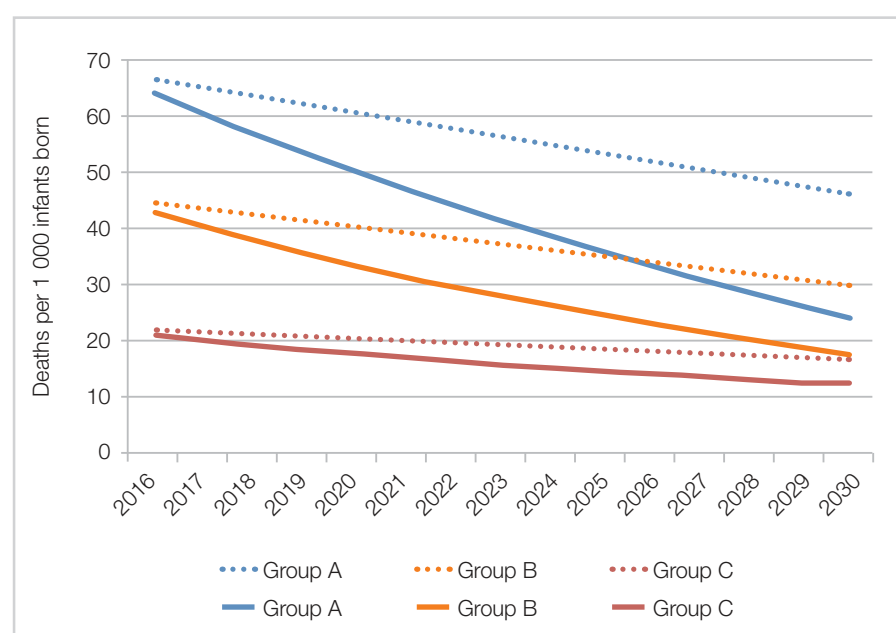
There are also large impacts on infant mortality in this scenario. In Africa Uninfected, 16 fewer deaths per thousand infants born occur in 2030 relative to the Current Path. The reduction in infant mortality is caused mainly by the eradication of respiratory infections and malaria. In 2015, acute respiratory infections accounted for 15% of total infant mortality, while malaria accounted

3 million

THE ESTIMATED REDUCTION
IN DEATHS IN THE AFRICA
UNINFECTED SCENARIO
COMPARED TO THE
CURRENT PATH SCENARIO
IN 2030 ALONE

for 12%.⁶⁵ Figure 14 shows the improvement in infant mortality for the three groups in the Africa Uninfected scenario. For countries in Groups A and B, infant mortality rates are nearly halved by 2030 relative to the Current Path, at 48% and 41% respectively. In Group C countries, the rate improves by 25% compared to the Current Path by 2030, but those countries begin from a much lower baseline. Largely due to this reduction in infant mortality, the total fertility rate in sub-Saharan Africa drops to an average of 3.5 births per woman in 2030, compared to 3.7 births per woman on the Current Path in 2030. By 2050, the fertility rate drops to 2.5 births per woman in this scenario, compared to 2.7 births on the Current Path.

Figure 14: Infant mortality trends under Africa Uninfected



Source: International Futures 7.22.

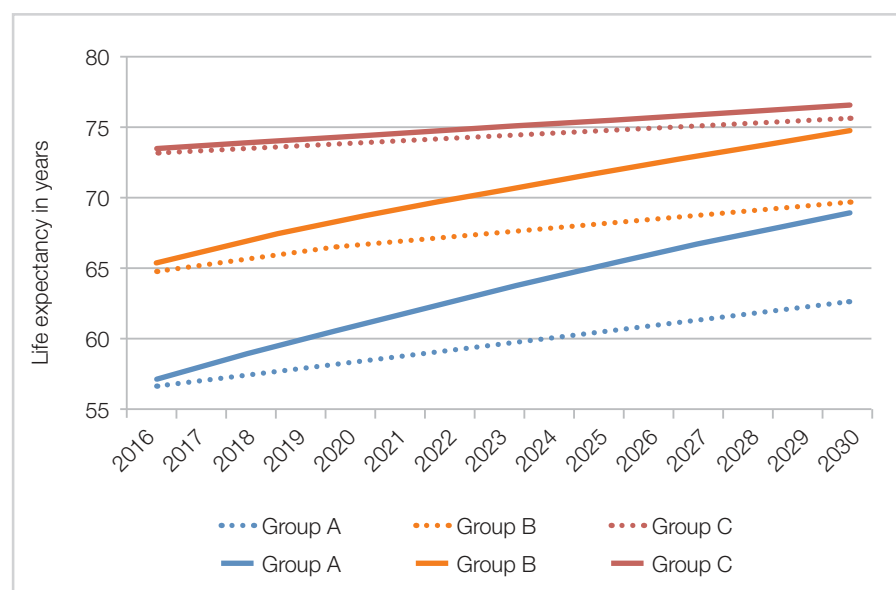
Given that infectious diseases also lead to poor nutrient intake and chronic malnutrition, limiting the incidence of communicable diseases in a population reduces stunting. The stunting rate under Africa Uninfected (as a percentage of the total population) is reduced by 1.5 percentage points compared to the Current Path by 2030.

