policy

PROJECTING ETHIOPIAN DEMOGRAPHICS FROM 2012–2050 USING THE SPECTRUM SUITE OF MODELS

Brief

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Summary

Introduction

Until the 1980s, Ethiopia had no mechanism to accurately estimate its population size. The first national census was conducted in 1984 and estimated the total population to be 42.6 million. Subsequent censuses estimated 53.5 million (1994) and 73.5 million (2007), while the 2012 Inter-Censual Population Survey estimated 83.7 million. This analysis, conducted by the Ethiopian Public Health Association (EPHA) and the USAID-funded Health Policy Project (HPP), aims to generate useful demographic information for policymakers and development experts in Ethiopia for planning and program design.

Methods

The Demographic Projection (DemProj) module of the Spectrum suite of models was used to project the size of the Ethiopian population from 2012 to 2050. The base year population was taken from the 2012 Inter-Censual Population Survey. Other projection parameters were taken from the United Nations Population Division's *World Population Prospects* (2012 revision) medium variant scenario.

Results

The total fertility rate (TFR) declined from 4.6 in 2012 to 3.1 in 2032 and then to 1.8 in 2050. The projected Ethiopian population steadily increased from 83.7 million in 2012 to 133.5 million in 2032 and 171.8 million in 2050, with a doubling time of 83 years in 2050. The rate of natural increase decreased from 1.9 percent in 2012 to 0.8 percent in 2050. The crude birth and death rates in 2012 were 34.6 and 9.7 per 1,000 people, and were projected to decline to 14.7 and 6.4 per 1,000 in 2050. The 0–14 age group declined after 2030, while the working-age population (ages 15–64) and older age groups (ages 65+) continued to increase. Ethiopia's window for capturing a possible demographic dividend was projected to peak around 2040.

Conclusions and Recommendations

Access to reproductive health and family planning services should be accelerated to create the opportunity for a demographic dividend in Ethiopia. Investments in health, education, and other development sectors are needed to capture the dividend.

Introduction

Ethiopia is the second most populous country in Africa, after Nigeria. Until the 1980s, the country had no mechanism to accurately estimate its population size.

Census Year	Estimated Total Population (millions)	Average Annual Growth Rate Since Last Survey
1984 Census	42.6	3%
1994 Census	53.5	2.9%
2007 Census	73.8	2.6%
2012 ICPS	83.7	2.6%

The first national census, conducted in 1984, estimated the total population to be 42.6 million. The second national census in 1994 found that over 10 years the population had increased by more than 25 percent to 53.5 million, corresponding to an average annual growth rate of 2.6 percent. The most recent census was conducted in 2007 and estimated a population of 73.5 million, corresponding to an average annual growth rate of 2.9 percent. In 2012, an Inter-Censual Population Survey (ICPS) estimated the population at 83.7 million, corresponding to an average annual growth rate of 2.6 percent.

In response to Ethiopia's demographic and health situation, which is characterized by high maternal and child mortality, high fertility, and rapid population growth, the country adopted the National Population Policy in 1993. This analysis was conducted to provide policymakers and development experts in the country with accurate demographic projections for planning purposes and implementation of population-related socioeconomic interventions.

Methods and Assumptions

The Spectrum suite of models answers questions about the cost and impact of various policy and program scenarios in health and development. The Demographic Projection module (DemProj) is the "engine" of Spectrum; given a base-year population and other demographic inputs, DemProj projects the population, broken down by age and sex, using standard demographic methods. The model also provides information about fertility and mortality by age and sex. It is designed to aid sector-based programming and demonstrate the magnitude of population challenges over time, explore policy and resource options, and set priorities.

