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# Uganda

## Demography and Economic Growth in Uganda

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## CURRENCY AND EQUIVALENT UNITS

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Currency Unit = UG Shillings

**US\$1 = 2,495 UG Shillings**

## WEIGHTS AND MEASURES

Metric System

BCC	Behavioral Change Communication
CCT	Conditional Cash Transfer
CPR	Contraceptive Prevalence Rate
DHS	Demographic and Health Survey
EV	Equivalent Variation
GCR	Gross Completion Rate
GDP	Gross Domestic Product
GER	Gross Enrollment Rate
ICPD	International Conference on Population and Development
ICT	Information Communication Technology
IEC	Information, Education, and Communication
MAMS	Maquette for MDG Simulations
MDGs	Millennium Development Goals
MOH	Ministry of Health
NGOs	Non Government Organizations
NIR	Net Intake Rate
NPP	National Population Policy
OECD	Organization for Economic Co-operation and Development
ORT	Oral Rehydration Therapy
PoA	ICPD Program of Action
PPP	Purchasing Power Parity
PV	Present Value
RH	Reproductive Health
TFP	Total Factor Productivity
TFR	Total Fertility Rate
UBOS	Uganda Bureau of Statistics
UN	United Nations
UNAIDS	United Nations Program on HIV/AIDS
UNICEF	United Nation's Children's Fund
USAID	United States Agency for International Development
WB	World Bank

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## EXECUTIVE SUMMARY

1. ***Uganda has one of the youngest and most rapidly growing populations in the world.*** The total fertility rate (TFR) is estimated at 6.7 children per woman according to the government's data and 6.4 according to the UN data. About half (48.7 percent) of Uganda's population is younger than 15, well above Sub-Saharan Africa's average of 43.2 percent and world average of 26.8 percent. Both the high level of fertility and the youthfulness of the population bring a very high youth dependency ratio. The country's population growth rate, currently at 3.3 percent, has also been steadily above Africa's average, except for the period of peak prevalence in HIV/AIDS in early 2000s.

2. ***The most important demographic issue for Uganda is related to the age structure rather than the overall size of its population.*** A very young population represents a major challenge for Uganda in the short and medium term. In order to change its population age structure faster, Uganda needs to accelerate the demographic transition, namely the shift from high levels of mortality and fertility to low levels of mortality and fertility. Once mortality (especially infant and child) and fertility rates begin to fall, young age dependency ratio will follow the same trend albeit with some lag. This will have positive – and quite possibly major – implications for the economic growth.

3. ***Changes in the age structure of population may bring about a “demographic dividend” that can be captured to produce a virtuous cycle of economic growth with the right policy framework.*** Increasing the share of the working age individuals in total population may positively affect income per capita growth in three ways:

- Through *translation effects* owing to the differential growth of the total population and the working population; if the share of the working-age population increases, any growth of GDP per worker translates into higher growth of GDP per capita, unless the difference is offset by increase in the unemployment rate or a fall in the labor force participation rate;
- Through *savings effects*: more people of working age mean a higher share of savers in the population; higher probability of surviving into old age may encourage higher savings rates; and
- Through *human capital effects*: an increase in life expectancy generally implies better health and increases the demand for education; for any given ratio of education expenditures as a share of GDP, a lower dependency ratio implies higher per capita spending on education.

4. ***There is a number of similarities among the countries which benefited from large demographic dividends, which gives an idea about the policy framework needed to capture the dividend.*** All these countries fully exploited the world economy, maintained macroeconomic stability, mustered high rates of saving and investment, let markets allocate resources, and finally had committed, credible, and capable governments. Gender equality and upgrading of the social services delivery systems were also among the factors contributing to their success.

5. ***Given the high fertility and reduced mortality over the last several decades, Uganda's population will be growing rapidly over the next several decades.*** The young age structure will also foster population growth (the phenomenon of population momentum). If Uganda manages to make further substantial progress in increasing the life expectancy, even under the assumption that current fertility rate will by then be more than halved its population will be growing in 2050 more rapidly (estimated 1.7 percent per year) than the world's population is growing today (1.2 percent); in 2050, Uganda's population is likely to exceed 80 million people. Focusing government's efforts on increasing life expectancy inevitably contributes to population growth. However, in the long run, this strategy is consistent with accelerating the demographic transition, as fall in infant and child mortality is likely to trigger decline in fertility.

6. ***Uganda's economic future looks brighter under assumptions of demographic change.*** The impact of demographic variables on income per capita levels in Uganda was estimated using a demographic-economic model and historical data from 108 countries. The model includes a number of demographic variables, such as life expectancy at birth and proportions of different age groups in the population. Baseline simulations for four UN demographic scenarios (High, Medium, Low, and Constant fertility) were produced using the model. In a "High fertility" scenario, Uganda's income per capital roughly doubles by 2050, and for the "Medium fertility" and "Low fertility" scenarios, it nearly triples. Remarkably, medium and low fertility scenarios result not only in much higher incomes per capita, but also in much larger economies, despite smaller populations.

7. ***Reducing the number of children per working-age individual will also help Uganda to transform its oil wealth into a more balanced combination of human and physical capital.*** Simulations showed that other things being equal, halving Uganda's total fertility rate during the oil era would help to more than double per capita growth rates of public expenditures on services of all categories, dramatically improving both fiscal space and the country's MDG indicators.

8. Econometric analysis of key proximate and intermediate determinants of fertility in Uganda has shown that:

- Fertility in urban areas – and especially in Kampala – is lower, and actual number of children is closer to the desired one (as per Ugandan Demographic and Health Survey);
- Education is a significant predictor of fertility, and so is the increase in the age at the first sexual intercourse;
- Increasing contraceptive use makes a significant impact on fertility, and this can be achieved by tapping into unmet needs for family planning<sup>1</sup>;
- Fertility is negatively correlated with access to electricity; and

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<sup>1</sup> Women with an unmet need for family planning are defined as those who indicate that they either want no more children or want to wait for at least two years before having another child but are not using contraception

- Finally, women who earn some cash from their work have fewer children than those who do not, and female labor participation increases age at marriage and decision making by women in the home.

9. ***Since the proximate determinants of child mortality, such as eradication of communicable disease, have been studied extensively in Uganda and internationally, this study focused on the contextual determinants of under-five mortality as well as breast-feeding and birth weight. The econometric analysis of these determinants has shown that:***

- Prenatal care also increases substantially the child's chances to survive;
- Mother's education is important too, and spacing of births helps to increase children's survival;
- Type of toilet used by the household affects the child's survival;
- The household's source of drinking water is important in urban areas;
- Breast-feeding has a huge impact on the probability of surviving beyond the fifth birthday; and
- Finally, child's weight at birth affects her/his chances for survival.

10. ***Uganda's strategies on fertility and child mortality are generally consistent with the findings of the econometric analysis.*** In particular, the development strategies, the population and reproductive health policies, as well as the plan to reach the MDGs do address the wide range of variables highlighted in this analysis. However, Uganda has been more successful in combating communicable diseases than in reducing overall child and maternal mortality levels. Furthermore, despite major improvements in the area of vaccine preventable diseases that helped bring down the high levels of under-five mortality, the improvement of these outcomes has remained relatively poor compared to other countries in the region.

11. ***A number of public policies can help accelerate the fertility decline.*** Investing in girls' education and adopting laws and policies enhancing gender equality should be among priorities. The government needs also to promote more rapid and better urban planning by investing in urban infrastructure and by reducing disparities in the provision of social services between the urban and rural areas in order to make the rural-urban migrants better protected as well as more employable in the cities<sup>2</sup>. Family planning policies targeting reduction in unmet need for contraceptives are more effective when they are accompanied by effective communication campaigns and integrated with other health services. Finally, improving access to electricity, especially in the country side, can also help to decrease fertility through enhanced access to mass media communication.

12. ***Although Uganda has put into place interventions to address the contextual variables of mortality, it has more consistently deployed programs geared at the proximate determinants of mortality.*** Uganda has also fought the HIV/AIDS that initially reversed the gains that had been made in maternal and under-five mortality.

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<sup>2</sup> Please see also forthcoming policy notes on inclusive growth in Uganda

Among the proximate determinants of mortality, one should list the launching of vaccinations campaigns, the administration of nutritional supplements and oral rehydration therapy (ORT) regimens, and the efforts to combat malaria (e.g., with impregnated bed-nets) and other communicable diseases. Nonetheless, more focused interventions to improve the contextual variables of mortality would help accelerate the decrease in under-five mortality and eventually the fertility decline.

13. ***Uganda would benefit from the design of a comprehensive policy framework combining all direct, indirect, and specific interventions needed to reduce its under-five mortality and maternal mortality.*** In this respect, a functioning primary health care with a framework that encompasses a lifelong continuum of care, spelling out specific interventions at four critical stages (i.e., pre-pregnancy, pregnancy, newborn/postnatal, and childhood), would help coordinate the various programs toward the overall goal. In turn, this would most likely accelerate the decline in the levels of mortality, yielding faster results than those that had been obtained so far.

14. ***Institutional issues also need to be addressed to improve the implementation of population and health policies and strategies.*** Improving services delivery and the performance of the health system will imply improving governance (e.g., the issue of absentee health workers). These goals will also entail strengthening priority-setting mechanisms by setting up an appropriate monitoring and evaluation system, and improving inter-agency coordination between various line ministries for a multisectoral approach, as well as coordination between the government, lawmakers, and civil society institutions. Last but not least, also it is important to ensure that services reach the poor and the most vulnerable as well as underserved areas such as the Northern part of the country and rural areas.

## DEMOGRAPHY AND ECONOMIC GROWTH IN UGANDA

### 1. Introduction

1.1 *What is the role of demography in Uganda's economic development?* Does the country need to have more people to expand its internal markets? Or does it need a larger share of working-age people in its population, because it is adults, not children or elderly, who work, save, and invest? Should Uganda accelerate its transition to lower fertility levels as a way to trigger the transformation of its age structure in order to reduce the youth dependency ratio? And if so, how could this be accomplished?

1.2 *The connection between population and economic growth has been at the core of economics ever since its formation as an academic discipline.* The battle line in the debate has mainly been dividing economists into Malthusians and non-Malthusians. The Malthusians were defending the conclusion of Rev. Malthus (first voiced in 1798) that any growth of per capita income will be annihilated by the ensuing population growth, as increased income permits higher fertility which in turn reduces income per capita. The more optimistic non-Malthusians have proposed a rather diverse range of arguments why this need not be the case, perhaps most prominently Adam Smith's (1776) view that the productivity gains of specialization with the increase of the size of markets would overtake the Malthusian tendency. While this characterization is an oversimplification, it pretty much summarizes the debate up to modern times. However, another dimension of the debate focused on whether there were causal links between population growth and economic growth at the aggregate level, often using cross country regressions. In 1958, Coale and Hoover argued that reduction in fertility and population growth rates will lead to higher incomes per capita. On the other hand, Boserup (1965, 1981) developed new arguments why population growth in itself would force technological and institutional innovations thus counteracting the Malthusian trap.

1.3 *During the 1990s the focus of the debate on the connection between population and economic growth shifted from the growth impact of population size to that of the age structure.* Changes in the age structure of population are usually driven by demographic transition from high mortality and high fertility levels to low mortality and low fertility levels. This demographic transition was first observed in Western Europe during the 18th and 19th century. It was sparked by a decrease in mortality rates, predominantly infant and child mortality rates, and has since turned out to be a pervasive phenomenon all over the world, typically coinciding with industrialization and urbanization processes and take-off of the economy that has broken through the Malthusian trap into higher growth regimes (see, for example, Birdsall et al., 2003). Demographic transition has clearly taken roots in East Asia, spreading through the continent to South Asia and to the Middle East. The process is now also apparent and easily recognized in Latin America and the Caribbean. Many demographers now believe that in spite of setbacks and anomalies, it has started in most of Sub-Saharan Africa as well.

1.4 ***Changes in the age structure of population may bring about a “demographic dividend” to economic growth.*** The window of opportunity to capture this “demographic dividend” is ushered by the decline of fertility levels, which improves the youth dependency ratios and, relatively speaking, expands the size of the working age population. This, which occurred in East Asia, may positively affect, for a certain period of time, growth of income per capita in three different ways:

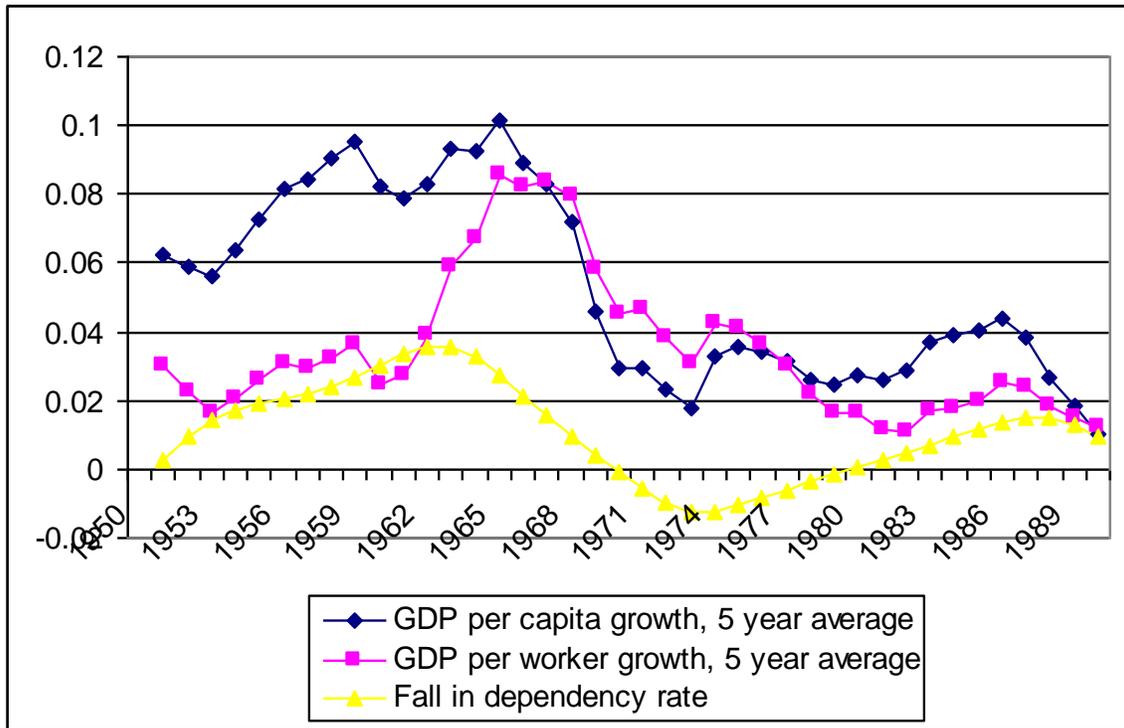
- Through *translation effects* owing to the differential growth of the total population and the working population: if the share of the working-age population is increasing, any growth of GDP per worker translates into higher growth of GDP per capita, unless the difference is offset by increase in the unemployment rate or a fall in the labor force participation rate;
- Through *savings effects*: more people of working age mean a higher share of savers in the population; higher probability of surviving into old age may encourage higher savings rates; and
- Through *human capital effects*: an increase in life expectancy generally implies better health and increases the demand for education; a lower dependency ratio implies higher per capita spending on education.

1.5 ***These effects may help to get the economy into a “virtuous circle” with the right policy framework.*** Demographic transition helps to accelerate economic growth, which in turn increases resources available to improve the population’s health and education status, and further accelerates the demographic transition.

1.6 ***Countries have benefited from the “demographic dividend” to economic growth as their dependency ratios decreased.*** To illustrate this point, Figure 1 plots rates of reduction in the dependency ratio (defined as a number of people aged 0-14 per person aged 15-64) against rates of growth of GDP per capita and GDP per worker in Japan for the period 1950–1990. The correlation coefficients between the former and the two latter variables are 0.56 and 0.8, respectively. That is, whenever dependency ratio declined, economic growth tended to accelerate, and whenever dependency ratio increased, economic growth tended to slow down.

1.7 ***The magnitude of a demographic dividend – and how soon it materializes – depends however on political leadership and economic policy framework.*** Firstly, the experience of other countries shows that when political leadership is persuaded that demographic change is crucial for the country’s well-being, this change is much more likely to occur - and to be sufficiently rapid to have a sizeable effect on economic growth. Secondly, the extent to which the demographic dividend is captured will also depend on whether complementary policies and institutions ensuring growth of employment and investment to match increases in the labor force and savings are in place.

**Figure 1: Rates of economic growth and demographic dependency reduction in Japan, 1950–90**



Source: UN World Population Prospects, Penn World Tables, and OECD

1.8 ***Interaction of sound policy framework and demographic transition can deliver remarkable growth outcomes.*** The Growth Report produced by the Commission on Growth and Development identified 13 countries where GDP grew by 7 percent or more for at least 25 years during the postwar period, namely Botswana, Brazil, China, Hong Kong SAR, China, Indonesia, Japan, Korea, Malaysia, Malta, Oman, Singapore, Taiwan, China, and Thailand. The report also identified broad "points of resemblance" of their economies: they fully exploited the world economy, maintained macroeconomic stability, mustered high rates of saving and investment, let markets allocate resources, and finally had committed, credible, and capable governments. Gender equality and upgrading of the social services delivery systems were also among the factors contributing to their success. Box 1 elaborates on the policy frameworks of some of these countries. All of these countries for which we have demographic data have experienced rapid demographic transition which coincided with the periods of high growth: Figure 2 shows young age dependency ratios for these countries for the period 1950-2000 after the dependency ratios started to decline (in all cases except for Japan the periods of rapid growth occurred after 1960).