The improvement in health outcomes creates large gains in life expectancy relative to the Current Path. Average life expectancy at birth in Africa increases by 11 years under Africa Uninfected, from about 61 years in 2015 to 72 years in 2030. This increase is slightly more than five years larger than is expected on the Current Path. On a group level, Group A sees the largest increase at slightly more than five years by 2030 but still comes up short of the target of 70 years set by UNECA, the AU Commission and AfDB. Group B and C countries make the 70-year target by 2030, at 74 years and 76 years respectively. Figure 15 shows the increase in life expectancy for all groups compared to the Current Path.



LIMITING THE INCIDENCE
OF COMMUNICABLE
DISEASES IN A POPULATION
REDUCES STUNTING

Figure 15: Increase in life expectancy across groups



Source: International Futures 7.22.

Although the gains in life expectancy are significant, a huge gap remains between Group A countries and those in Groups B and C. Average life expectancy in Group B countries is only two years lower than Group C countries in 2030, while the life expectancy of Group A countries is seven years lower than that of Group C countries in 2030. This happens despite the significant reduction in the burden of communicable diseases.

Demographic and economic outcomes

While disease reduction provides immediate health benefits up to 2030, Africa can also expect long-term demographic and economic changes as a result of reducing mortality from communicable diseases. This section describes these long-term outcomes out to 2050.

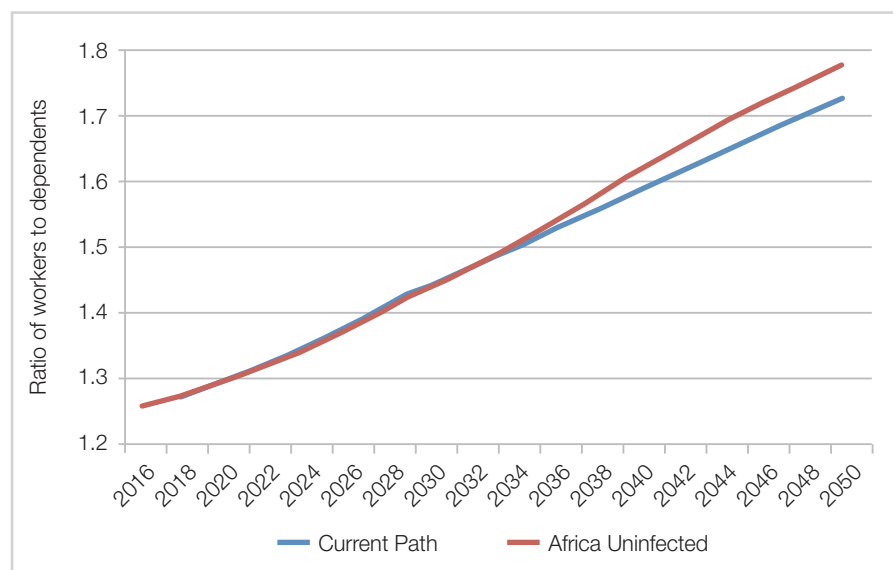
Africa can expect long-term demographic and economic changes as a result of reducing mortality from communicable diseases

Ultimately, reducing deaths from the communicable diseases outlined in SDG 3.3 leads to an increase in population of 27.2 million people throughout Africa by 2050 compared to the Current Path. Of this increase, Group A countries are expected to have about 19 million more people, while populations in Group B and Group C countries could increase by eight million and 300 000 people respectively by 2050.

Decreasing mortality combined with declining fertility rates (caused by the fall in infant mortality) cause the proportion of Africa's working population relative to its dependent population (i.e. the population under the age of 15 and the