The base-year population data were taken from the 2012 ICPS. The age-sex population structure of the country was divided into five-year age groups and one age group for 80 and above. Other demographic inputs for the 2012–2050 projection period were taken from the medium variant projections of the 2012 *World Population Prospects*, a set of international demographic projections produced by the United Nations Population Division. The study team applied a total fertility rate (TFR) of 4.6 children per woman in the base year 2012, which was projected to decrease to 1.8 in 2050. A life expectancy (LE) at birth of 59.5 years was used for both sexes in 2012 and projected to increase to 71.6 in 2050. The results of this analysis were determined most directly by base-year population, TFR, and LE at birth.
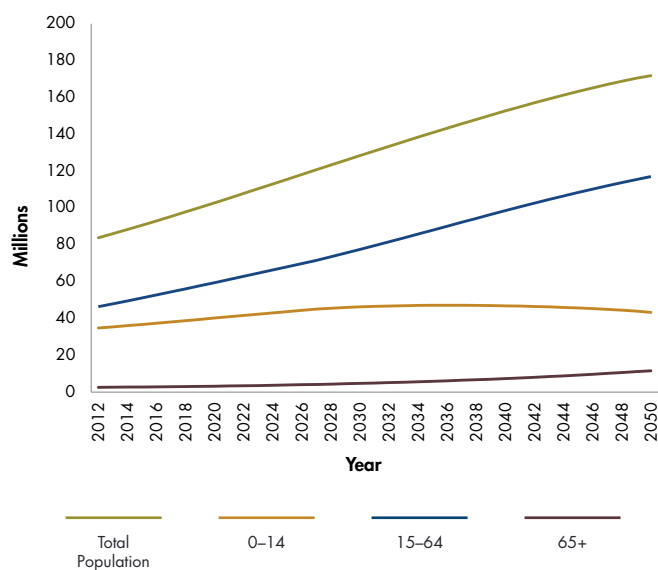
Results

Population Size and Demographic Dividend

Figure 1 and Table 1 show the population projection under the assumed fertility and mortality declines over the specified period. The total population size increased to 133.5 million in 2032 and then to 171.8 million in 2050. Over the same period, the percentage of the population that is of working age (ages 15–64) increased from 56 percent to 68 percent, with a corresponding decrease in the young and old age groups. The dependency ratio, or the ratio of young (ages 14 and below) and old (ages 65+) to the working-age population, decreased from 77.4 percent in 2012 to 63.4 percent in 2032 and 47 percent by 2050. This change in the population's age structure opens up a window of opportunity for Ethiopia to capture a demographic dividend, if favorable social and economic policies and conditions exist.

**Table 1. Population and Health Summary Indicators in 2012, 2032, and 2050**

Demographic Indicators	Year		
	2012	2032	2050
Population (millions)	83.7	133.5	171.8
Working-age population (millions; % of total population)	48.3 (56%)	81.7 (61%)	117 (68%)
Dependent population (millions; % of total population)	37.4 (44%)	51.8 (39%)	54.8 (32%)
Population doubling time	28	37	83
Median age	19	23	29
Total fertility rate	4.6	3.1	1.8
Life expectancy at birth	59.5	67.9	71.5
Infant mortality rate	67.7	37.8	26.7
Under-5 mortality rate	105.7	53	34.8
Crude birth rate	34.6	24.9	14.7
Crude death rate	9.7	6	6.4

**Figure 1. Total Population by Age Groups, 2012–2050**

time. The rate of natural increase, defined as the difference between the crude birth and crude death rates, also decreased from 2.5 in 2012 to 0.8 in 2050. Under this scenario, the TFR would reach a replacement level of 2.1 in 2046.

Figure 2. Key Demographic Parameters, 2012–2050

Other Population-Related Attributes

Figure 2 shows the TFR decline and life expectancy increase that characterized this population projection. As fertility declined, the age structure of the population shifted toward older age groups, raising the median age and dramatically increasing the population doubling

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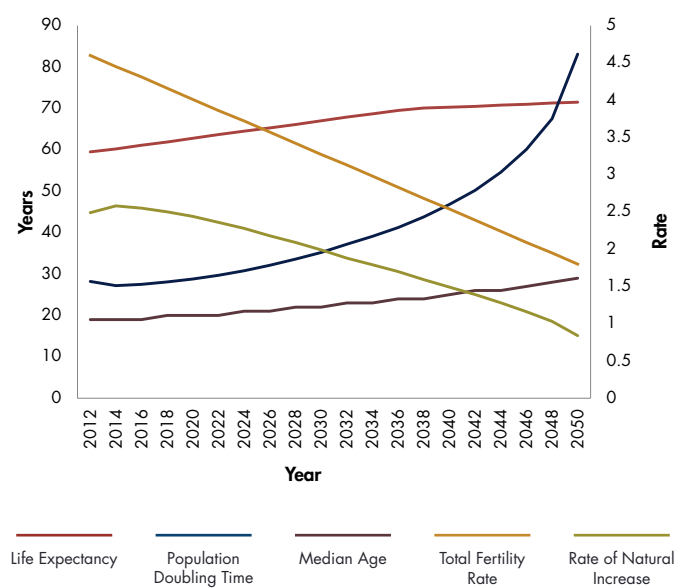
Fertility and Mortality