### **Box 1: Policy frameworks to capture demographic dividend: lessons from East and Southeast Asia**

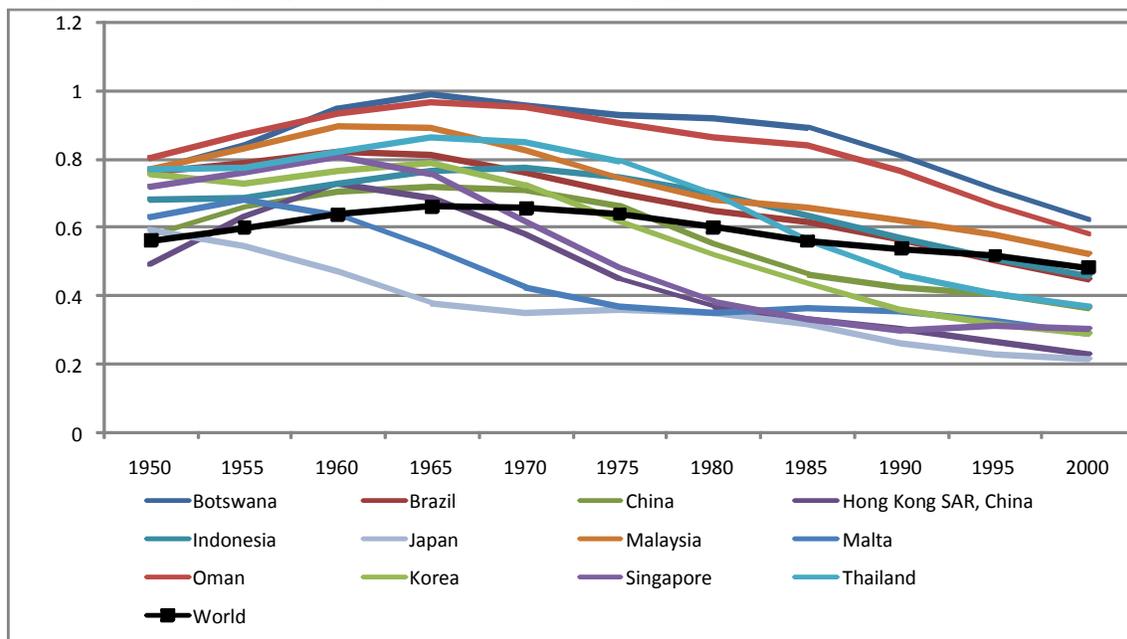
East and Southeast Asian countries stand apart from the rest of the world because of their extremely fast fertility transitions. In 1960, South Korea, Hong Kong SAR, China, Singapore, and Thailand had total fertility rates (TFR) greater than or equal to five children per woman (and higher than six in Thailand). In 2010, all these countries had TFRs lower than replacement level (2.1 children per woman), and most of them had already reached such low levels in the 1990s. During the same time, these countries benefited from spectacular economic growth rates. This was called the “Asian economic miracle” and the countries were dubbed the Asian Tigers.

When the first window of demographic opportunity becomes available, it must be accompanied by adequate policies if it is to be captured to its fullest extent. Public authorities in Asia seized the opportunity. They complemented demographic changes with energetic policies facilitating public and private investment in the areas of health and education. The economic policies of the Asian Tigers varied widely from one country to another. Some elements, such as sound macroeconomic management, were common, but others factors, such as degree of the government's intervention in the economy, were quite different (Singapore's proactive stance vs. Hong Kong's SAR, China laissez-faire is a classic example). What was common is that all these countries converged during the demographic transition towards the institutional frontier of the developed world (roughly speaking, the norms of the OECD countries), and this was most conducive to economic growth. For example, China's institutions are nowadays more similar to institutions of any OECD country than they were 35 years ago under Mao's rule, even though they are still quite different from OECD institutional norms (Ying 2006). The Asian Tigers were probably converging to different points on that frontier, having chosen different convergence paths. The fact that they were doing so during the period of demographic dividend resulted in outcomes larger than the simple sum of the demographic dividend and the “institutional convergence dividend.”

What are specific policy areas important for maximizing the demographic dividend? The dividend can work in three ways: when share of working-age people in the population increases, any growth in the gross domestic product (GDP) per worker may result in higher growth in GDP per capita; savings rate may go up as more people of working age also means more savers; and investments in human capital per child may increase because the number of child dependents per worker goes down. Hence, first, business environment needs to be improved to create incentives for investing larger domestic savings as well as foreign savings into economy, and creating more jobs by doing so. Second, the financial sector needs to be developed to provide intermediation of savings into investments. Third, sensible labor laws need to be put in place to encourage formal employment, including the laws on gender equality. And, fourth, social services such as health and education need to be expanded and strengthened to maximize benefits of higher investments in human capital per child.

As economist and Nobel Prize-winner Robert Solow once pointed out, “a list of ingredients is not a recipe” and for different countries recipes will be different – in a sense that the policy ingredients listed above plus standard population policy components will need to be mixed in various proportions, depending on specific circumstances. The good news is that the causality between fertility decline and acceleration of economic growth goes in both directions during the window of the demographic dividend. Once the demographic transition has started, the virtuous circle might well become self-sustaining.

**Figure 2: Young-age dependency ratios for selected high-growth countries**

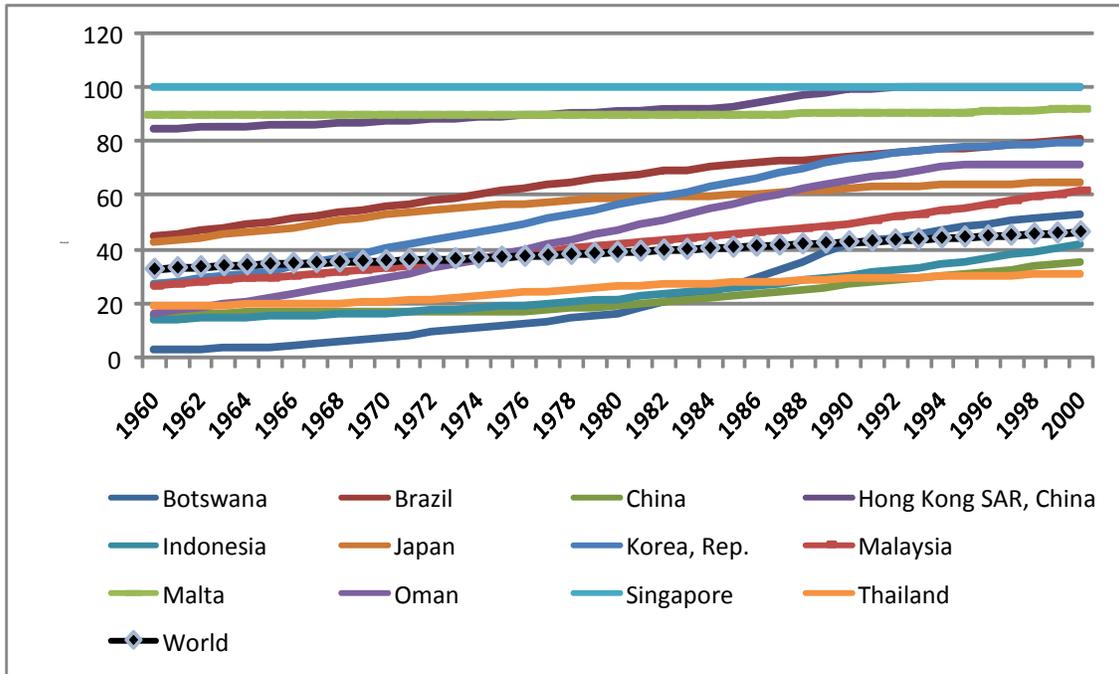


Source: UN World Population Prospects

1.9 ***Increasing population density, at least in certain parts of the country, also remains highly relevant for the economic growth, in particular when it helps to achieve higher levels of urbanization and is accompanied by investment in infrastructure.*** The World Bank’s World Development Report for 2009, “Reshaping Economic Geography”, found that higher density, together with rural-urban migration, creates higher urban agglomeration. No country has ever reached high income levels with low urbanization, which has two distinct economic advantages. First, as more people interact, there is more scope for innovation. Second, larger groups of population living in close proximity allow for economies of scale. Firms can produce goods in larger numbers at lower marginal costs and deliver them more cheaply, serving a larger number of customers.

1.10 ***In many cases demographic transition and accelerated urbanization work in synergy.*** Figure 3 shows dynamics of urbanization ratios (share of population living in urban areas) for the same set of countries. On the one hand, urbanization tends to accelerate when a large cohort born during the period of rapid decrease in infant mortality moves into the working age, since members of a large cohort who have fewer children are more likely to migrate to urban areas. On the other hand, as urbanization produces agglomeration effects, it amplifies the magnitude of the demographic dividend. Urbanization also tends to further reduce fertility, as in most countries fertility rates in urban areas are lower than in rural areas. ones This occurs in part because of different social norms in urban areas, leading among other things, to increased female labor participation in urban areas and access to education for women, translating into higher ages at marriage for urban women. To maximize its benefits, urbanization needs to be accompanied by effective urban planning and adequate investment in infrastructure.

**Figure 3: Shares of urban population for selected high-growth countries**



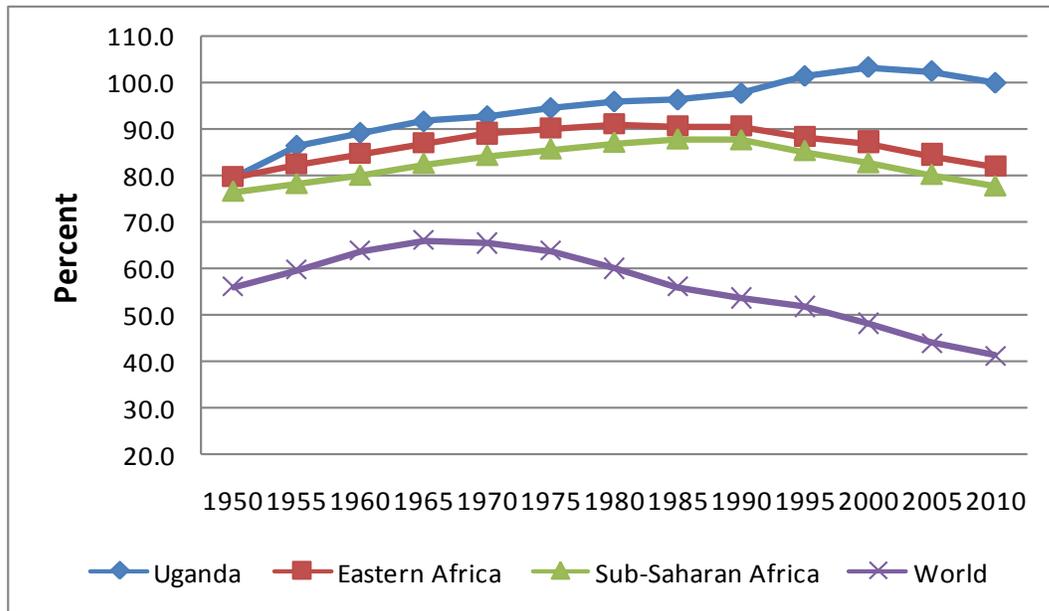
Source: World Development Indicators

1.11 *The remainder of this report is organized as follows.* Section 2 looks at the demographic trends in Uganda; and possible magnitude of demographic dividend in Uganda. Section 3 analyzes potential impact of various demographic scenarios on economic growth. Section 4 looks at the interactions between oil revenues, public expenditures, and social indicators under various demographic assumptions. Sections 5 and 6 analyze determinants of fertility and under-five mortality in Uganda, respectively. Section 7 discusses political leadership on population issues and the country's recent population policies. Section 8 discusses Uganda's population policies in the light of the report's analytical findings. Section 9 looks at institutional dimensions of population policies, and Section 10 concludes.

## 2. Demographic trends in Uganda: The past, the present, and the future

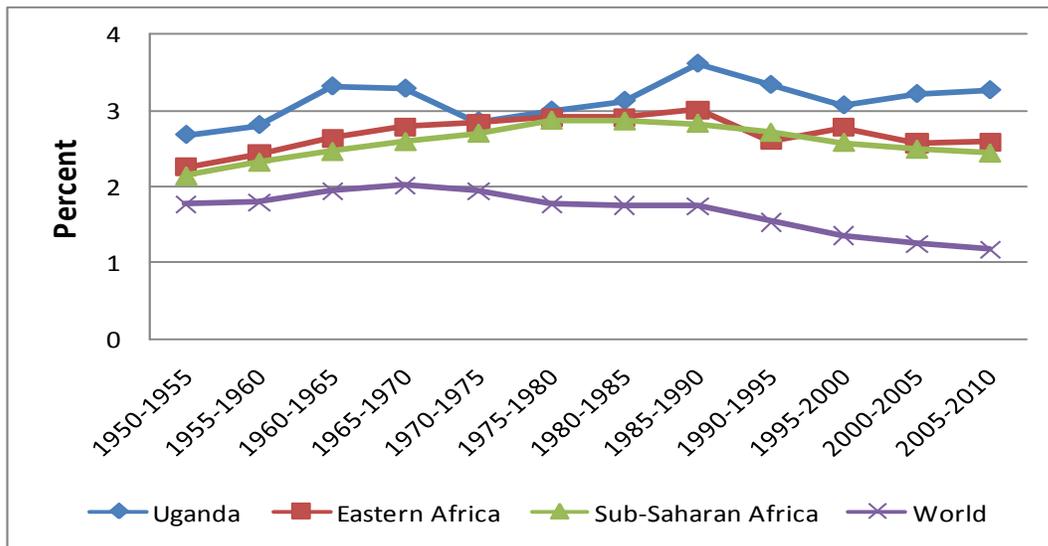
1.12 *Uganda has one of the youngest and most rapidly growing populations in the world.* With a total fertility rate (TFR) of 6.7 according to the government's data and 6.4 according to the UN data, about half (48.7 percent) of Uganda's population is younger than 15, well above Sub-Saharan Africa's average of 43.2 percent. This brings a very high youth dependency ratio (see Figure 4). The country's population growth rate, currently at 3.3 percent, has been steadily well above Africa's average, except for the period of peak prevalence in HIV/AIDS in early 2000s (see Figure 5).

**Figure 4: Youth dependency ratios**



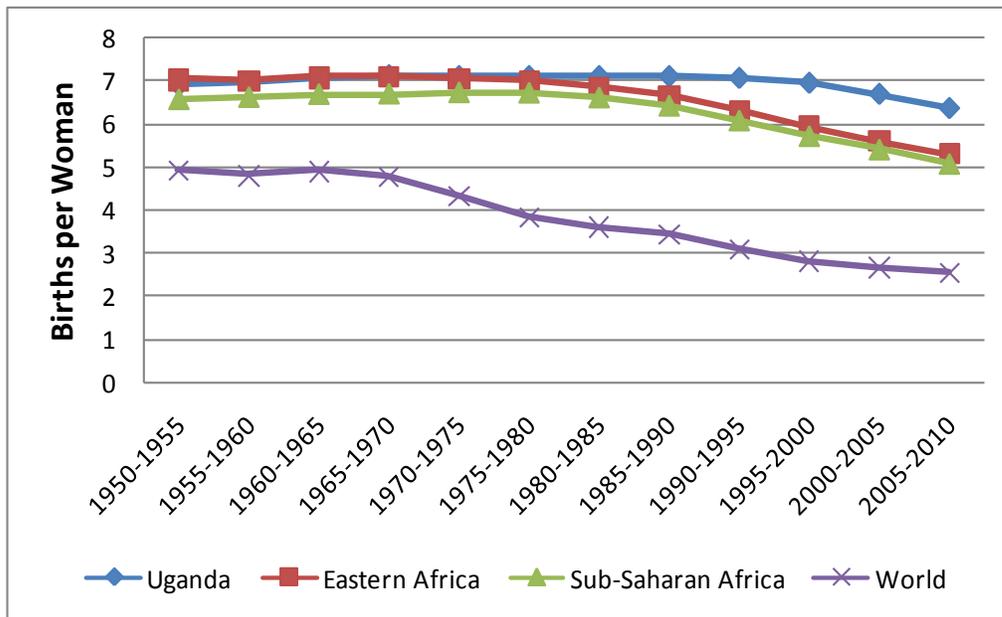
Source: UN World Population Prospects

**Figure 5: Population growth rates**



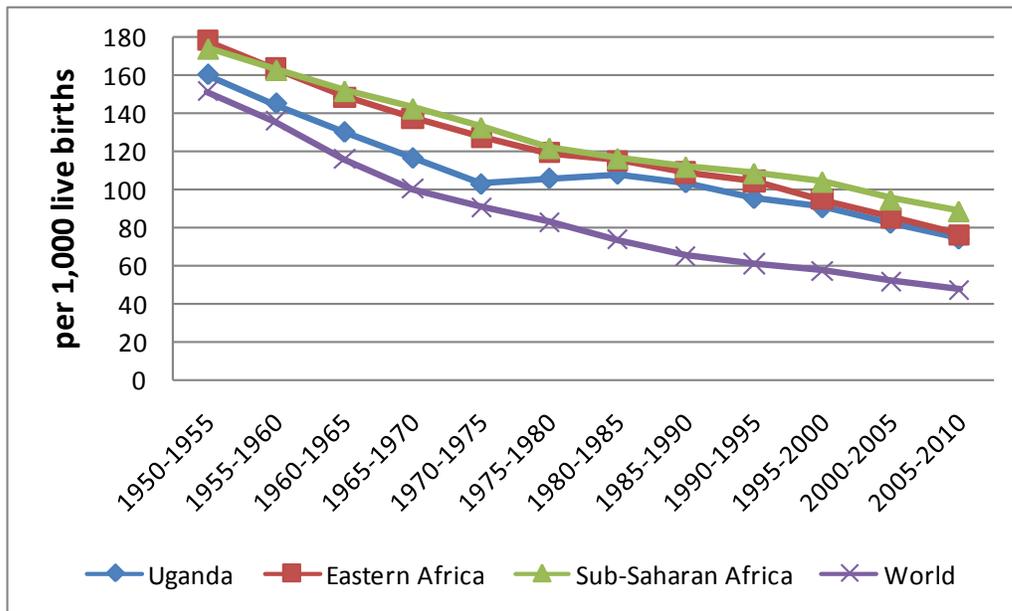
Source: UN World Population Prospects

Figure 6: Total fertility rates



Source: UN World Population Prospects

Figure 7: Infant mortality rates



Source: UN World Population Prospects

1.13 *In part, high fertility in Uganda can be explained by high infant mortality, although this is not the only cause.* While over the last two decades fertility has been declining in Uganda, the pace of this decline has fallen behind that in other comparable countries (see Figure 6). Infant mortality rate remains high (76 deaths per 1,000 live births); in 1950s – early 1970s Uganda used to have an infant mortality rate well below the continent’s average, but during the period of political turbulence which followed and high prevalence of HIV/AIDS, it converged to Africa’s (declining but still very high)

average rate (see Figure 7). At the same time, recent surveys indicate that average number of children per household is still about 1.5 points above the average desired number of children, and that unmet demand for contraceptives is one cause of this situation (UBOS, 2006).