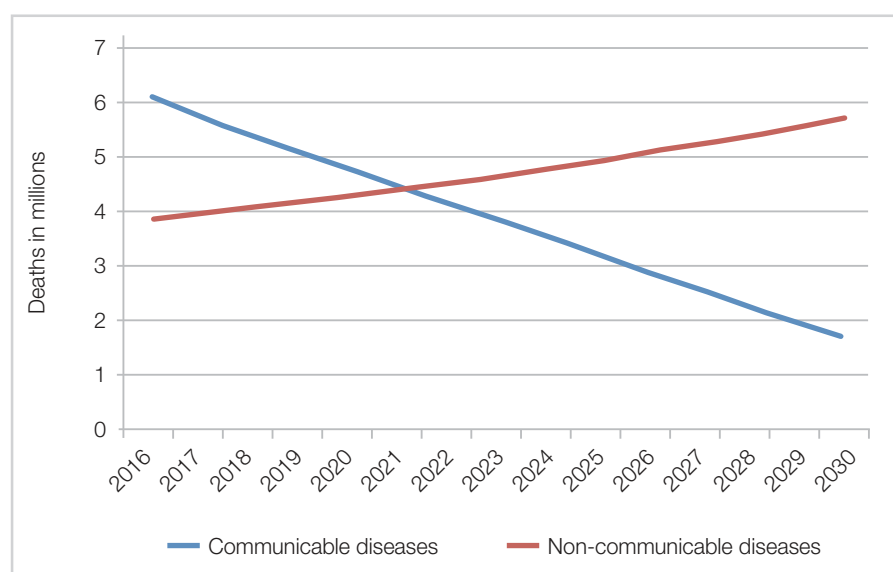
DISEASE REDUCTION
PROVIDES IMMEDIATE HEALTH
BENEFITS UP TO 2030

Figure 16: Demographic dividend under Africa Uninfected

Source: International Futures 7.22.

population over 65) to rise in this scenario. The working population increases by 33 million people for Africa as a whole by 2050 compared to the Current Path, which is higher than the total population increase under this scenario. The ratio of the working population to the dependent population under Africa Uninfected (also known as the demographic dividend) grows compared to Current Path by 2050. Figure 16 shows that this ratio increases from 1.7 to 1.8 workers per dependent by 2050.

As mentioned earlier, a successful reduction of communicable diseases directly contributes to a rise in the burden of non-communicable diseases. The increased life expectancy and altered age structure of Africa's population

Figure 17: Disease burden shift under Africa Uninfected

Source: International Futures 7.22.

AFRICA'S CUMULATIVE
GDP GAIN IN THE AFRICA
UNINFECTED SCENARIO
IS NEARLY

US\$8.6 trillion more

THAN IN THE CURRENT
PATH SCENARIO

created by this scenario brings forward the shift in the disease burden by 10 years. Figure 17 shows that if Africa achieves SDG 3.3 by 2030, the burden of disease will shift from communicable to non-communicable diseases not in 2031, but in 2021.

Although this is true for Africa as a whole, the disease transition happens at different times for the different groups used in this paper. The disease burden shifts in Group A countries in 2025, which is 14 years earlier than on the Current Path. In Group B countries the shift happens in 2023, nine years earlier than on the Current Path. Group C already has a higher burden of non-communicable diseases in 2015.

Since communicable diseases are related to extreme poverty and poor living conditions, reducing these diseases improves those conditions

An earlier shift in the disease burden could create problems for stressed African health systems, however. In Group A countries, premature death rates from non-communicable diseases remain high in 2030. This means that the larger working population created by the Africa Uninfected scenario will still have a high risk of dying a premature death from a non-communicable disease. So although Africa Uninfected increases the working population, this scenario does not address the problem of premature mortality from non-communicable diseases that this increased working population will face in the years to come.

The economic benefits for Africa in this scenario are also considerable. The cumulative gain in GDP for Africa as a whole is nearly US\$8.6 trillion more than the Current Path by 2050. Individual wellbeing is also improved by 2050 as GDP per capita at PPP for Africa increases by roughly US\$260 compared to the Current Path. GDP per capita increases by about US\$400 in Group A, by about US\$125 in Group B, and about US\$65 in Group C by 2050 compared to the Current Path. Figure 19 shows the net increase in the GDP per capita relative to the Current Path up to 2050 across all groups. This increase in economic output is mainly through the addition of healthy years and an increase in the size of the working population.

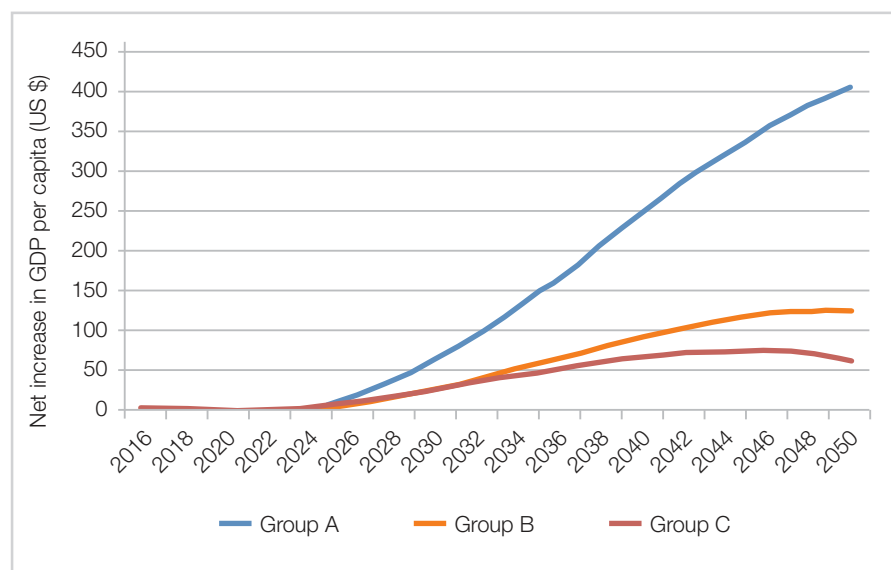
Since communicable diseases are related to extreme poverty and poor living conditions, reducing these diseases improves those conditions. By 2050, Africa Uninfected reduces the number of people living on less than US\$1.25 per day by nine million people compared to the Current Path.⁶⁶ The largest decrease in poverty happens in Group A countries, where almost seven million more people are lifted out of poverty by 2050 followed by Group B countries, where 1.9 million fewer people are living in poverty compared to the Current Path. For Group C countries, poverty declines by about 13 000 people by 2050 compared to the Current Path.