The Coale-Demeny North model life table was used to compute the infant mortality rate, which was 67.7 per 1,000 live births in 2012. The under-5 mortality rate was 105.7 per 1,000 live births in 2012. The crude birth and death rates in 2012 were 34.6 and 9.7 per 1,000 people (total population), respectively. In 2050, the infant and child mortality rates were projected to reach 26.7 and 34.8 per 1,000 live births, respectively. Similarly, the crude birth and death rates also declined to 14.7 and 6.4 per 1,000 people, respectively (Figure 3 and Table 1).[1]

Figure 3. Trends in Fertility and Mortality, Ethiopia, 2012–2050
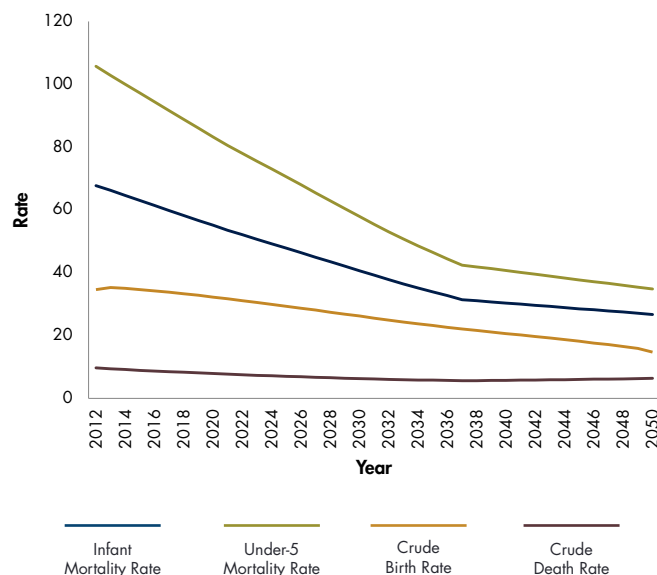
Population Structure of Ethiopia

The population pyramids in Figure 4 show the population's age structure in base year 2012, in 2032, and in 2050. The fertility decline is visible in the decreasing size of the pyramid base over time, as more of the population is concentrated in the working-age groups (green). This concentration is the necessary (but not sufficient) first condition for the demographic dividend.

Discussion

Assessing and projecting population dynamics and attributes are important for the design of sound public health, socio-demographic, and economic policies and programs at the national and subnational levels. Ethiopia's population is increasing rapidly, but the growth rate is expected to slow in future decades, with continued investment in family planning and maternal and reproductive healthcare. The broad base of Ethiopia's population pyramid indicates a large proportion of young people; 41.5 percent of the total population was age 14 or younger in 2012. Ethiopia's young population is also reflected in the low median age and high dependency ratio.

The continued growth of Ethiopia's population is certain under any plausible scenario, although the rate of growth might decrease. With sound public health, education, governance, infrastructure, and other beneficial policies and conditions, the decline in fertility and mortality—or demographic transition—projected here could lead to a demographic dividend for Ethiopia's economy (UN Population Division, 2012).

Limitations

1. The analysis reveals what might happen if fertility and mortality were to decline. Such dramatic changes are not automatic, but are rooted in policy and health system design, as well as economic changes.

2. The infant and under-5 mortality rates used by DemProj may overestimate true mortality in those age groups; however, this is not expected to change the overall conclusions of the study.

3. There is a shortage of data on migration. As a result, no projection was made for migration rates and related dynamics in the country.

Recommendations

The government, in collaboration with partners and the community, should undertake the following measures to accelerate positive indicators and alleviate negative ones:

- Ensure equity in and accessibility to family planning services at the national and subnational levels to accelerate the reduction of TFR and its consequences.