**1.14 *Uganda’s population is likely to continue growing fast over the next forty years even if fertility declines, especially as life expectancy at birth should continue to rise.*** A young age structure fuels additional population growth, a phenomenon called the population momentum. The United Nations developed four scenarios for future demographic developments in Uganda as a part of its World Population Prospects project. All four scenarios assume that the life expectancy will increase from 52 years in 2007 to 68 years in 2050. In the medium fertility scenario the assumptions are essentially that all countries will converge towards a level of 1.85 children per woman in the long term. In the case of Uganda this results in a projected TFR decreasing to 2.62 in 2050. In the high-fertility scenario the TFR is assumed to be 0.5 higher than in the medium variant for most of the period and in the low-fertility variant 0.5 lower than in the medium variant. For Uganda this means TFRs of 3.12 and 2.12, respectively, in 2050. Finally, the constant-fertility scenario implies a substantially higher fertility than any of the other scenarios – a TFR of 6.39. For Uganda, therefore, this is a “very high fertility” scenario. In all four scenarios, Uganda’s population will continue to grow. As Figure 8 shows, by 2050 the total population will be in a range between 80.6 million (low fertility scenario) and 152.2 million (constant fertility scenario). Even in the low-fertility scenario, Uganda’s population growth rate in 2050 (1.7 percent) will still be above the world’s population growth rate today (1.2 percent).

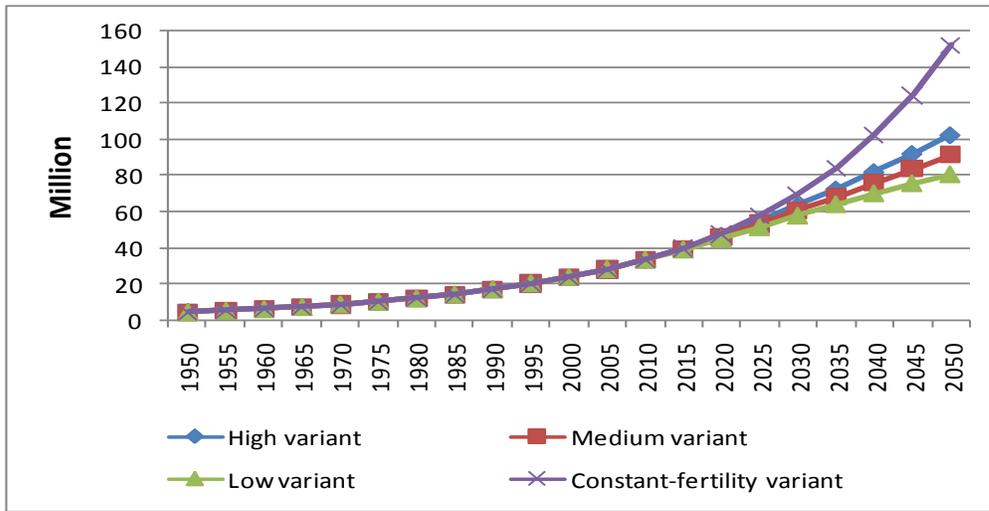
**1.15 *Population density will be also rapidly increasing, and in all the probability economic growth in the country will not be constrained by insufficient density.*** Figure 9 shows that within the next 5 years it will become higher than Western Europe, and over the next several decades it will be approaching that of India even if the total fertility rate is much reduced. This suggests that Uganda can potentially benefit simultaneously from the demographic dividend and advantages of high population density. These benefits however are not automatic, and they will require proper provision of social services and infrastructure.<sup>3</sup>

**1.16 *Median age in these scenarios is inversely related to the TFR and population size.*** The lower the fertility, the smaller will be the population, and the older will be the median Ugandan. By 2050, the difference in the median age between low fertility and constant fertility scenarios will be as large as 11 years – 26.5 years vs. 15.5 years (see Figure 10).

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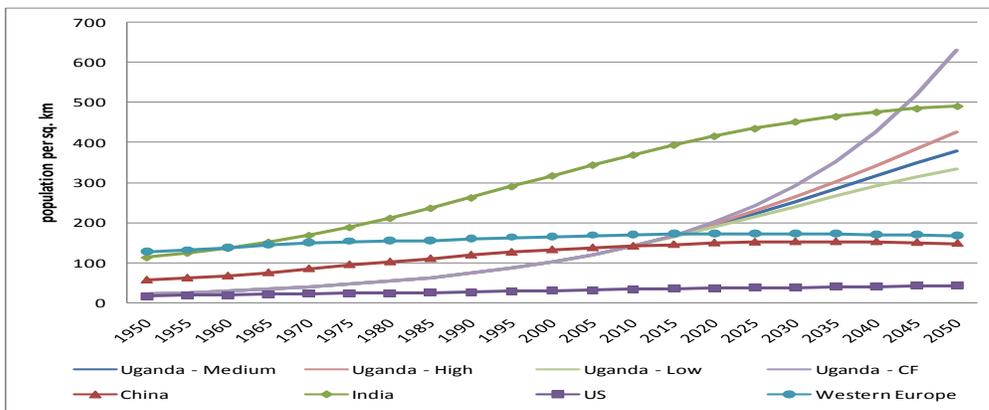
<sup>3</sup> Please see also forthcoming policy notes on inclusive growth in Uganda

**Figure 8: Population of Uganda, 1950 – 2050**



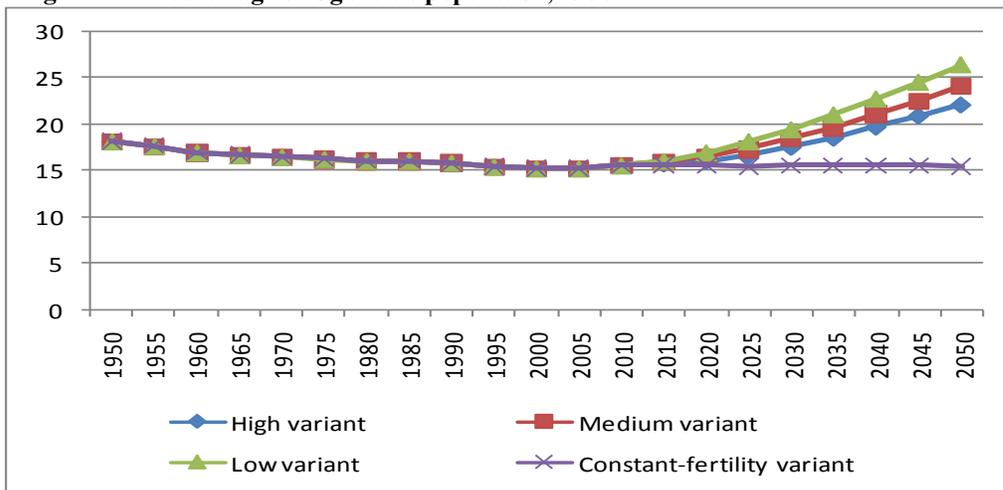
Source: UN World Population Prospects

**Figure 9: Population density in selected countries, 1950 – 2050 (UN medium scenario unless otherwise noted)**



Source: UN World Population Prospects

**Figure 10: Median age of Uganda's population, 1950 - 2050**



Source: UN World Population Prospects

1.17 The median age dynamics is a consequence of the demographic transition; it makes it much easier for the economy to grow when the increasing majority of population is working-age adults, compared to when most of the population are children.

### 3. Simulations of the impact of demographic scenarios on economic growth

1.18 *The impact of demographic variables on income per capita levels in Uganda was estimated using a demographic-economic model and historical data from 108 countries.* The model is based on Lindh and Malmberg (2007) and is described in Box 2 (Annex 1 also reports the detailed results of its estimation). The model includes a number of demographic variables, such as life expectancy at birth and shares of different age groups in the population, and allows for some systematic country heterogeneity as well as for time-specific effects. The global sample of countries was divided into two subsamples of countries in which growth was higher or lower than predicted by the model (dubbed “over-performing” and “underperforming” countries, respectively). Parameters of the model were estimated for these two subsamples, as well as for the full sample (see Annex 2). They were then used to project possible growth scenarios (optimistic, pessimistic, and baseline, respectively) by applying the model first to the data on Uganda’s demography in the past, and then to the UN Population Division’s World Population Projections for Uganda.

#### Box 2: The demographically based forecasting model for GDP

The demographically based forecasting model for GDP builds on the work of Lindh and Malmberg (2007). The model includes a number of demographic variables and allows for some systematic country heterogeneity as well as for time-specific effects. With the notation  $y$  for GDP per capita,  $e_0$  for life expectancy at birth, and  $a$  for an age group’s share in the population, the regression equation has been specified as

$$y_{it} = \alpha \log e_{0it} + \sum_{k=0-14}^{65+} (\beta_k + \gamma_k \log e_{0it}) a_{kit} + \eta_i + \nu_t + \varepsilon_{it}$$

The interaction terms allow for changing age-share coefficients contingent on how far the demographic transition has progressed. The  $\eta_i$  and  $\nu_t$  account for country- and time-specific effects. The subdivision into age groups is as follows: children 0–14 years old, young adults 15–29 years old, mature adults 30–49 years old, middle-aged adults 50–64 years old, and old dependents 65 years and older.

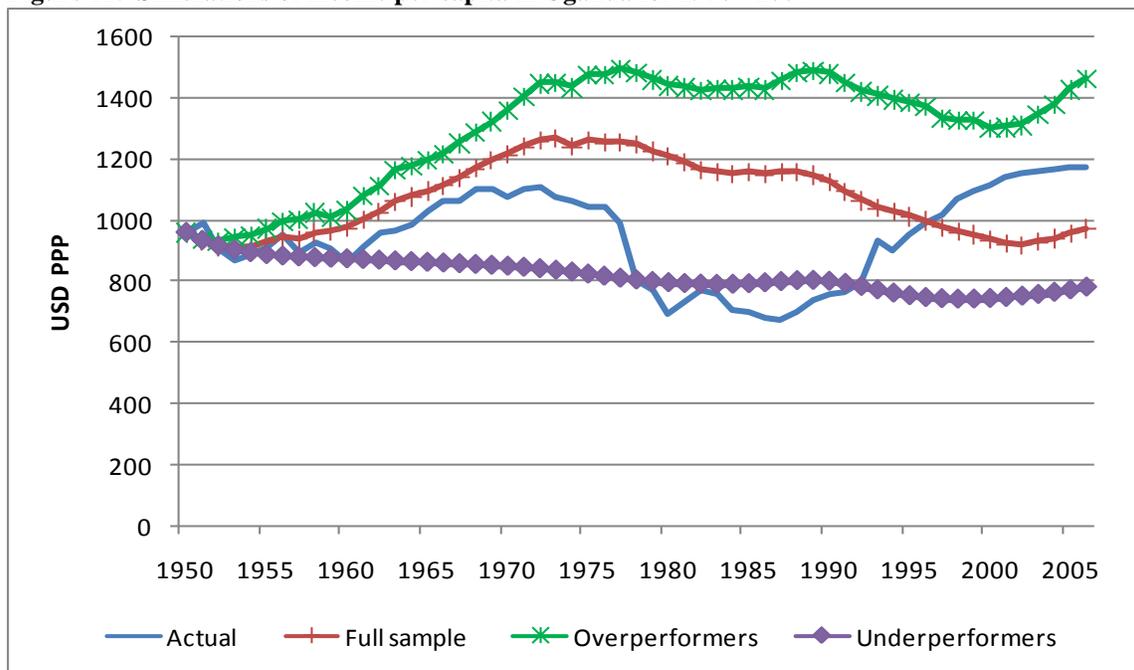
Following Kelley and Schmidt (2005), life expectancy is included to capture human capital effects. Increases in life expectancy and years of schooling are mutually reinforcing (longer life span encourages greater investment in education, and the other way around), and in many countries the relationship between them nearly linear.<sup>1</sup> By controlling for country-specific effects some country heterogeneity is allowed for, specifically that which could be accounted for by omitted variables remaining constant over the estimation period. Further, controlling for time-specificity allows for influences in time which are the same for the whole sample, such as the world business cycle, world market price fluctuations, and so forth.<sup>1</sup>

The model was first estimated on a world sample including 111 countries with sufficiently long time series (minimum 25 years) for annual purchasing power parity GDP. Panel estimation with fixed country and time effects was used, with the level of GDP per capita as the dependent variable. The sample has then been subdivided into underperforming countries and over performing countries according to whether their growth rates were lower or higher, respectively, than the growth rate predicted by the model. This

1.19 *The model predicts past income per capita trends in Uganda reasonably well.* Figure 11 shows projections of income per capita for the period 1950-2007 as well as actual data for this variable. From 1950 to early 1970s, income per capita in Uganda was reasonably close to that predicted by the model with parameters estimated based on the full global sample; from mid-1970s through 1980s the country income per capita was close to that projected by the model estimated based on the underperformers sample, and in 1990s – early 2000s Uganda was rapidly converging toward the sample of “over-performers”. Importantly, however, all three variants of projections imply that for a large portion of this simulations’ period Uganda’s income per capita should have remained nearly flat – because of its demography.

1.20 *The model was then applied to the demographic projections to look at the possible impact of demographic trends on income levels in the future.* It should be noted that the results of these simulations should not be interpreted in an excessively deterministic way: as discussed in the Section 1, the magnitude of the demographic dividend will much depend on the country’s policy framework. The assumption behind the simulations is that Uganda’s economic growth will benefit from the demographic changes as much as the countries comprising the sample used for estimation of the model would benefit on average from the same change in their demographics.

**Figure 11: Simulations of income per capita in Uganda for 1950 - 2007**

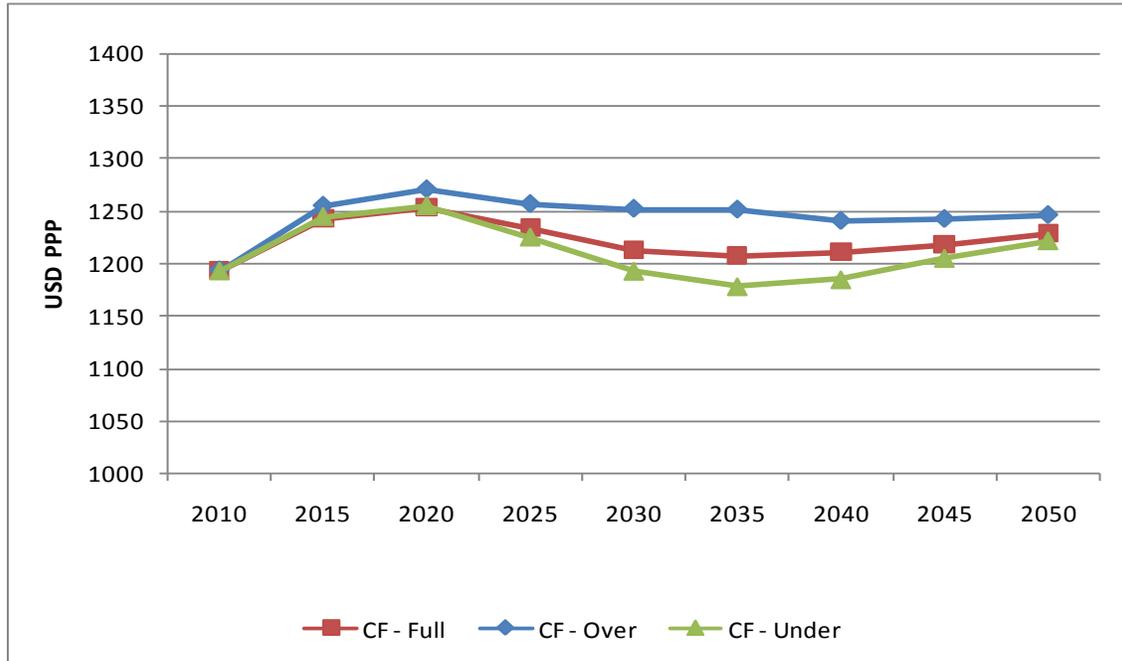


Source: Penn Tables and WB staff calculations

1.21 *The simulations for the period 2010 – 2050 suggest that if fertility remains constant, the future is likely to look similar to the past.* Figure 11 reports simulations results for the UN’s constant fertility scenarios obtained using parameters based on the full, over-performing, and underperforming samples. It looks remarkably similar to the Figure 12: the income per capita changes relatively little in all three versions.