THE AFRICA UNINFECTED
SCENARIO REDUCES
THE NUMBER OF PEOPLE
LIVING ON LESS THAN
US\$1.25 PER DAY BY

9 million

COMPARED TO THE
CURRENT PATH SCENARIO

Figure 18: Net increase in GDP per capita (PPP) compared to the Current Path



Source: International Futures 7.22.

Africa Uninfected illustrates the potential health and economic benefits that follow the eradication of communicable diseases. However, an approach that focuses solely on communicable diseases would thrust Africa into a future where the working population rises rapidly and this population is simultaneously subject to the risk of premature death from non-communicable diseases. In this scenario, African countries are exposed to a higher burden from non-communicable diseases earlier than in the Current Path.

It is critical that Africa prepares for a future where non-communicable diseases present higher mortality risks

While eliminating communicable diseases is an extraordinarily important goal, it is equally critical that Africa prepares for a future where non-communicable diseases present higher mortality risks and to keep in mind the outcomes that can be achieved by a reduction in deaths from non-communicable diseases. The next scenario describes the development outcomes that could be achieved in Africa if premature deaths from non-communicable diseases were reduced by 2030.

84 million

THE NUMBER OF HEALTHY YEARS OF LIFE THE AFRICA ENDURING SCENARIO ADDS TO AFRICA'S POPULATION BY 2030 COMPARED TO THE CURRENT PATH SCENARIO

Scenario 3: Africa Enduring

The previous scenario showed that despite creating large gains in many indicators, a singular focus on reducing mortality from communicable diseases also leads to a transition toward non-communicable diseases in Africa 10 years earlier than the Current Path forecast. Therefore, if Africa hopes to 'ensure healthy lives and promote well-being for all', countries

must also address the rising prevalence of non-communicable diseases. To demonstrate some of the effects of achieving SDG 3.4, the following scenario, Africa Enduring, simulates a push to reduce by one-third premature mortality from non-communicable diseases by 2030.

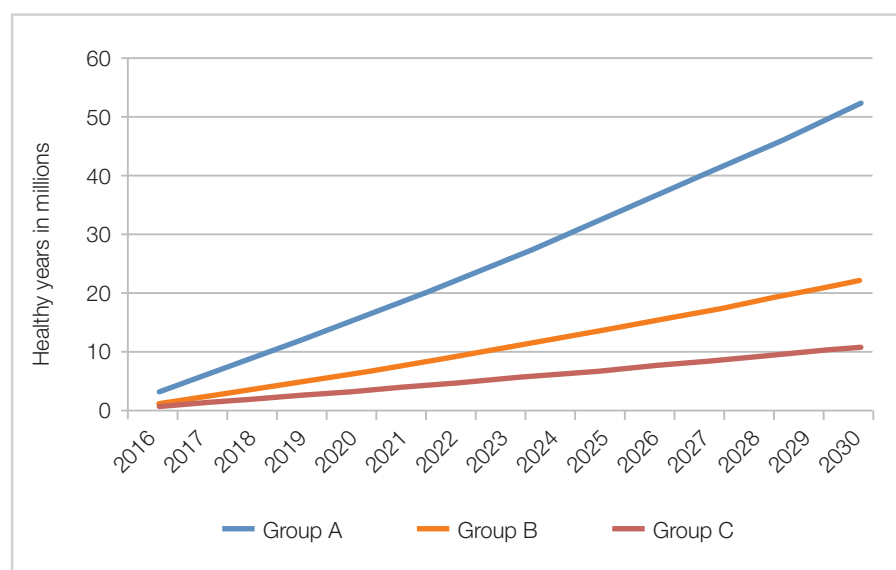
Health outcomes

The Africa Enduring scenario adds 84 million healthy years of life to Africa's population by 2030 compared to the Current Path. Reducing premature mortality from cardiovascular disease alone adds 13 million healthy years by 2030 compared to the Current Path. More than half of the gains under this scenario (52 million years) go to Group A's population. The increase in healthy years available for Group B and Group C countries is 22 million and 11 million years respectively. Figure 19 shows the increase in healthy years among country groups in this scenario compared to the Current Path.