- Promote and provide basic and primary healthcare interventions to be accessed by the general community, with special focus on maternal and

Figure 4. Population Pyramid, Ethiopia 2012, 2032, and 2050
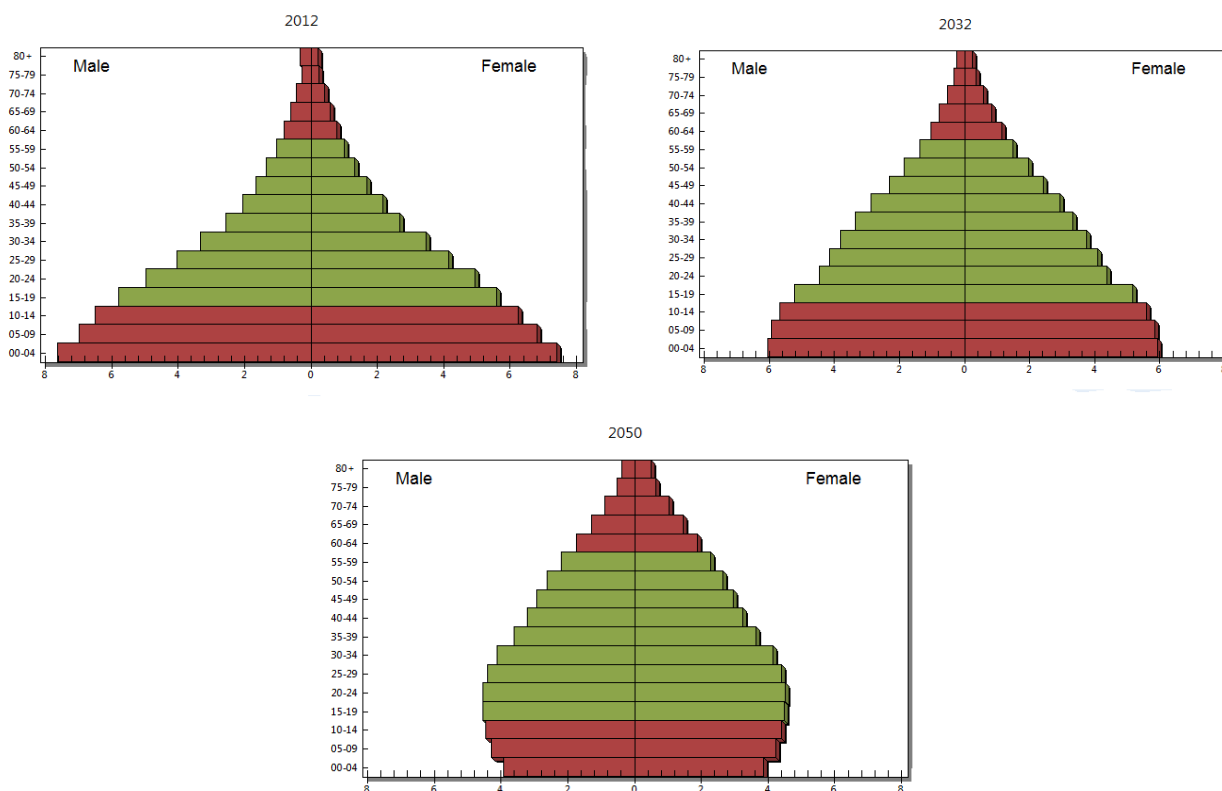
child health to avert preventable maternal, child, and infant deaths.

- Create job opportunities for working-age groups; expand access to and improve the quality of education, health, and other social services. Consider how Ethiopia might capture a demographic dividend in the future.

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Endnote

1. The DemProj projections used an infant mortality rate of 71.5 per 1,000 live births, taken from the Coale-Demeny North model life table. However, the infant mortality rate measured in the 2011 Ethiopia Demographic and Health Survey (EDHS) was lower, just 59 deaths per 1,000 live births. Similarly, the under-5 mortality rate used here is also slightly higher than that measured by the the 2011 EDHS. Neither discrepancy had a significant effect on the overall results of this population projection, beyond slightly overestimating mortality in the younger age groups. These discrepancies in mortality at young ages were necessary to get an accurate fit to the population's mortality over all age groups.