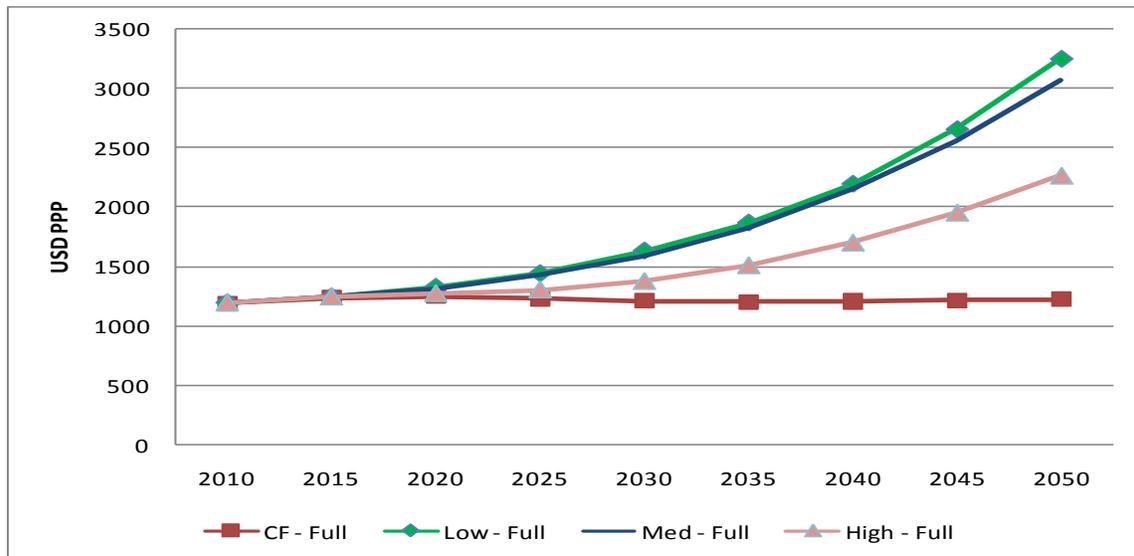
1.22 *The future starts to look much brighter under assumptions of demographic change.* Figure 13 reports baseline simulations for four UN demographic scenarios, all produced using the model estimated based on the full sample. In a “High fertility” scenario, Uganda’s income per capital roughly doubles by 2050, and for the “Medium fertility” and “Low fertility” scenarios, it nearly triples.

**Figure 12: Simulations of income per capita in Uganda for 2010-2050 (constant fertility)**



Source: WB staff calculations

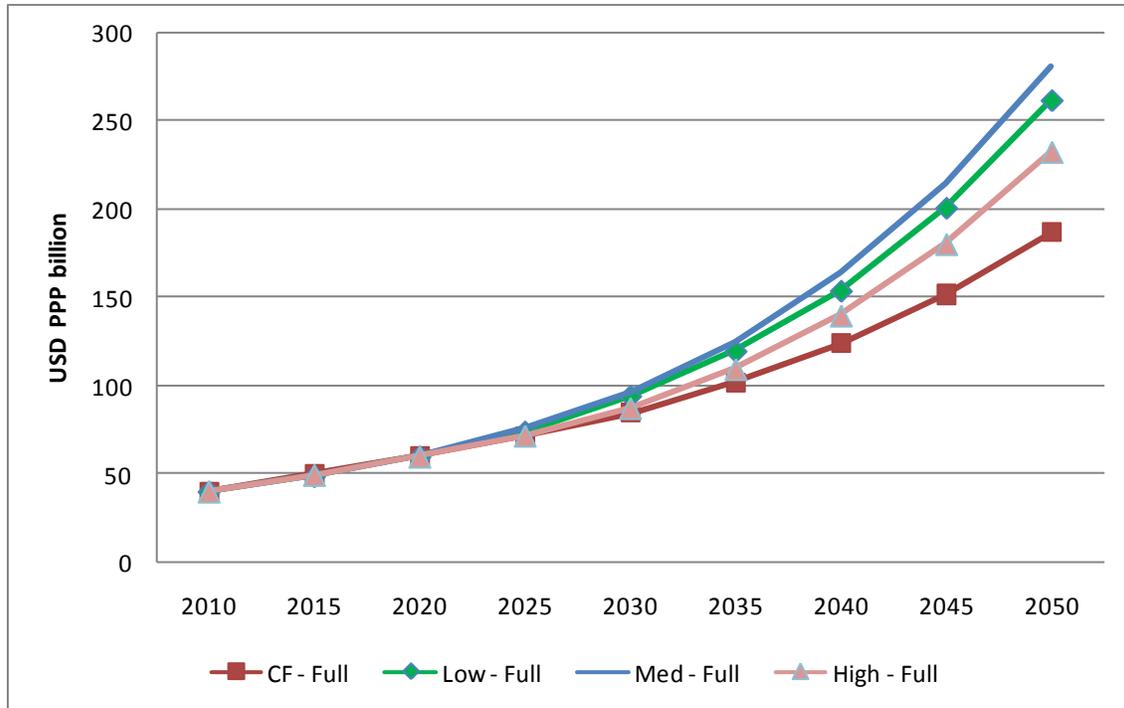
**Figure 13: Simulations of income per capita in Uganda for 2010-2050 (various fertility scenarios)**



Source: WB staff calculations

1.23 *Remarkably, low and medium fertility scenarios result not only in much higher incomes per capita, but also in much larger economies, despite smaller populations.* Figure 14 reports Uganda’s GDP for the period of simulations for all scenarios.

Figure 14: Simulated GDP for Uganda for 2010-2050 (various fertility scenarios)



Source: WB staff calculations

#### 4. Demography, oil revenues, public expenditures, and social indicators

1.24 *This section discusses how reducing the fertility per working-age individual may help Uganda to transform its oil wealth into a more balanced combination of human and physical capital.* This more balanced combination results from reducing trade-offs between investment in human capital and infrastructure. More specifically, reduction fertility will allow to achieve better human development outcomes while at the same time producing improvements in fiscal space (and increase in private resources) sufficient for substantially increasing investments in the critically important infrastructure.

1.25 *For this analysis we use a dynamic Computable General Equilibrium model MAMS (Maquette for MDG Simulations).* This model has been developed by the World Bank for analysis of the Millennium Development Goals (MDGs) and poverty-reduction strategies, and specifically adapted to the Ugandan context. One key feature of MAMS is its detailed modules describing the social sectors, which have been carefully tested and calibrated using Ugandan data. The MAMS model is already well embedded in Ugandan policymaking (in particular, it was extensively used by the Ministry of Finance, Planning, and Economic Development during the preparation of the National Development Plan).

1.26 *The simulations are intended to complement econometric analysis from Section 3 (which is limited to GDP and population data).* They allow analyzing what the demographic scenarios may imply in terms of a wider range of economic and social indicators during the period of oil extraction in Uganda. The connection between the simulations reported in the Section 3 and the analysis presented in this section is as follows: for each scenario, the MAMS model is calibrated in such a way that average annual GDP growth rate for the period 2010-2050 is equal to that obtained in the Section 3 using econometric model based on the full global sample of 111 countries. Roughly speaking, this means that evolution of economic policies and institutions in Uganda is assumed to bring about productivity changes similar to the world averages. Otherwise, this approach is methodologically different from an econometric analysis in the Section 3. The structure of the MAMS model is described in the Box 3.

**Box 3: Structure of the MAMS model**

The factors of production in the MAMS model include labor, capital, and land. There are three types of labor: those with less than completed secondary education (unskilled), with completed secondary education but incomplete tertiary (semi-skilled), and with complete tertiary (skilled). Each of these labor types is linked directly to the education sectors/cycles, and thus the growth in the labor force will in part depend on the functioning of the education system in the model. The remaining factors of production are a private capital stock, public capital stocks (disaggregated by government functions), and agricultural land.

The model includes a detailed government sector bloc. The government sector is disaggregated into 9 functions: three types of education (primary, secondary, and tertiary cycles), health, water-sanitation, agriculture, roads, family planning, and other government services. Like other production activities, these government sectors use production factors and intermediate inputs to produce an activity-specific output (in the case of the government this means different types of services). The private sector is divided into agriculture, industry, transportation, and other private services. The government finances its activities from domestic taxes, domestic borrowing, and foreign aid (borrowing and grants). The provision of education, health, and water-sanitation services contribute directly to the MDGs. Growth in the stocks of public agricultural and infrastructure capital stocks contributes to overall growth by adding to the productivity of other production activities.

The MDGs are covered in an additional set of the model's functions. These functions link the level of each MDG indicator to a set of determinants. The determinants include the delivery of relevant services (in education, health, and water-sanitation) and other indicators, also allowing for the presence of synergies between MDGs, i.e., the fact that achievements in terms of one MDG can have an impact on other MDGs. Outside education, service delivery for other MDGs is expressed relative to the size of the population. In education, the model tracks base-year stocks of students and new entrants through the different grades of the three cycles. In each year, students will successfully complete their grade, repeat it, or drop out of their cycle. Student performance depends on educational quality (quantity of services per student), household welfare (measured by per-capita household consumption), the level of road infrastructure, wage incentives (expressed as the ratio between the wages for labor at the next higher and current levels of education for the student in question, an indicator of payoff from continued education), and health status. There is also a built-in poverty module.

Demographic variables in this model thus influence economic and social developments through several channels. These include: (a) the size of the labor force, which depends on the size of the population in labor force age (15-64 years) and the labor force participation rate; (b) the demand for education services, which depends on the size of the population in the cohort in the official starting age for primary education; (c) services contributing to MDG and education outcomes are measured on a per-capita or per-student basis, and health services are also influenced by the age distribution of the population; and (d) household savings rates are negatively related to the youth and elderly dependency ratios.

1.27 *Assumptions on public finances in the model reflect forthcoming revenues from export of oil.* On the government receipt side, the government budget is assumed to receive foreign exchange earnings from oil starting from 2011 with gradual increases up to 2024 when a peak is reached, followed by a gradual decline up to 2045 when oil revenues come to an end. Grant aid is assumed to remain constant in real foreign currency terms (thus likely declining as a share of GDP). Otherwise, the government is assumed to maintain unchanged revenue-raising policies, and to permit public consumption and investment (across the board) to grow within fiscal limits.<sup>4</sup>

1.28 *The simulations results show that the demographic transition from high mortality and high fertility to low mortality to low fertility affects the fiscal space in a major way during Uganda's oil era.* Table 1 reports annual growth in per capita expenditures on real government services under different demographic scenarios. Shift from the constant fertility to medium fertility scenario helps to more than double per capita growth in all categories, dramatically improving fiscal space. Figures 15 and 16 illustrate this improvement by showing the dynamics of total expenditures (both current and capital) on education and roads for the period 2009 – 2050 under constant fertility and medium fertility scenarios. Under the medium fertility scenario, by 2050 annual expenditures on education increase by more than 11 times, and annual expenditures on roads increase more than 7 times compared to their 2009 levels; and both types of expenditures are 60 percent higher than they would have been in 2050 under the constant fertility scenario (of course, on a per capita basis the difference is much larger, since population growth is much more rapid under the latter scenario).

1.29 **This would help Uganda to much increase impact of the oil extraction on its social outcomes as exemplified by MDG indicators.** As shown in the Table 2, poverty rates at \$2 and \$1.25 (in purchasing power parity) are projected to increase by 2050 if fertility remains constant, but fall by about 30 and about 25 percentage points, respectively, under the medium fertility scenario. Difference in other MDG outcomes is similarly dramatic.

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<sup>4</sup> Government's foreign and domestic borrowing is set so as to keep foreign and domestic debt stocks roughly unchanged relative to GDP. Effective rates of import tariffs are unchanged over time. Domestic tax rates (direct and indirect) are scaled to ensure that the government stays within the limits of available fiscal space. On the spending side, government service consumption (disaggregated by function), investments in infrastructure (split into roads and agriculture), and domestic government transfers are exogenous shares of absorption (total domestic final demand); this means that government spending on these items will be adjusted in response to changes in GDP growth, the trade balance, and terms of trade changes. The private sector benefits, across the board, from the productivity gains that stem from increased investments in public infrastructure.

**Table 1: Average annual per capita growth rates of the real government services by simulation, 2010-2050 (percent)**

	High	Medium	Low	Constant
Primary education*	3.7	4.4	4.9	1.3
Secondary education*	3.4	4.0	4.4	1.6
Tertiary education*	3.1	3.6	3.9	1.6
Health	2.8	3.2	3.5	1.1
Water	2.8	3.2	3.5	1.1
Agriculture	3.0	3.5	3.7	1.3
Roads	3.5	4.0	4.3	1.8
Other	2.6	3.1	3.3	0.9
Total	2.8	3.2	3.5	1.1

\*Growth per capita with population represented by those in the official age of the cycle

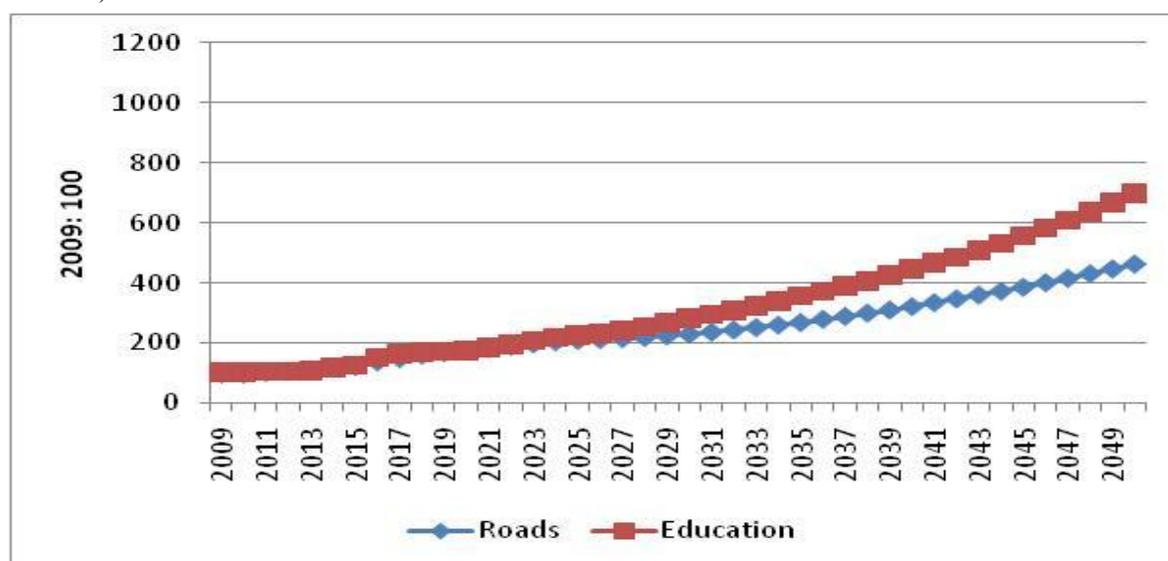
Source: World Bank staff calculations

**Table 2: Welfare and MDG indicators by simulation for various scenarios in 2050**

	High	Medium	Low	Constant
Household consumption per capita ( <i>index, 2009 = 100</i> )	167.2	210.4	222.1	86.3
MDG 1: Headcount poverty at \$2 a day (PPP) ( percent)	47.9	37.3	35.3	75.8
MDG 1: Headcount poverty at \$1.25 a day (PPP) ( percent)	24.0	16.4	15.1	51.9
MDG 2: Primary on-time completion ( percent)	77.5	90.2	94.0	27.3
MDG 4: Under-five mortality (%)	53.0	47.4	45.9	89.4
MDG 7: Improved water access ( percent)	83.8	88.0	89.3	71.2

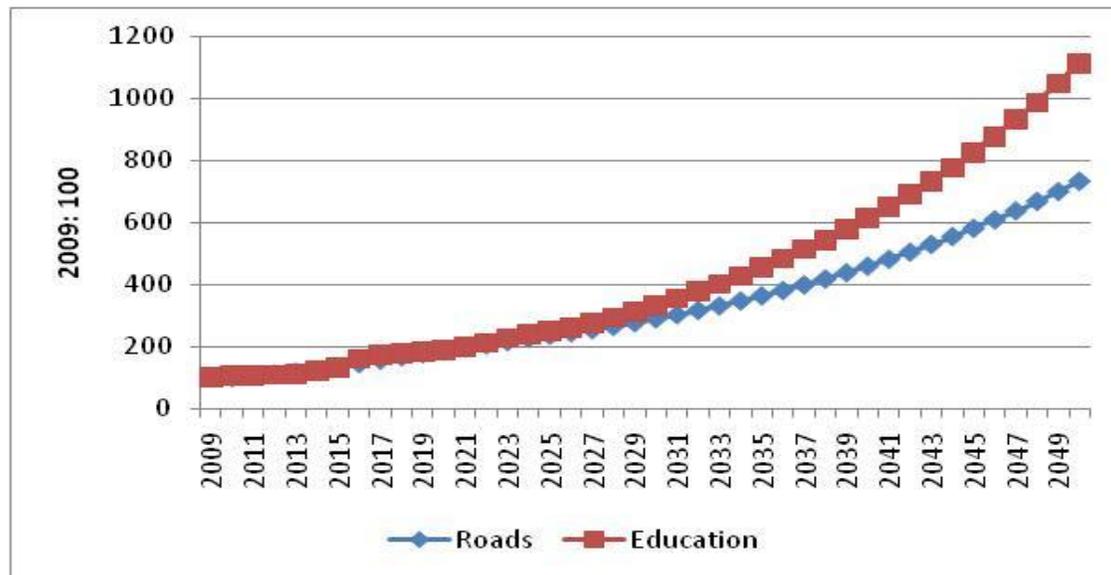
Source: World Bank staff calculations

**Figure 15: Public expenditures on roads and education by simulation under constant fertility scenario, 2009-2050**



Source: World Bank staff calculations

**Figure 16: Public expenditures on roads and education by simulation under medium fertility scenario, 2009-2050**



Source: World Bank staff calculations

## 5. Determinants of fertility

1.30 *This section discusses the results of econometric analysis of determinants of fertility and illustrates them with the figures presenting some aggregate data.* The econometric analysis (see Annex 3 for the complete results) helps to uncover what determines the total number of children a woman in Uganda has had till 2006, when women were interviewed in the 2006 Ugandan Demographic and Health Survey (DHS), as well as the determinants of having given birth at least once in the five years prior to the interview. The analysis controls for factors that have been found to affect fertility in other literature and further separates the total sample depending on region of residence (rural versus urban). In every figure shown in this section, each point represents one of Uganda's nine regions (Central 1, Central 2, Kampala, East Central, Eastern, Northern, West Nile, Western, and Southwest<sup>5</sup>).