Even though Africa Uninfected creates more healthy years within the overall population, the majority of the healthy years added in this scenario are through a reduction of disability; these are primarily added to the working population. Africa Enduring adds 42 million healthy years to Africa's population compared to the Current Path by 2030, just through a reduction in productive years of life lost to disability. This is 16 million more years than the reduction in years lost to disability achieved by Africa Uninfected. Of this total, 27 million years are added to Group A's population by 2030 and 11 million years and 4 million years are added to Group B and Group C's populations by 2030 compared to the Current Path.

Cumulatively, absolute deaths are reduced by 9.5 million between 2015 and 2030 under Africa Enduring compared to the Current Path. Group A countries

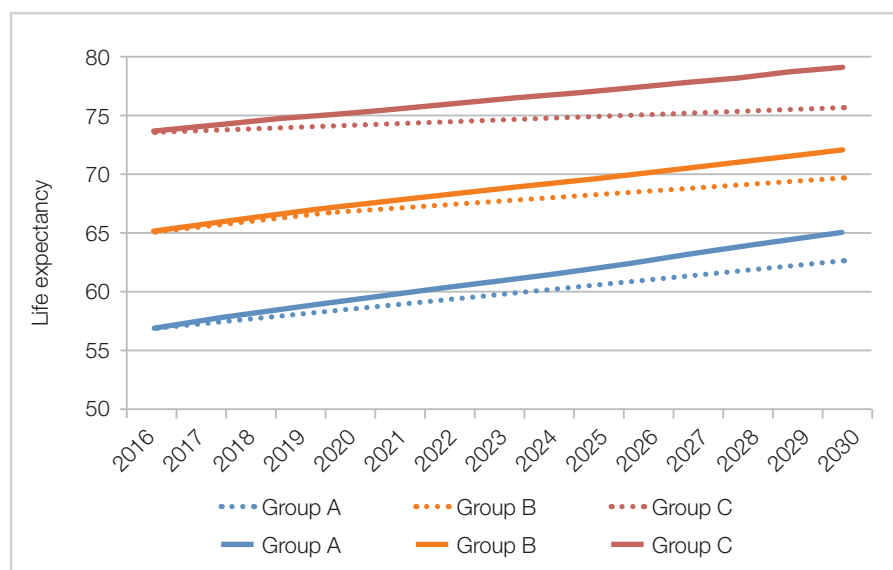
Figure 19: Increase in healthy years under Africa Enduring compared to the Current Path



Source: International Futures 7.22.

9.5 million

THE REDUCTION IN
ABSOLUTE DEATHS
BETWEEN 2015 AND 2030
UNDER THE AFRICA
ENDURING SCENARIO

Figure 20: Rise in life expectancy under Africa Enduring compared to the Current Path

Source: International Futures 7.22.

delay five million deaths, whereas Group B and Group C countries postpone two million deaths each by 2030 compared to the Current Path.

Africa Enduring also creates a small drop in infant mortality. Under this scenario, in 2030 one fewer infant dies annually per thousand births compared to the Current Path. This is mainly on account of the reduction in deaths from cardiovascular and digestive disorders that occur during the antenatal period.

In Africa Enduring, life expectancy in Africa rises by almost three years compared to the Current Path by 2030. The most dramatic effect on life expectancy in this scenario is in Group C countries, where average life expectancy at birth increases from 73 years in 2015 to 79 years in 2030, compared to 76 years on the Current Path. Group C countries currently suffer the heaviest burden of non-communicable diseases, and therefore benefit the most from a policy that targets premature deaths from these diseases. The gains in Groups A and B are still significant, however, as average life expectancy at birth increases by roughly two years above the Current Path in each group, to 65 (from 63) and 72 years (from 70) respectively. Figure 20 shows the increase in life expectancy among country groups by 2030 under Africa Enduring compared to the Current Path.