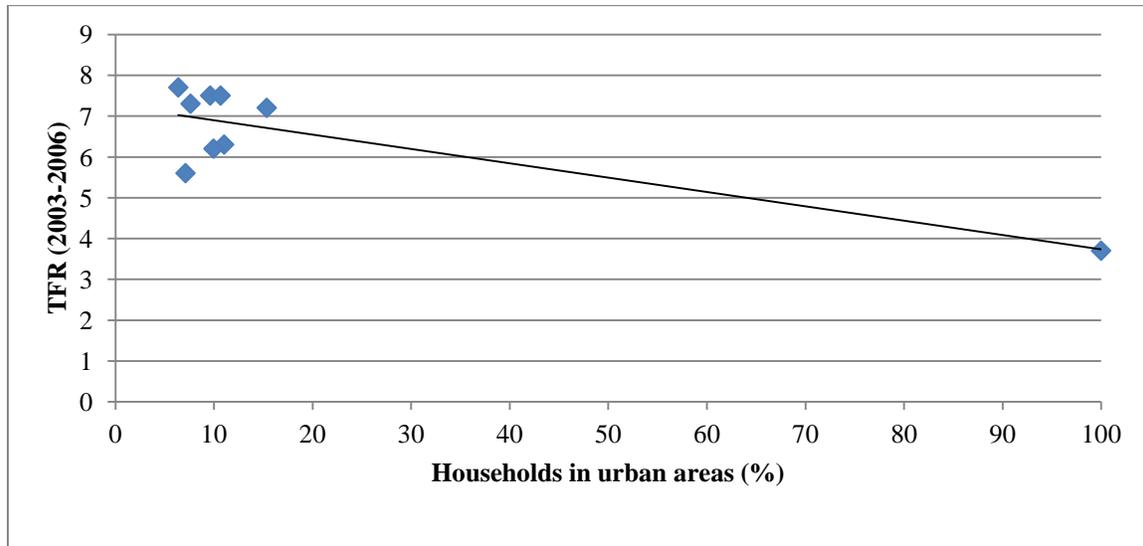
1.31 *Fertility in urban areas – and especially in Kampala – is lower, and actual number of children is closer to the desired one.* Other things being equal, Ugandan women in the rural areas have given birth to a larger number of children than similar women in cities or towns. Other things being equal<sup>6</sup>, rural women are also 5 percent more likely to have given birth at least once in the five years previous to the survey. Figure 17 depicts this relationship graphically. Although the mean desired (ideal) number of children for Ugandan women (as determined by the answers to the question posed in the DHS) is still relatively high (five children), total fertility rates are significantly higher than this desired number; it is only in Kampala where the mean desired number (3.7) coincides with the real one (see Figure 18). In the Southwest and

<sup>5</sup> Please find the name of the districts included in each region in page 21 (Appendix 1) of this note.

<sup>6</sup> In this case, we are comparing women with average values in age, education, marital status, wealth quintile, etc., who only differ in their place of residence.

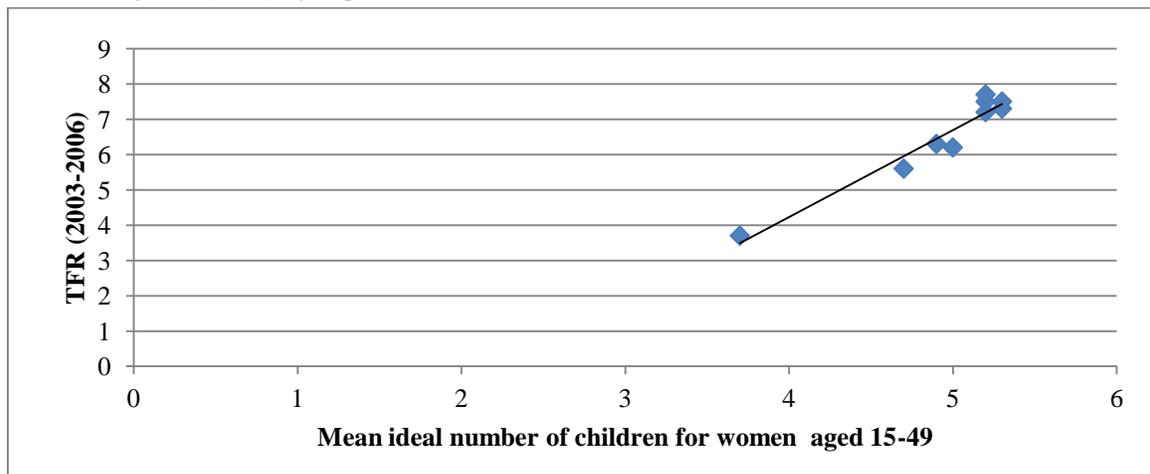
Central (1 and 2) regions, actual fertility exceeds desired fertility by one child, whilst in all other regions the difference increases to more than two children. An urban community can be a large city (such as Kampala), a small city or even a town; but it is evident that a town in a region other than Kampala cannot be compared to the capital city. Therefore, a level of urbanization similar to that of Kampala<sup>7</sup> may be needed to yield an important effect on fertility.

**Figure 17: Correlation between the percentage of households residing in urban areas and the total fertility rate (TFR) by region**



Source: Ugandan Demography and Health Survey 2006

**Figure 18: Correlation between the mean ideal number of children for women aged 15-49 and the total fertility rate (TFR) by region**

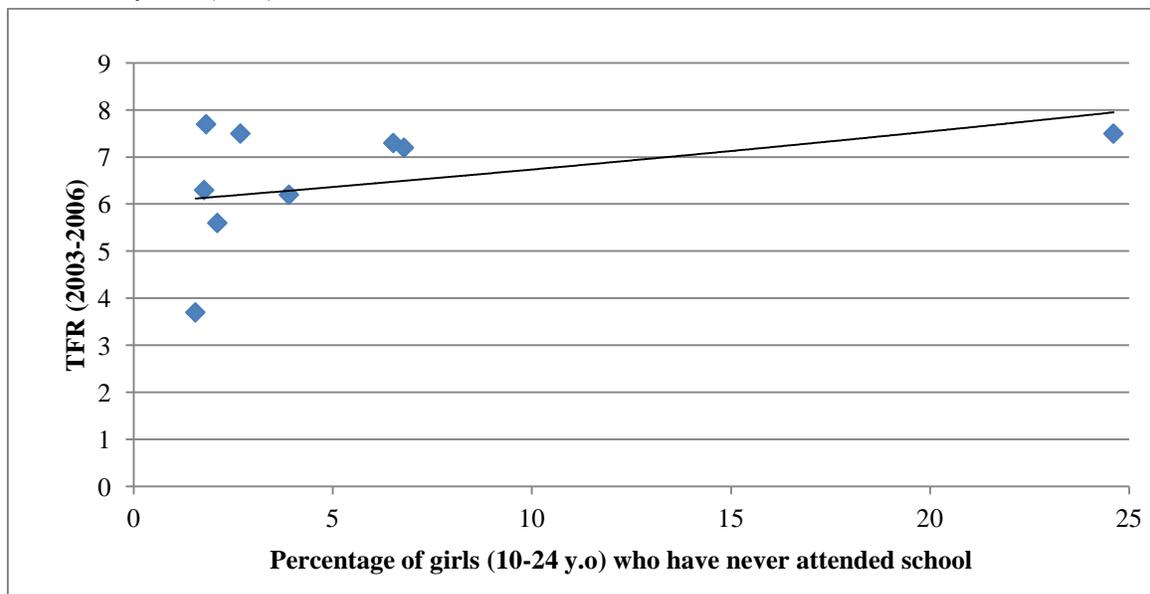


Source: Ugandan Demography and Health Survey 2006

<sup>7</sup> Also, Kampala region differs from the other regions not only in its level of urbanization but in its high level of electrification, education, etc. All these factors are combined to yield the relatively low total fertility rate that the Kampala region has. Still, note that the econometric analysis controls for all these factors (electrification, education, urbanization, etc.) and each of them turns out to have, individually, a negative and significant effect on fertility.

1.32 *Education is a significant predictor of fertility, but the relationship is rather complex.* Women who have at least completed primary school have given birth to fewer children than similar women with no education. To the contrary, having a few years of primary education has no effect on the total number of children born. This holds for women residing in the rural areas as well as those in urban areas. Figure 19 shows that the higher the percentage of girls aged 10 to 24 who have never attended school, the higher the total fertility rate. The situation in the Northern region, where almost a quarter of the girls in that age interval have never gone to school, constitutes an aberration<sup>8</sup>. Figure 20 plots the percentage of girls who dropped out from O-level<sup>9</sup> (senior 1 to senior 4) in 2005 and the total fertility rate, showing that the higher the percentage of drop-out girls, the higher the total fertility rate. It is these girls which need to be kept at school in order to delay marriage and the onset of childbearing.

**Figure 19: Correlation between the percentage of girls 10-24 who have never attended school and the total fertility rate (TFR)**

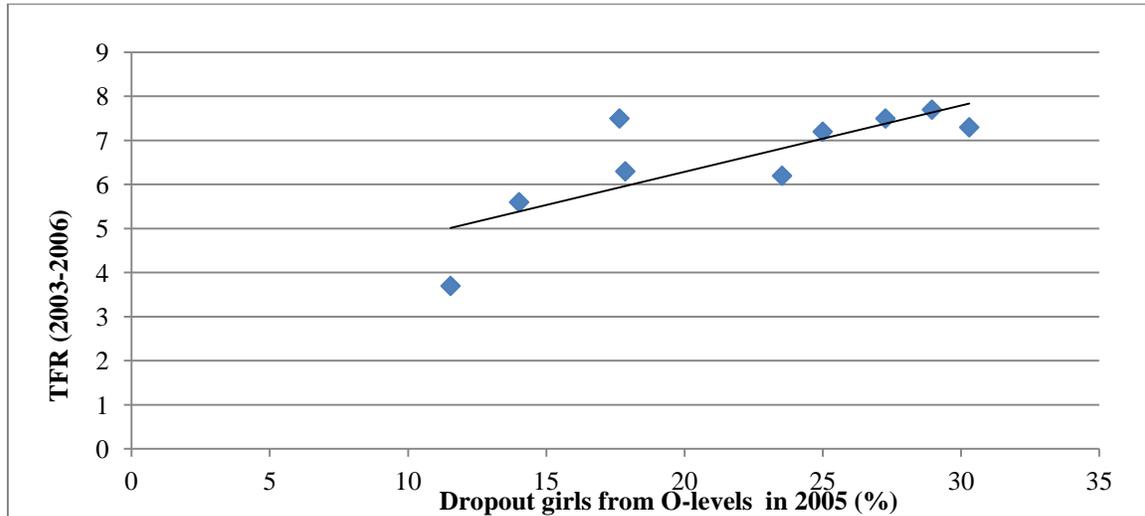


Source: Ugandan Demography and Health Survey 2006

<sup>8</sup> Excluding this data point reduces the strength of the relationship, although it would still be positive.

<sup>9</sup> Only the school grades S1 to S4 were included because in most regions, the number of girls studying at A-levels was just a handful, and many of them did not continue studying. So for instance in one region there were only two such girls and one of them dropped out, such that we were getting drop-out rates of 50 percent. Furthermore, in other regions there was no one studying at A-levels, so the drop-out rate could not be assessed. This may partially be due to the fact that in rural localities there is often only one secondary school, which is only able to offer education up to O-levels (see <http://www.guardian.co.uk/katine/2010/feb/08/education-system-explainer>).

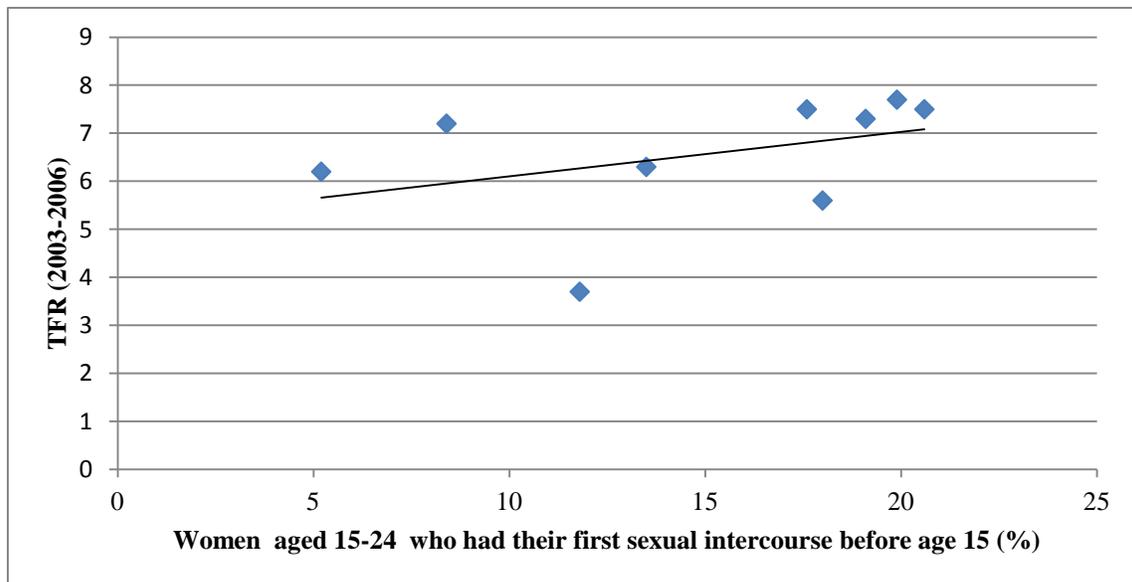
**Figure 20: Correlation between the percentage of drop-out girls from O-levels and the total fertility rate (TFR)**



Source: Ugandan Demography and Health Survey 2006

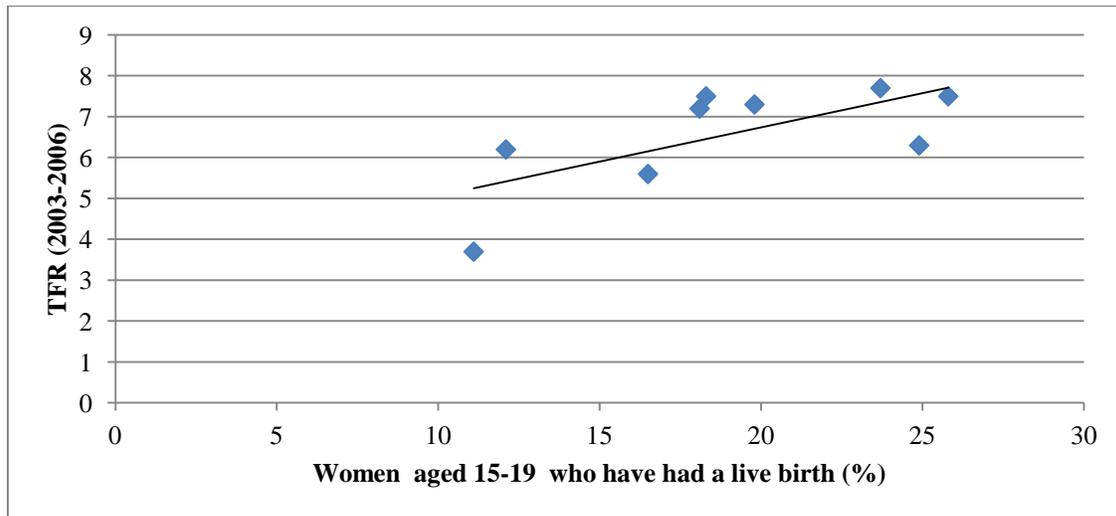
1.33 ***A five year increase in the age at the first sexual intercourse decreases the total number of births by almost one child, ceteris paribus.*** Note that this is a lower boundary as the value of the corresponding variable in econometric analysis was set to the current age for women who have not yet had sex. Figure 21 shows correlation between the percentages of women 15-24 who had their first sexual intercourse before age 15 and the total fertility rate, and Figure 22 shows correlation between the percentage of women 15-19 who have had a live birth and the total fertility rate (TFR) by region. Both of these correlations are strongly positive.

**Figure 21: Correlation between the percentage of women 15-24 who had their first sexual intercourse before age 15 and the total fertility rate (TFR)**



Source: Ugandan Demography and Health Survey 2006

**Figure 22: Correlation between the percentage of women 15-19 who have had a live birth and the total fertility rate (TFR) by region**

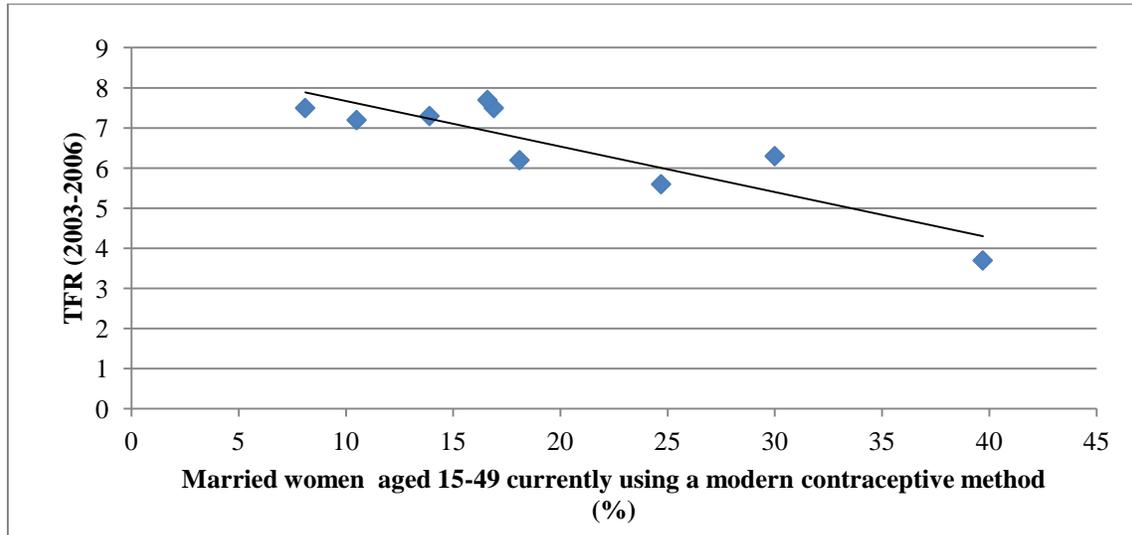


Source: Ugandan Demography and Health Survey 2006

1.34 ***Unmet need for family planning makes a significant impact on fertility.*** Women with an unmet need for family planning are defined as those who indicate that they either want no more children or want to wait for at least two years before having another child but are not using contraception. According to the 2006 Demographic and Health Survey (DHS), unmet need in Uganda is estimated at 41 percent. Moreover, desired fertility is lower among women than among men. Given the definition of unmet need for family planning, and other things being equal, women with such an unmet need have about one child more than similar women who are using contraceptives, are trying to get pregnant, cannot get pregnant since they are amenorrheic, sterile, etc., or are abstaining. These women are also 23 percent more likely to have given birth in the last five years. Unmet need for family planning might be related to insufficient supply of family planning services, but it could also be that women do not trust the methods or that their partner does not approve the use of contraceptives, etc.

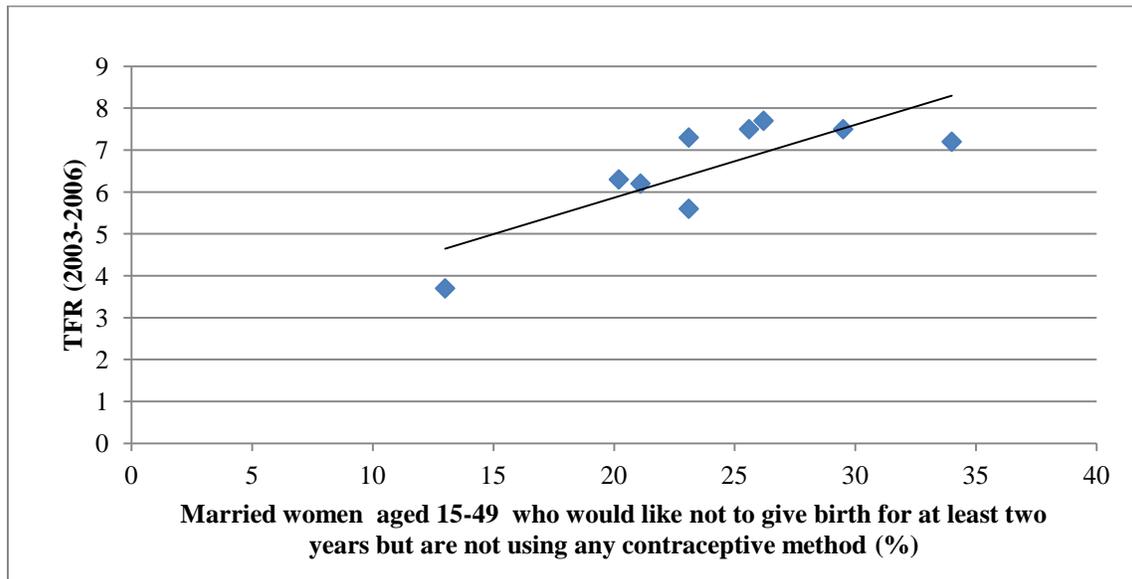
1.35 ***Increasing the contraceptive prevalence rate is crucial for decreasing fertility, and this can to a large extent be achieved by tapping into the unmet needs for family planning.*** Figure 23 shows that there is a negative relationship between the percentage of fertile-aged married women who were using a contraceptive method in 2006 and the total fertility rate observed between 2003 and 2006. Kampala is the region that displays the largest modern contraceptive use among married women (40 percent) along with the lowest TFR. Figure 9 and 10 show that this is also in that region where the lowest unmet need for family planning, both for spacing as for limiting births is found. Similarly, Figures 24 and 25 show that the higher the unmet need for contraception, either for spacing or for limiting births, the higher the total fertility rate.

**Figure 23: Correlation between the percentage of married women 15-49 currently using a modern contraceptive method and the total fertility rate (TFR) by region**



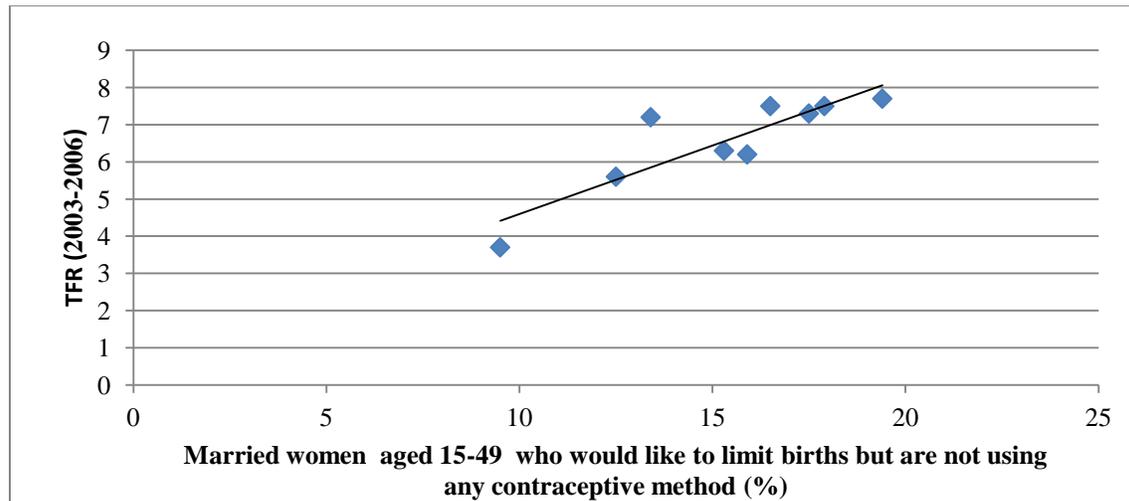
Source: Ugandan Demography and Health Survey 2006

**Figure 24: Correlation between the percentage of married women 15-49 who would like not to have children for at least two years but are not using any contraceptive method and the total fertility rate (TFR) by region**



Source: Ugandan Demography and Health Survey 2006

**Figure 25: Correlation between the percentage of married women 15-49 who would like to limit births but are not using any contraceptive method and the total fertility rate (TFR) by region**



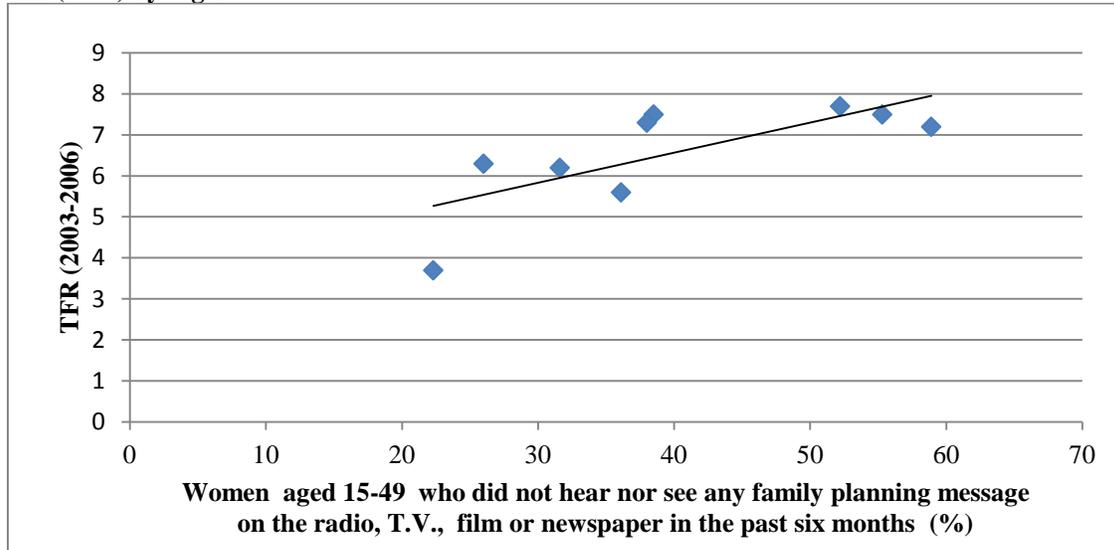
Source: Ugandan Demography and Health Survey 2006

1.36 *Mass media communication such as T.V., radio and film can help disseminate family planning messages in an effective and relatively inexpensive way.* Figure 26 shows that a positive relationship exists between the percentage of women who did not hear any family planning message on T.V., radio, film or newspaper in the past six months and the total fertility rate. Although the relationship is far from perfect, this counts only the number of people who did not hear any message, whilst in fact the number of times that one hears such messages might be crucial to trigger behavioral changes, which can affect fertility.

1.37 *Increasing the number of households with access to electricity, especially in the country side, can help decrease fertility.* In an urban setting, the hypothesis of a linkage between households' access to electricity and fertility has been fed by cases such as the New York's 1965 blackout, which allegedly had resulted in a baby boom nine months later. Although such a relationship had later been disproved (Udry, 1970), Harbison and Robinson (1985) have reviewed nine studies in six countries and concluded that there is in fact some link between the spread of electrification in rural areas and subsequent declines in human fertility. More specifically, they found that the higher the level of rural electrification, the higher the contraceptive prevalence rate and the lower the fertility level. In Uganda, women who have no electricity at home have given birth to a larger number of children than similar women with access to electricity at home. This is true for women residing in the rural areas as well as for those in urban settings. Similarly, Figure 27 shows that the higher the percentages of households with access to electricity in a region, the lower the region's total fertility rate. This link may be due, among others, to the absence of access to mass media communication (T.V., radio and film) because of the lack of electricity. This may in part explain the findings by Harbison and Robinson (1985): mass media communication might be the cheapest and most effective way to disseminate family planning messages, especially in rural settings where

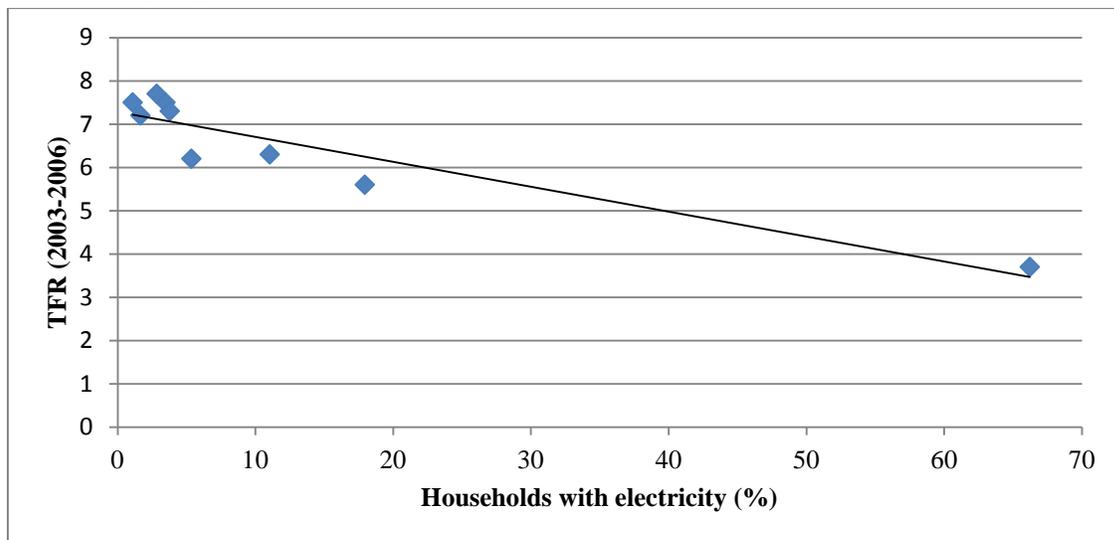
localities might be physically hard to reach. The lack of electricity means that such tools cannot be used.

**Figure 26: Correlation between the percentage of women 15-49 who did not hear nor see any family planning message on the radio, T.V., film or newspaper in the past six months and the total fertility rate (TFR) by region**



Source: Ugandan Demography and Health Survey 2006

**Figure 27: Correlation between the percentage of households with electricity and the total fertility rate (TFR) by region**



Source: Ugandan Demography and Health Survey 2006

1.38 *Finally, although this effect is not too sizeable, women who earn some cash from their work have fewer children than those who do not, ceteris paribus.* Empowering women and changing their role in society through enhancing gender equality and increasing female labor force participation rate can also help – and can be helped by – reducing fertility.

## 6. Determinants of under-five mortality

1.39 *The demographic transition theory emphasizes that the decline in mortality, especially in infant and child mortality, is usually a prerequisite for the decline of fertility.* Since fertility levels are closely correlated to those of mortality, the mortality decline can be viewed as a demographic “precursor” of fertility changes, and this has been observed around the world using time-series data (Chesnais, 1992). The speed of the mortality decline is also important: generally, the faster the decline in under-five mortality, the faster the decline in fertility. The interval between the two declines is usually estimated to be 30 to 50 years. However, it is often difficult to date with any degree of precision the start of the mortality decline owing to the lack of reliable data on the recent past (Chesnais, 1992).

1.40 *There is also a causal link between high under-five mortality and high desired fertility.* In this regard, Palloni and Rafalimanana (1999) have analyzed aggregate data from Latin American countries and found a small positive effect of infant mortality on fertility. Similarly, Chowdhury (1988) analyzed data from thirty-five developing countries and concluded that several countries appear to support this correlation as well. More recently, McCord et al. (2010) concluded that child mortality is a robust driver of fertility behavior in Sub-Saharan countries.<sup>10</sup>

1.41 *Nonetheless, the data at hand are insufficient to establish a strong relationship between child mortality and fertility at a micro level.* For that, one would need to analyze births histories in order to see what the desired number of children for each woman was before starting child-bearing, and whether she responded with higher fertility given child mortality experiences, as to meet her original desired fertility. This is not possible to investigate as women interviewed in a given round of the DHS are not necessarily interviewed in future DHS rounds. Still, Figure 28 plots the correlation between the under-five mortality rate from 1997 to 2006 and the TFR from 2003 to 2006, showing a positive correlation.

**Figure 28: Correlation between the under five mortality rate and the total fertility rate - All regions of Uganda**



Source: Ugandan Demography and Health Survey 2006.

<sup>10</sup> One should also keep in mind the role of HIV/AIDS in reversing the gains that had been made in reducing under-five mortality, which could therefore foster desired fertility.

1.42 ***A rather complex network of factors determines mortality levels.*** One may cite *inter alia* the medical infrastructure; biomedical resources and equipment; the density, quality, and distribution of health personnel; the supply of clean water; sewerage, transport, and communications networks; public policies with respect to health regulations, vaccination, nutrition, health prevention, and housing; and ecological conditions such as climate and habitat. In addition, socioeconomic status as well as cultural and religious attitudes also play a role (Chesnais, 1992; Frisbie, 2005). With respect to infant mortality, authors have sorted out the multiple intervening variables into background factors, prenatal intervening factors, and postpartum/proximate factors. Prenatal intervening factors include biomedical, behavioral, and psychosocial variables.<sup>11</sup> Box 4 provides an overview of the recent research findings on determinants of infant and child mortality.

1.43 ***For the sake of this analysis, however, it has been posited that mortality levels can be divided between proximate and contextual (i.e., background and prenatal) determinants.*** The proximate determinants of mortality, which have been studied extensively in Uganda as well as internationally, are mostly demographic (sex of infant and parity) and biomedical (birth outcomes, ambient smoke, breast-feeding, infant morbidity, and postnatal care). The contextual determinants include the eradication of communicable diseases, the fight against malaria and HIV/AIDS, as well as improvements in nutrition. These determinants of mortality are most amenable to policy interventions, particularly in the form of vaccination and malaria programs, the provision of nutritional supplements, and the use of information, education, and communication (IEC) and behavioral change communication (BCC) campaigns.

1.44 ***Since contextual determinants have been much less studied in Uganda, an econometric analysis of these determinants has been undertaken in this study, along with an econometric analysis of breast-feeding and birth weight.*** These contextual determinants can be regrouped into three categories: (i) the variables linked to the mothers, (ii) the variable pertaining to the children; and (iii) the environmental variables. It should be noted that these contextual determinants are to a large extent also amenable to policy interventions. The analysis presented here is based on the DHS 2006 data and details are reported in Annex 4. The remainder of this section summarizes the conclusions of this econometric analysis (see Annex 4 for the complete results).

1.45 ***Prenatal care increases substantially the child's chances to survive.*** Children born to a mother who did not undergo any prenatal care during her pregnancy are 10 percent more likely to die before their fifth birth than children born to similar mothers who had at least one prenatal care visit. This is true for the pooled sample as for those children in the country side. The effect of prenatal care is lower in urban settings. There, children whose mother did not have any prenatal care are 4.44 percent more likely to die before age five compared to children whose mother did attend prenatal care, *ceteris paribus* (at average values).

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<sup>11</sup> However, several biomedical variables (including birth weight and breast-feeding) also belong to the postpartum/proximate factors (Frisbie, 2005).

#### **Box 4: The Strides to Reduce Infant and Child Mortality Levels**

Infant and child mortality rates are defined by the number of children born alive and dying before age 1 and age 5, respectively (the under-five mortality rate measures children born alive who die before reaching age 5). Infant mortality rates are often calculated separately for the neonatal period (from birth to age 28 days) and the post-neonatal period (from 1 to 11 months of age).

Although sustained reductions in infant and child (under-five) mortality began in the nineteenth century in Europe, North America, and Japan, developing countries started to see their under-five mortality levels decrease in earnest after World War II. Under-five mortality declines in developing countries occurred more rapidly than in countries where it had declined much earlier.

Despite great advances in developing countries, however, the pace of decline has been uneven and has varied substantially among countries. Since the 1960s, and particularly in the period 1975-1985, the decline in child mortality appeared to have stalled in many poor countries because of economic stress and other problems (e.g., oil crisis of 1973-1974). Later, in the 1990s, the HIV/AIDS epidemic halted and even reversed declines in under-five mortality in several eastern and southern Sub-Saharan countries.

The causes of infant and child deaths are numerous. One distinguishes usually between endogenous and exogenous factors; the former are linked to congenital malformations, genetic abnormalities, and complications of delivery including low birth weight; the latter encompass external factors such as infectious diseases, accidents, and injury. It is easier to tackle the exogenous than the endogenous causes of under-five mortality and exogenous risks can usually be reduced by improving living standards, offering better health care, and expanding public health programs. In countries with higher levels of under-five mortality, infectious and parasitic diseases, in particular acute respiratory infections (ARIs) and diarrheal disease are the major causes of death after the first month of life. Measles and malaria are other important causes of under-five mortality.