Demographic and economic outcomes

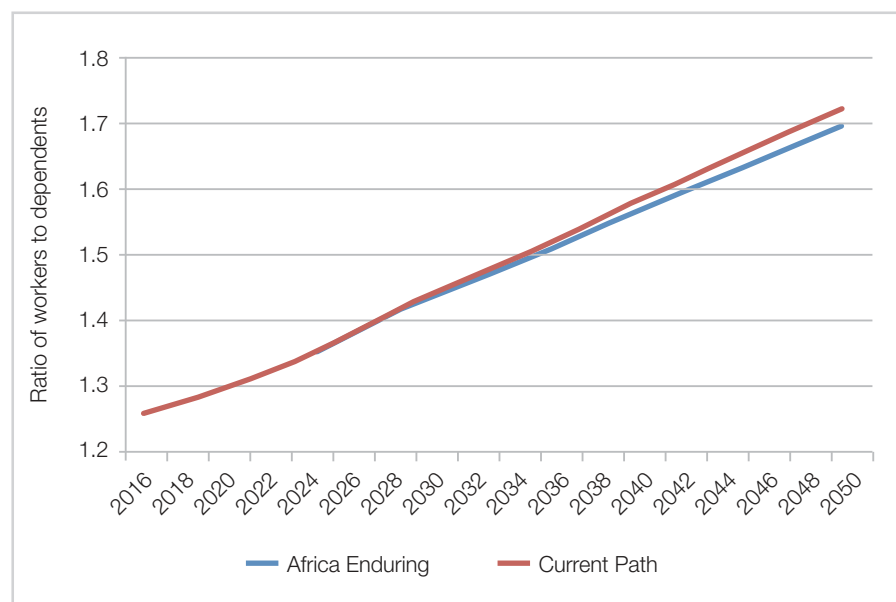
Up to 2050, Africa's total population increases by 32 million people in this scenario compared to the Current Path. The population increases by 17.5 million people in Group A countries compared to the Current Path; and by 8.2 million and 6.2 million people in Group B and Group C countries respectively.

BY 2030 LIFE EXPECTANCY
RISES BY ALMOST

3 years

IN THE AFRICA ENDURING
SCENARIO COMPARED
TO THE CURRENT
PATH SCENARIO

Figure 21: Demographic dividend for Africa under Africa Enduring



Source: International Futures 7.22.

However, unlike Africa Uninfected, the largest increase in the population comes from individuals over the age of 65. The working population increases by 11.5 million people by 2050 in this scenario compared to Current Path. The working population grows by 7.5 million people in Group A countries, while the corresponding rises in Group B and Group C countries are three million and 1.2 million people respectively.

Although the economic benefits from the Africa Enduring scenario are significant, they are outweighed by the gains in the Africa Uninfected scenario

Given that infant mortality is reduced only marginally in this scenario, fertility rates remain unaffected and birth rates do not fall. This creates an increase in the population under the age of 15 when compared to the Current Path. Moreover, the fall in deaths from non-communicable diseases increases average life expectancy. Although more working years are added to the population under Africa Enduring, the combination of unchanged fertility rates and longer life expectancy means that there are actually more dependents per worker than on the Current Path. Figure 21 shows the shrinking demographic dividend for Africa as a whole under Africa Enduring.

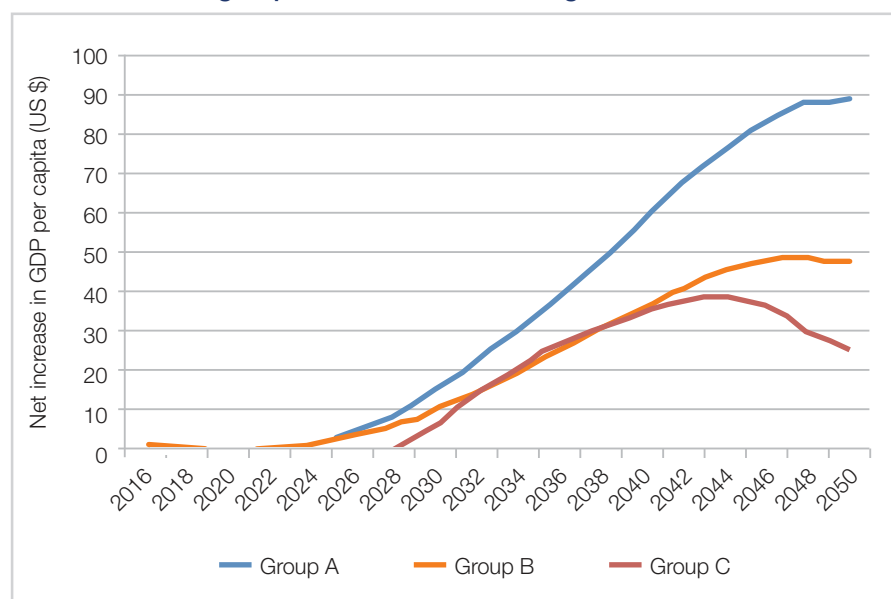
Although the economic benefits from this scenario are significant, they are outweighed by the gains in the Africa Uninfected scenario. Under Africa Enduring, the cumulative increase in GDP is US\$3.5 trillion above the Current Path, but also roughly US\$5 trillion below that under Africa Uninfected. In Africa Enduring, GDP per capita for the continent is improved by about

UP TO 2050, AFRICA'S TOTAL POPULATION INCREASES BY

32 million

IN THE AFRICA ENDURING SCENARIO COMPARED TO THE CURRENT PATH SCENARIO

Figure 22: Net change in GDP per capita compared to the Current Path for all groups under Africa Enduring



Source: International Futures 7.22.