The determinants of the dramatic decline in under-five mortality in developing countries have been studied extensively and have been attributed to four broad sets of factors: (a) the increases in income and other improvements in nutrition, housing, and standards of living; (b) investments in public works (e.g., water supply and sanitation) and public health programs; (c) changes in health seeking behavior; and (d) improvements in medical technology. It seems that all these factors impact under-five mortality outcomes concomitantly. Culture and beliefs also play a key role: in particular, improved knowledge about germs has helped trigger better health seeking attitudes (e.g., better hygiene).

In all this, the role of public policies has been paramount. Interventions have had important indirect effects on under-five mortality outcomes through economic development policies, compulsory education schemes, and improvements in transportation, communications, and public works projects. However, direct interventions have been crucial as well, such as child immunization programs, provision of nutritional supplements, distribution of oral rehydration packets, growth monitoring to detect malnutrition in children, programs to encourage breast-feeding, and insecticide spraying.

Nonetheless, some important causes of under-five mortality cannot be tackled by specific health care programs alone. The Integrated Management of Childhood Illnesses (IMCI) promoted by the World Health Organization (WHO) is an attempt to provide a more comprehensive framework to improve children's survival overall. Specifically, the IMCI seeks to improve cases management skills among health personnel, health systems more generally, as well as family and community health practices.

*Source:* Pebley (2003)

1.46 ***Mother's education is important too.*** Children born to mothers who currently<sup>12</sup> have at least primary school completed are 1.65 percent less likely to die before their fifth birthday than children born to similar mothers with no formal education. This figure is a weighted average of the rural and urban sub-samples. Specifically, children born to mothers who currently have at least primary completed and reside in the rural areas are 1.38 percent less likely to die before age five than children born to similar mothers with no formal education. The same figure increases to 6.34 percent for urban children.

1.47 ***Spacing of births helps to increase the children's chances to survive.*** Children born 15 months or less after the birth of their previous sibling are 3.08 percent more likely to die before age five than similar children born more than 15 months after the birth of their previous sibling. The figure is a bit smaller for rural children; they are 2.82 percent more likely to die before age five if they are conceived less than six months after the birth of their last sibling.

1.48 ***A type of toilet used by the household affects the child's survival.*** Children born in households that currently use a composting toilet are 9.2 percent more likely to die before age five than similar children in households where a covered pit latrine is used. This is true in the country side as well as for the pooled sample.

1.49 ***The household's source of drinking water is important in urban areas.*** Children born in households that are currently urban and whose members drink water from an uncovered source (unprotected wells or springs) are 3.35 percent less likely to die before age five than similar children in households whose members currently drink surface (a river, lake or a dam) or rainfall water. This makes sense as in town and cities air might be quite polluted, which in turn pollutes rainfall water; rivers, lakes and dams may also be quite polluted, so drinking their water may cause illnesses. In contrast, for the pooled sample, drinking from an unprotected well or spring is actually worse than drinking from a river, lake or a dam, or drinking rainfall water. In particular, the probability of dying before age five increases by 1.83 percent if drinking water from the first sources rather than from the latter. This effect is due to the rural sub-sample.

1.50 ***Breast-feeding has a huge impact on the probability of surviving beyond the fifth birthday, especially in rural settings.*** Specifically, children in the rural areas who are breast-fed for less than six months are 31.3 percent more likely to die before age five than similar children who are breast-fed longer than that, *ceteris paribus*. The figure is a bit smaller (18.4 percent), although equally significant, in towns and cities.

1.51 ***Finally, child's weight at birth affects her/his chances for survival.*** Children born weighing less than 2.5 kilograms are about 2.5 percent more likely to die before their fifth birthday than children born with normal weight, *ceteris paribus*. This holds for the pooled sample, as well as for children in the country side. Rural children who were

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<sup>12</sup> This means at most five years after the birth of the child. This is the only data we have, we do not have a panel as to know precisely the level of education the mother was having at the time of giving birth. Nonetheless, given the social and cultural costumes in Uganda, young mothers do not usually gain any further education after having given birth, at least not during the first five years of life of the child, so that the data on education we have may be identical or very close to the one at the time of giving birth.

not weighted after being born (that is, for which no birth weight register exists) are 1.04 percent more likely to die before age five than similar children who are weighed, keeping everything else constant at their mean values. The same figure for urban children is 4.3 percent.

## **7. Population policies and political leadership**

**1.52** *To a large extent, Uganda is exemplary of the delay shown by many Sub-Saharan countries to address their population challenges.* Confronted with very high fertility, Uganda has not yet tackled its population issues as effectively and with the same sense of urgency as some other African countries (Blacker et al., 2005). In addition, since the early 1990s Uganda has had also to confront a most severe HIV/AIDS epidemic, and large funds were redirected to address the new health crisis. Fortunately, HIV/AIDS programs have been quite successful in Uganda. To a large extent, the country has been able to mitigate its epidemic and stabilize the level of HIV prevalence among its adult population (15-49). It is relatively recent that Uganda has been able to refocus its health strategy and turn again to population and reproductive health issues.

**1.53** *The reluctance to tackle population issues head-on in Uganda might be attributed in part to the lack of sufficient policy space with respect to population and reproductive health issues.* Policy space is defined here as the support from a government's stakeholders (political leaders, voters, lobbyists, beneficiaries, employees, , critics, and donors) that enables deployment of resources to agreed purposes and groups (May, forthcoming). Furthermore, one should also mention strong cultural patterns in favor of high fertility, as well as the relatively poor coverage of family planning services.

**1.54** *Despite the country's delay to take action to mitigate its rapid population growth, Uganda has had a National Population Policy since 1995.* Uganda's original 1995 National Population Policy (NPP) was developed following the International Conference on Population and Development of 1994 (ICPD) held in Cairo, Egypt, and was closely aligned with the related ICPD Programme of Action (PoA). The policy outlined strategies for achieving goals in the areas of family health, migration, urbanization, education, employment, nutrition, housing, the environment, the role of men and women in family welfare, youth, the elderly, and persons with disabilities. According to the policy, its overall goal was "to influence the future demographic trends and patterns in desirable directions in order to improve the quality of life and standards of living of the people" (NPP, page 25). Notably the policy focused on specific segments of the population, like children, youth, women, elderly, and persons with disabilities. More generally, the document stressed the importance of achieving population and development goals through comprehensive reproductive health services.

**1.55** *In 2008, the Government of Uganda issued a second population policy document, the 2008 National Population Policy for Social Transformation and Sustainable Development, confirming its commitment to population and reproductive health issues.* More than ten years after the first National Population Policy, the country's demographics and critical areas of development had changed markedly. With the population growing at an even faster rate, from 2.5 percent per year between 1980

and 1991 to 3.2 percent per year between 1991 and 2002, the second population policy document revised its focus. This new policy places more emphasis on family planning, child spacing, and the prevention of risky pregnancies. The policy also encourages male involvement in reproductive health in order to promote health seeking behavior. In addition, the 2008 population policy calls for improved health through strengthening of referral systems, the deployment of skilled human resources for reproductive health, reproductive health commodities' security, and youth-friendly reproductive health services. Overall, the policy expresses a greater understanding of the links between population and development issues and shows a larger commitment to placing population and reproductive health issues on the policy agenda. The policy also shows a more multi-sectoral approach with various sectors of the Government contributing. However, despite the policy's recognition of the broader connections between population, health, poverty, and the environment, the implementation strategies remain within individual sectors and need to be better coordinated. Moreover, the 2008 population policy lacks a sense of priority and does not provide rigorous benchmarks and indicators to monitor its objectives and goals.

**1.56 In 2010, Uganda released its National Development Plan (2010/11 – 2014/15) with the theme of growth, employment, and social-economic transformation for prosperity.** Within this comprehensive document, the Government reiterated the need for sustainable population growth. Among the constraints to achieving this goal, the plan cites low levels of education, cultural and religious beliefs, scarcity of reproductive health services, lack of social safety nets, and absence of advocacy programs. The objectives listed in the plan (nine in total) are identical to those in the previous 2008 National Population Policy for Social Transformation and Sustainable Development. However, the strategies and interventions outlined to address the objectives are expanded upon. Yet still, this most recent document designed to address issues of population growth also lacks clear benchmarks and indicators for monitoring and evaluation.

**1.57 In addition, the Government of Uganda has drafted several other policies and strategies that relate to population and reproductive health issues.** These include the National Youth Policy (2001), the National Gender Policy (1997) and its revision (2007), the Roadmap to Reduction of Maternal and Neonatal Morbidity and Mortality 2007-2015 (2007), the Reproductive Health Commodity Security Strategic Plan 2009/10 – 2013/14 (2009), and the Health Sector Strategic and Investment Plan (2010). Finally, in March 2011 the Ministry of Health also announced New Reproductive Health Guidelines aimed at providing women in Uganda with greater access to injectable contraceptives. Of all these documents, the 2009 Reproductive Health Commodity Security Strategic Plan goes the farthest in suggesting three objectives with (perhaps too ambitious) benchmarks. These pertain to the contraceptive prevalence rate (from 23 to 50 percent by 2015) and the unmet need for family planning (from 40 to 5 percent by 2015); the increase of the proportion of health facilities with no stock-outs of selected reproductive health (RH) commodities to 80 percent by 2015; and the increase of the government budget allocation and expenditure on reproductive health commodities to 80 percent by 2015. But beyond these goals, the document relegates the operational plan for the strategy to the Annex of a future Monitoring and Evaluation Plan, which would contain indicators at various levels (i.e., impact, outcome, output, and process) that are missing from this document.

1.58 ***Last but not least, the Government of Uganda issued a major strategy to reach the Millennium Development Goals (MDGs).*** Addressing fertility and population issues is essential for Uganda's progress towards the MDGs targets. In order to address these challenges, Uganda released its *Millennium Development Goals Report for Uganda 2010* with the special theme of accelerating progress towards improving maternal health. The document celebrates many of the development achievements made in Uganda, but also highlights MDG-5 – and its call to improve maternal health – as a key goal where there has been insufficient progress. Maternal health is afforded a special section in the report, where the government prioritizes four key interventions: emergency obstetric care, skilled attendance at birth, family planning, and effective antenatal care. According to the document, family planning prevents unintended pregnancies and enables women to have pregnancies neither too early, too late nor too frequently. Addressing family planning issues, therefore, is essential to Uganda's own strategy for the Millennium Development Goals. Moreover, the report highlights Uganda's own weak national commitment to family planning as one of the biggest obstacles. The document is honest in discussing the challenges to addressing reproductive health issues. Among them, resource availability (until recently, family planning was not a priority within the health budget), accountability in the allocation and use of health resources, the limited number of centers for the distribution of supplies, and the insufficient number of midwives and trained nurses. The document falls short, however, in establishing benchmarks and indicators to address reproductive health issues directly.

1.59 ***All these population policy documents and broader development strategies show an awareness of the need for intervention on population and reproductive health issues.*** The government's commitment to implement them has improved over the last years, but needs to be further strengthened to include *inter alia* increased capacity building of the institutions responsible for implementing the policies.. Most of these policy and strategic documents appear too often to be based on general considerations pertaining to the consequences of rapid population growth rather than on a rigorous analysis of the available policy levers, the priorities for intervention, and the rigorous monitoring and evaluation of the policies to be implemented. Moreover, the majority of these documents remains broad and lack clear objectives, highlighting too many priorities rather than identifying and focusing on a few key areas. Finally, these policies and strategies lack proper result chains, going from inputs to outputs to outcomes, and indicators for monitoring and evaluation

## **8. Uganda's population policies in the light of analytical findings**

1.60 ***The most relevant determinants must be addressed to reduce the youth dependency ratio through fertility decline.*** Although the Government has recently shown a stronger commitment to encouraging lower fertility rates, it must focus its efforts on the key determinants of fertility to be most effective. Namely, given the findings of the econometric analysis, government policy should focus on a broad spectrum of multisectoral interventions and inputs. These should include girls' education and, in particular, secondary and tertiary education, urban development to generate the jobs and innovation, adolescent health to delay sexual behavior and promote better health behavior, increased coverage of quality family planning and maternal and child health

services to reach underserved groups in rural areas and address the unmet need for contraception, media communication and involvement of civil society to address some of the cultural aspects in support of high fertility, access to electricity, and increased opportunities for female employment including the promotion of gender equality. Indeed, the state and the public sector may help accelerate these changes by designing and implementing the right policy interventions targeting a variety of relevant market failures ranging from imperfect information on advances in medical technologies to insufficient monetization of the rural economies reducing the scope for the manufactured goods markets (e.g., market for contraceptives). The Government of Uganda has addressed all of these items to various degrees within its policy documents. This section looks at the extent to which the Government has focused on these determinants through policy and what could be done to address them further.

1.61 ***The Government will need to promote more rapid and better urbanization.*** The analysis does show that not only is fertility lower in urban areas but also that the actual number of children in cities is closer to the desired one compared to rural areas. Increasingly population movements are flowing from rural to urban areas in Uganda. This is certainly a positive trend: as discussed in the Section 2, urbanization helps both economic growth and demographic transition. In addition, the unmet need for family planning among rural women is almost double that among their urban counterparts. Urban living provides a healthier life, as nearly all health indicators are better in Uganda's urban areas. However, urbanization also needs to be carefully managed, for otherwise it leads to slums, traffic jams and poor sanitation and waste management. The current urban population growth rate of 5.9 percent per year challenges the government to make sure that public investment in infrastructure and social services does not lag behind. For the country to benefit from urbanization to a full extent, the Government will need to invest more in its cities. It will also need to invest in better social services in rural areas in order to make the migrants more employable in the cities, and in the infrastructure connecting rural and urban areas (World Bank, forthcoming). Furthermore, in 2011, Uganda's Ministry of Lands, Housing and Urban Development introduced its first *National Land Policy* to address some of these concerns. Until then, there was no clear government policy on the management of government land, public land or natural resources, leading to abuse and inefficiency. This *National Land Policy* is a step in the right direction but does not go far enough to address the expanding population's effect on urban areas.

1.62 ***Education of women is essential to empowerment and the ability to make informed decisions, in particular reproductive health decisions.*** The analysis in the determinants of fertility section shows a complex relationship between education and fertility. One of the findings is particularly relevant for policy intervention. As shown, the higher the percentage of drop-out girls at the O-level (the first four years of secondary school), the higher the total fertility rate. The strong correlation in this group suggests targeting girls at this level of education to stay in school and delay marriage. Fortunately, the MDG target of gender parity between boys and girls in primary education has been achieved in Uganda. Progress has also been made at secondary levels of education, where the ratio of girls to boys reached 0.84 in 2009 compared to 0.79 in 2000 (Republic of Uganda 2010a). The affirmative action of additional points to female applicants who

wished to gain entry to university resulted in an increase in tertiary enrolment for girls, most notably in 2004. However, a high primary school drop-out rate of 78 percent, particularly among girls, is a barrier to development of any kind. Universal primary education has been implemented since 1997 and the government also began the implementation of universal secondary education in 2007. There is great need to make both primary and post-primary education compulsory and to target the attendance of young girls in particular. Most of the burden will fall on the Ministry of Education and Sports. The Millennium Development Goals Report for Uganda 2010 identifies specific health related interventions for MDG-5 and also suggests which ministry the domain of the intervention falls under. It outlines wide ranging tasks for the Ministry of Education and Sports, like the design of a national incentive program to keep girls at school and the establishment of a long-term strategy for boosting sciences and formal training to increase the pool of qualified midwives. The government of Uganda may wish to consider more direct interventions that incentivize parents to keep their children in school longer, such as conditional cash transfer programs (Box 5).

**Box 5: Conditional Cash Transfers**

Conditional Cash Transfer (CCT) programs are increasingly becoming a part of development projects. CCT programs provide cash payments to poor households that can meet certain behavioral requirements, usually related to children's education and health. They help prevent parents from pulling children out of schools in order to earn an income and from denying children health care because of prohibitive time and costs. In this regard they address the inter-generational transmission of poverty by combining short-term transfers for income support and incentives for long-run investments in human capital. In addition, they can provide a steady stream of income protecting poor households from the worst effects of unemployment, illness, and other sudden shocks. CCT programs have been successfully implemented on a large scale in several middle-income countries such as Brazil, Chile, Colombia, Ecuador, Jamaica, Mexico, South Africa, and Turkey. They have also shown results in low-income countries. In Cambodia, two World Bank pilot programs have reduced the drop-out rate between 6<sup>th</sup> and 7<sup>th</sup> grades by 20 to 30 percentage points. In Pakistan, a CCT program increased by 11 percentage points the number of 10-14 year-old girls in school. CCT programs have increased the preventive health care services in Colombia, Honduras, Mexico, and Nicaragua by between 8 and 33 percentage points. However, these programs should not be thought of as a panacea in their own and should be part of comprehensive social and economic policy strategies. For example, it should be cautioned that higher enrollment rates do not necessarily mean better performance in learning tests.

**1.63 *Delaying the age at first sexual intercourse calls for gender-focused policies.***

The data shows that delaying first sexual intercourse greatly reduces the total number of births over a lifetime. Promoting empowerment of women allows them to make informed decisions that positively influence their reproductive health. Uganda's Constitution guarantees equality between women and men, and includes affirmative action measures to increase women's roles in decision-making and participation in the development process. In addition, the *Uganda Gender Policy* provides a framework to address gender issues. However, there is still much progress left to be made. In Uganda, 25 percent of young women become pregnant by the age of 19. These early pregnancies are often the result of low contraceptive use among the adolescents and cause greater health risk to young mothers. The government needs to scale up adolescent health services to reduce teen unwanted pregnancies since teenage pregnancies contribute disproportionately to the high maternal mortality ratio. In addition, many cultural practices and customs regarding property ownership, widow inheritance, child marriages,

polygamy, female genital mutilation, child labor, and gender division of labor all affect the status and welfare of women. It is estimated that 59 percent of ever-married women aged 15 to 49 have experienced some form of physical and/or sexual violence. Existing laws need to be revisited to promote the positive aspects of the culture and discourage the negative ones in order to enhance the welfare of women (i.e., changes of attitudes and perceptions; see Cleland and Wilson 1987). Finally, religious, cultural, and judiciary institutions should continue to work together to promote beneficial behavioral changes. Although essential to women's health, it will be the Ministry of Gender, Labor and Social Development that addresses many of these concerns according to current policy. However, how gender policies will directly address population concerns and how Ministries will coordinate together still need more analysis.