US\$79, compared to US\$262 under Africa Uninfected by 2050. Figure 22 shows the growth in GDP per capita under this scenario for all the groups.

Conclusions

Although creating a set of global development targets is a laudable exercise, the SDGs do not take into consideration different levels of national development and therefore set unrealistic goals for many countries in Africa. The level of economic development, level of human development and prevailing disease burden in a given population are all relevant factors to consider when creating development targets, particularly health targets. Moreover, the SDGs do not set a hard target for life expectancy, which is a critical outcome of any health intervention in developing countries and has been identified by WHO as a critical metric for evaluating health outcomes.

The SDGs do not take into consideration different levels of national development and set unrealistic goals for many countries in Africa



REDUCING THE PREVALENCE
OF DISEASE IN AFRICA LEADS
DIRECTLY TO A SIGNIFICANT
RISE IN LIFE EXPECTANCY

This paper provides a context for countries attempting to achieve the SDGs. By highlighting the gaps between countries and revealing how much work must be done to achieve the specific targets, this research shows that Africa could hypothetically make tremendous progress in health outcomes and still ostensibly fail to achieve the targets of the SDGs. Under the Current Path scenario, African countries do not achieve the targets defined in the SDGs but they nonetheless achieve significant reductions in mortality relative

to their present levels. Reducing the prevalence of disease in Africa leads directly to a significant rise in life expectancy, where Africa lagged far behind other developing regions at the start of the SDGs in 2015. The table below summarises the results under the two scenarios presented.

Table 2: Summary of results from the two scenarios

Variable	Africa Uninfected	Africa Enduring
Addition in healthy years by 2030	233 million years	84 million years
Addition in years due to reduction in the disability impact of diseases by 2030	26 million years	42 million years
Increase in average life expectancy up to 2030	11 years	3 years
Increase in working population by 2050	33 million people	11.5 million people
Increase in overall GDP by 2050	US\$8.6 trillion	US\$3.5 trillion
Increase in GDP per capita by 2050	US\$262	US\$79
Demographic dividend (workers per dependant)	1.77	1.69
Population (increase from Current Path)	27 million	32 million

Source: International Futures 7.22.

Reducing deaths from communicable diseases in accordance with SDG 3.3 leads to an increased demographic dividend in Africa by 2050. Africa Uninfected also creates a massive addition of about 33 million people to its workforce. However, the increase in the workforce under Africa Uninfected comes at a cost. Africa Uninfected causes the disease burden to shift in the year 2021, rather than 2031, and it does little to address the rising number of premature deaths from non-communicable diseases. Therefore, a reduction in communicable diseases thrusts Africa into a future where its large working population is exposed to premature mortality risks from non-communicable diseases. Health systems in Africa are likely to be extremely pressurised as a result of these changes.

Alternatively, reducing non-communicable diseases does not address the heavy prevalence of infectious diseases in Africa and actually reduces the demographic dividend by 2050. But, the Africa Enduring scenario improves the productivity of the working population by reducing the effect of chronic diseases on disability, which can drive people out of the workforce and be a drain on productivity. The two scenarios make it clear that considering the relationship between communicable and non-communicable diseases is crucial when developing and implementing disease reduction strategies.

The impact of the trade-offs mentioned above is the most pronounced in Group A countries, which are more vulnerable to mortality and disability from communicable and non-communicable diseases. This is largely a result of underdevelopment, and highlights the interconnected nature of diseases. Communicable diseases disproportionately affect younger members of the population, which makes those people vulnerable to early-onset

non-communicable diseases such as heart disease, among others. Given the widespread underdevelopment in Group A countries, addressing the inter-relationship of both types of diseases is the best hope to achieve more inclusive human development outcomes.

Group B countries achieve significant human development outcomes from reducing mortality from communicable diseases. These countries are on a more conventional development path, however, and are already transitioning towards a higher prevalence of non-communicable diseases on the Current Path. In these countries, the burden of non-communicable diseases will naturally increase on account of the rising age of the population and a successful history of reducing communicable diseases. Group B countries must continue the push to eliminate communicable diseases, but also prepare for a high level of deaths and disability from non-communicable diseases. Group C countries are already at a high level of development and are largely on track to eliminate the communicable diseases outlined in SDG 3.3, so a reduction of non-communicable diseases in these countries provides a more substantive boost to development.

Keeping these trade-offs in mind, African countries should focus on the development of horizontal health systems that address a broad range of needs; along with vertical programmes that address specific diseases, particularly in Group A and B countries. Vertical programmes that target specific diseases have been successful in the past on the African continent, but are limited in the scope of health issues they can address and do not sufficiently anticipate forthcoming health challenges. Considering that many African countries today face a dual burden of infectious diseases and premature incidence of non-communicable diseases, investment in horizontal health programmes is vital for the region. Indeed, countries that were star performers during the MDG period such as Malawi and Ethiopia focused on the development of broad horizontal health systems along with addressing certain communicable diseases in an aggressive manner. Developing integrated programmes takes time and is subject to factors such as political will, community involvement, budget flexibility, etc. However, considering the epidemiological transition occurring in Africa, investing in these dynamic health programmes will help avoid the massive cost of combating the dual burden of disease.

Appendix 1: International Futures

International Futures (IFs) is a global, dynamic model that integrates data and outcomes across development systems. IFs holds historical data for more than 3,600 data series from 186 countries and produces long-term forecast outcomes for hundreds of variables across development sectors (i.e. economics, infrastructure, health, etc.). IFs should not be thought of as purely a forecasting tool, but rather as a dynamic scenario-building tool that allows for the modelling of long-term futures concerning development across human, social and natural systems. It is important to think of IFs forecasts as highly contingent scenarios, not predictions.⁶⁷

IFs allows users to perform three types of analysis. Firstly, historical trends and relationships can be analysed to understand how a country has developed over time. Secondly, these relationships are formalised in the model to produce Base Case forecasts. These initial forecasts, which are integrated across all systems within IFs, are useful indicators of where a country seems to be heading under current circumstances and policies, in the absence of major shocks to the system (wars, pandemics, etc.). Thirdly, scenario analyses augment the Base Case analysis by exploring the leverage that policymakers may have to push systems to gain more desirable outcomes.⁶⁸

Referring to the Base Case as a business-as-usual scenario incorrectly implies that it is only an extrapolation of the present. IFs incorporates many constraints and dynamics that can cause aspects of the Base Case to unfold in a very non-linear fashion. It is best to think of the Base Case as a starting point for analysis and thought, one that model users can reshape as they believe appropriate and/or can use as a foundation for what-if questions about possible alternative assumptions/interventions. IFs is open source and can be downloaded for free (pardee.du.edu).

IFs serves as the quantitative foundation for this paper. Using IFs we: (1) explore the changing disease burden in the Base Case (current trajectory); and (2) craft scenarios to understand interventions that change the mortality and morbidity impacts from communicable and non-communicable diseases and (3) analyse the outcomes of these scenarios so that policy makers can make better informed interventions.

Appendix 2: Country groups

Group	Country name	Average life expectancy at birth in 2015	Group	Country name	Average life expectancy at birth in 2015
Group A	Nigeria	52.3	Group B cont.	Sudan	63.1
	South Africa	57.1		Niger	60.7
	Angola	52.7		Ghana	61.5
	Uganda	57.2		Malawi	61.0
	Mozambique	54.6		Madagascar	64.5
	Côte d'Ivoire	51.9		Senegal	65.8
	Cameroon	56.0		Rwanda	63.1
	Chad	51.8		Liberia	60.3
	Mali	57.2		Congo, Republic of	62.7
	South Sudan	55.1		Mauritania	62.8
	Zambia	58.8		Eritrea	64.1
	Somalia	54.9		Gambia, The	60.5
	Zimbabwe	54.8		Namibia	64.3
	Burundi	57.1		Djibouti	62.2
	Sierra Leone	50.2		Comoros	63.5
	Central African Republic	51.4		São Tomé and Príncipe	66.2
	Lesotho	49.5	Group C	Algeria	75.0
	Guinea-Bissau	55.5		Cape Verde	73.6
	Swaziland	49.2		Egypt	71.3
	Equatorial Guinea	57.9		Libya	71.5
	Congo, Democratic Republic of	59.0		Mauritius	74.1
	Burkina Faso	59.0		Morocco	73.6
	Guinea	59.1		Seychelles	72.9
	Benin	59.8		Tunisia	74.6
	Togo	59.0			
Group B	Gabon	64.8			
	Botswana	64.4			
	Ethiopia	64.4			
	Kenya	61.9			
	Tanzania	64.0			

Appendix 3: African regions

Region	Countries	Life expectancy (years)
Central Africa	Cameroon, Central African Republic, Chad, the Republic of Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, São Tomé and Príncipe	58
East Africa	Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Mauritius, Rwanda, Seychelles, Somalia, Sudan, South Sudan, Tanzania, Uganda	62
North Africa	Algeria, Egypt, Libya, Mauritania, Morocco, Tunisia	73
Southern Africa	Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe	56
West Africa	Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo	55

Notes

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- 1 Communicable diseases and infectious diseases refer to the same classes of diseases and are used interchangeably throughout this paper.
- 2 Africa and sub-Saharan Africa are not used interchangeably in this paper. Sub-Saharan Africa refers to the area of Africa south of the Sahel (i.e. excluding Algeria, Morocco, Tunisia, Egypt and Libya).
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