**1.64 *Unmet need for family planning can be addressed on both the supply and demand sides.*** As seen in the model, unmet need for family planning has a significant impact on fertility. Most obviously, supply-side constraints need to be addressed. Distance to the source for obtaining contraceptives, stock-outs of contraceptives among providers and legal constraints should be the focus of policy to combat gaps in family planning need. However, policy should also address demand-side constraints like cultural or religious objections to contraception, lack of knowledge, fear of side effects or lack of spousal approval. In addition, this implies that strictly knowing a certain level of unmet need exists does not by itself provide information on why it exists or what the potential future demand for contraception might be. Research needs to be conducted to better understand this and other indicators. The Uganda 2006 DHS gives information on methods, trends and reasons for use of contraceptives broken down by regions, ages and religions among other demographic groups. It is equally important not to interpret high levels of unmet need as a failure of a family planning program, as unmet need is a dynamic indicator. This should be considered when reviewing monitoring an evaluation results and be judged along with other indicators such as total fertility rate, fertility preferences, method mix, and reasons for not using contraceptives.

**1.65 *Increasing the contraceptive prevalence rate is crucial for improving youth dependency ratios through a decrease in fertility.*** The current low level of the contraceptive prevalence rate (CPR), estimated in 2010 at 18 percent for modern methods among married women 15-49 (Population Reference Bureau 2010) and, in particular, the slow pace in the progress of this indicator in recent years point to the urgent need to boost the family planning program, which may bring very high economic returns if designed at an appropriate scale (Box 6). Indeed, much of the interventions needed to foster the contraceptive prevalence rate could be addressed within the broader context of the family planning campaign. The MOH issued in March 2011 *New Reproductive Health Guidelines* to provide women in Uganda with greater access to injectable contraceptives and this recent announcement by the MOH is most encouraging. The guidelines aim to address unmet demand for family planning services by enabling community health workers to provide injectable contraception to women in hard-to-reach rural areas. According to the MOH, community based delivery of injectable contraceptives is the best method to increase access to the most popular family planning method in Uganda. Nonetheless, progress in family planning coverage may be hampered by a series of barriers, which can be geographical, medical, cultural, or financial. Such barriers can

also be linked to the poor status of women, lack of choice of methods, and fear of side effects (Campbell et al., 2006). To boost the contraceptive prevalence rate, efforts will be required in the twin areas of supply-side and demand-creation.

**Box 6: Taking the MAMS Model Further: Returns on Investments in Family Planning Programs**

The MAMS model has been also applied to calculate rate of return to investment in family planning program (see Annex 5). The analysis focuses on comparison between the high and medium fertility scenarios UN population projections scenarios (assuming that the difference in TFR of 0.5 children which these scenarios imply can result from implementation of family planning policies, which is consistent with the literature on family planning policies) and looks at the costs to the government of providing additional family planning services compared to benefits gained from reduced fertility and increased economic growth. It aims to capture welfare changes from policy decisions summarized by changes in real household consumption per capita and poverty. The results show that relative to cost, the simulated benefit is extremely large. Its results indicate that a moderate expansion in family planning services would lead to significant net benefits much larger than any associated increase in government expenditures (costs). The initial welfare loss is minimal compared to the subsequent gains, producing a three-digit rate of return. The results from this further analysis show that based on the same assumptions the evolution of the total fertility rate may have a sizable impact on the future development of average living standards, poverty, and other MDG indicators.

1.66 *Media campaigns can be one of the cost effective methods to promote maternal and child health as well as fertility change.* Good information, education and communication (IEC) and behavior change communication (BCC) campaigns are essential not only to involve civil society to address the cultural barriers but also to foster the demand for family planning services and better health seeking behavior (Westoff and Rodriguez 1995). Previous economic analysis demonstrated the positive relationship between women who did not hear any family planning message on T.V., radio, film or newspaper in the past six months and the total fertility rate. It suggests that mass media communication can help transmit family planning messages effectively. Communication and media strategies were mentioned in the most recent population policy document (2008), but a specific plan of action was not determined. Currently in Uganda, radio is the most accessible means of mass communication. For the rural population radio covers 44.7 percent compared to just .3 percent for both print and media and television, while for urban areas it is 67.3 percent for radio and 2.7 percent for television. Interestingly, the main source of information is non-formal communication mostly by word of mouth since 53.2 percent of the rural population and 24.4 percent of the urban areas continue to receive information only through this channel. This suggests that the most crucial media expansion may be in the telecommunication sector, particularly mobile phones, and information communication technology (ICT), where social networking is increasingly powerful as a means to share information. According to Internet World Stats, Uganda's internet usage went from .1 percent of the population in 2000 to 9.6 percent in 2010. Once the Government has decided what the most effective means of communication is, it should act to spread its message.

1.67 *Directly related to media outreach, the analysis shows increasing the number of households with electricity can help decrease fertility.* The latest census from 2002 shows that only 2.6 percent of rural and 39 percent of urban dwellers use electricity for lighting. In addition, 94 percent of rural dwellers use firewood and 66 percent of urban

use charcoal for cooking. Obviously, extending access to and promoting use of electricity is not just a concern for population issues. However, when planning fertility policy it must be considered and weighed. An effective media campaign must rely on basic access to energy and should be discussed in any related strategy. The 2008 population policy document only makes reference to energy deficiencies once. The Ministry of Energy must be involved to help come up with innovative solutions to Uganda's energy problems.

1.68 ***Lastly, economic autonomy for woman will lead to fewer children.*** Lack of decision-making power for women leads to poor health outcomes. It also excludes women from productive economic and social activities. Of the limited formal employment available in Uganda, only 19 percent is represented by women. Worse still, the share of women in wage employment in the non-agricultural sector, another key indicator of women's empowerment, dropped to 28 percent in 2005/2006 from 39 percent in 2002/2003. Despite the fact that women are responsible for producing most of the food, men maintain the responsibility of proceeds from agriculture. Although women comprise an estimated 70 percent of those working in agriculture, women experience unequal access to, and control over, important productive resources like land, which limits their ability to move out of subsistence agriculture. The determinants of fertility analysis showed that women who earn some cash from their work have fewer children than those who do not. In addition, women do not have the influential voice in social, civil and political life that is necessary to promote socioeconomic change. More generally, enabling female economic autonomy increases household incomes. This, in turn, reduces vulnerability to sickness and mortality and contributes to faster poverty reduction. Among the various policy documents it is difficult to find which ministry (or ministries) will be devoted to this issue.

1.69 ***With respect to infant and child mortality, the analysis points to a series of contextual and two proximate variables that are all positively correlated to better under-five mortality outcomes.*** As mentioned, these variables can be regrouped into three categories: (i) the variables linked to the mothers, namely mothers' education, birth spacing, prenatal care, and breast-feeding; (ii) the variable pertaining to the children, namely their weight at birth; and (iii) the environmental variables such as the type of toilet (sanitation) and the availability of drinking water (particularly in urban areas).

1.70 ***These contextual and proximate variables have either a direct or an indirect effect on under-five mortality.*** Although the chain of causality is hard to determine, some variables have a most direct impact on infants and children's survival prospects. For instance, the birth weight is a key variable for survival until age five, and so is birth spacing and breast-feeding. On the contrary, other variables may play a more indirect role, such as the level of education of the mother.

1.71 ***All these contextual and proximate variables are to a large extent amenable to policy interventions.*** The variables linked to the mothers are dependent on the availability of services (e.g., education and health), but they are also determined by the ongoing information, education, and communication (IEC) campaigns, which can help increase the length of birth intervals (birth spacing) and the duration of breast-feeding.

Moreover, improvements in nutrition intakes by the mothers during pregnancy can increase the birth weight of newborns.

1.72 ***Uganda has put into place a large number of programs and interventions that address the contextual variables impacting on mortality levels.*** These are captured in the various strategies designed and implemented by the Government, in particular the strategy pertaining to the MDGs and the health programs. Efforts to increase female education must also be cited, as well as ongoing programs to improve supply of clean water and sanitation. Programs to provide nutritional supplements can also improve children weight at birth. Finally, IEC and BCC campaigns are also targeted at several of the contextual variables.

1.73 ***Uganda has also deployed a number of specific interventions that are needed to reduce under-five mortality.*** These are the launching of vaccinations campaigns, the administration of nutritional supplements and oral rehydration therapy (ORT) regimens, and finally the efforts to combat malaria (e.g., with impregnated bed-nets) and other communicable diseases. Such specific mortality reduction interventions are multisectoral in nature, are focused on the proximate determinants of mortality, and complement the interventions on the contextual variables.

1.74 ***In addition, Uganda has deployed specific interventions to reduce its maternal mortality levels.*** The various mortality reduction interventions are captured in the strategies to reach MDG-4, MDG-5, and MDG-6. Moreover, the National Development Plan 2010/11 – 2014/15 refers specifically to advocacy as a means “*for improvement of maternal and child mortality through campaigns to reduce teenage pregnancies, proper spacing of pregnancies and improve quality of maternal care*” (page 215).

1.75 ***However, Uganda has been more successful in combating communicable diseases than in reducing overall child and maternal mortality levels.*** The prevalence of vaccine preventable diseases has declined sharply. The under-five mortality rate decreased from 156 in 1995 to 137 deaths per 1,000 live births in 2006 and the infant mortality rate improved also, from 85 to 76 deaths per 1,000 live births (same dates). The maternal mortality ratio was estimated at 435 deaths per 100,000 live births in 2006. Yet, the improvement of these outcomes remains poor compared to other countries in the region.

1.76 ***Uganda needs to design a comprehensive policy framework based on a clear results chain that would combine all direct, indirect, and specific interventions needed to reduce its under-five and maternal mortality levels.*** In this respect, a framework that encompasses a lifelong *continuum of care* (Kerber et al., 2007), spelling out specific interventions at four critical stages (i.e., pre-pregnancy, pregnancy, newborn/postnatal, and childhood), would help coordinate the various programs toward the common goals. In turn, it would help reconcile interventions on the proximate and contextual determinants of mortality. Finally, this would also accelerate the decline in the levels of mortality, yielding faster results than those that had been obtained so far.

## 9. Institutional dimensions of population policies

1.77 *The policymakers often take different positions with respect to fertility reduction.* On the one hand, some policymakers believe that development *per se* will eventually bring down high fertility. High fertility levels are perceived to be a by-product of poverty and inequality patterns. As socioeconomic development improves, so goes the reasoning, fertility levels will gradually erode. On the other hand, other policymakers claim that *ad hoc* policy interventions should be put into place to tackle high levels of fertility specifically. Their position is based on past experience in Latin America, the Caribbean, and Asia. Overall, it appears that the decision is whether to let developmental forces do their work albeit slowly or, instead, help accelerate social and demographic changes in order to reap greater benefits.

1.78 *Policymakers need also to set priorities.* With respect to the policy priorities, interventions to reduce high mortality levels, especially infant and child mortality are still paramount. It is only the improvement of the survival prospects of their children that may entice parents to reduce their fertility. In addition, interventions to reduce high fertility levels are also needed, if only to meet the unmet needs and improve the health outcomes of mothers and children.

1.79 *Government and nongovernmental coordination is limited.* The Uganda Ministry of Health (MOH) is in charge of the country's family planning program. The MOH issues family planning regulations, manages the supply of contraceptive commodities, runs the health centers where the methods are to be made available, ensures the proper training in family planning of health personnel, and prepares the messages for the information, education, and communication (IEC) as well as behavior change communication (BCC) campaigns. The extent to which the MOH does partner with, and outsource to, third-providers for services delivery (e.g., NGOs, private-voluntary organizations, etc.) is not entirely clear in Uganda. In this respect, a family planning market segmentation study would help charter the role of the various stakeholders in the delivery of quality family planning and reproductive health services (e.g., public and private sectors, social marketing, pharmacies, NGOs, private-voluntary organizations, etc.). Such study would also help monitor the program and manage its expansion, since many different delivery mechanisms can be adopted (e.g., social marketing, pharmacy retail, community-based distribution, etc.).

1.80 *Some policy solutions will need to be addressed by lawmakers.* One of the more controversial determinant of fertility with policy complications, and yet to be discussed, is women's access to safe abortion. Several countries in Sub-Saharan Africa have reformed their abortion laws and policies (e.g., Ethiopia, Ghana, and South Africa) or are poised to do so (e.g., Kenya, which has broadened permissible indications for abortion in the new national constitution adopted in August 2010). The consequences of unsafe abortions have a huge impact on public health outcomes. Induced abortion is illegal in Uganda except to save the life of a woman (Francome and Vekemans 2007). Nonetheless, abortions are still common throughout the country and are most often performed in very poor conditions. Nationwide estimates place the number of total abortions at 300,000 a year for women 15-49 (Singh et al., 2005). Unfortunately, many

of these procedures result in complications, with one study showing that 20 percent of women with complications decide not to seek treatment (Grimes et al., 2006). The consequences of having induced abortions performed by untrained doctors, and outside of hospitals or proper medical facilities, can be even more serious. In 1993 a study in Kampala found that one in five maternal deaths was due to induced abortion (Mirembe 1996). Statistics from the most recent Demographic and Health Survey (2006) show that demand for abortion services may still remain strong, if not stronger than before. Since the previous DHS from 2000-2001 there has been an increase in the proportions of men and women who desire no more children and a decrease in the proportions who want another child within the next two years. Also compared to the 2000-2001 DHS, a lower proportion of births were wanted at the time of delivery. The survey showed that among women 15-49, 46 percent of pregnancies were unplanned. Unsafe abortions take a heavy toll on Ugandan women. Therefore, access to contraceptives and legal medical channels are needed to reduce unplanned pregnancies and the urge to turn to unsafe abortions.

**1.81 *Policymakers will need to look at the proximate and intermediate determinants of fertility to isolate the most important interventions.*** Intermediate determinants are mostly socioeconomic, such as mortality, education, employment, income, urbanization, and the status of women. Intermediate determinants influence fertility but do not control it directly. Policy interventions may modify intermediate determinants, but generally there is a time lag between such interventions and a decline in fertility levels. The proximate determinants of fertility, which affect fertility levels directly, are essentially behavioral and biological. They include the proportion of people in union, the postpartum infecundability (which is linked to periods of both breast-feeding and culturally-motivated postpartum abstinence), the incidence of induced abortion, the prevalence of female sterility, and the use of contraception (including the effectiveness of the various contraceptive methods). In the case of Uganda, all these key dimensions are covered in the population policies and development strategies. However, one needs first a sense of priority among them and to choose the key policy levers. Policy levers are defined here as entry points or instruments to implement a policy (May forthcoming). With respect to fertility reduction, policy levers may include family planning programs, improvements in female education, information, education, and communication (IEC) campaigns, gender-sensitive laws and regulations, and so forth. Again, the key point is to choose policy levers that will bring change rapidly, since this may be the goal of the population policy. Moreover, policy levers need also to be efficient as well as cost-effective.

**1.82 *The key to using the determinants to promote change is through effective intervention.*** For Uganda to make an impact and intervene in a way that changes the course of its population growth, it needs first to assess the relevance of the specific population policy measures that are proposed. An important consideration should be the potential obstacles that would get in the way of the policy, especially with respect to family planning programs. Second, one needs to choose the right set of indicators to measure the effectiveness of the interventions. These should be measured in terms of specific results according to key performance indicators, for instance the infant mortality rate or the contraceptive prevalence rate (modern methods). Results of the policies need to be examined against the original national commitments and pledges made with methodologies in place to evaluate the policy interventions (namely, a monitoring and

evaluation framework). Third, Uganda should design the best institutional setting to implement the policy interventions or strengthen existing institutions. Fourth, analyses should be conducted to see whether the interventions are cost-effective given limited resources (see Box 7 for an example). Cost-effectiveness analyses can enable policymakers to better understand unit programs' costs and can also be used as a way to ease the policy dialogue and convince policymakers to launch specific programs, for instance by showing the savings that a fertility reduction can bring to the education sector. Fifth, the time frame of the policy interventions must be assessed as well. In order to evaluate the time frame, one may use population projections to estimate future fertility levels as determined by the proximate determinants of fertility. Sixth, comparisons should be made between specific interventions and across countries, most often by using benchmarks. These are reference points against which performance can be assessed and can come from other countries and/or similar programs.

#### **Box 7: Effective Interventions and Randomized Experiments**

Figuring out where and how to intervene depends on the strength of available data. However, as is often the case in developing countries, robust data can be hard to find. Instead of allowing policy decisions to be guided by what limited information is available, policy makers can design studies that provide the original data necessary to choose the right interventions. This lets policy makers pose the questions first and then find the data to answer them. Specifically, randomized evaluations measure the impact of an intervention by randomly allocating people to a “treatment” group, made of individuals receiving the program, and a “comparison” group, made of individuals who do not. A recent study in Zambia<sup>13</sup> attempted to understand the source of women’s unmet need for contraceptives. It tested the hypothesis that high fertility was the result of “bargaining” between male and female partners with divergent fertility preferences. Although 100 percent of women reporting unwanted pregnancies declared being familiar with at least one method of modern contraception, only 48 percent had ever used any modern method of contraception. Participants included 1,994 married women who had given birth in the last two years. Women in the study were given vouchers that granted appointments with a family planning nurse at the local government clinic, without waiting a long time, and with guaranteed access to modern contraceptive methods. The women were randomized into two treatment groups. One group was made of “individual” women who received the vouchers alone. The other group was a “couples” group where women were given vouchers in the presence of their husbands. Evidence from the study showed that sharing information about family planning services with husbands *reduced* the couple’s propensity to use the services, with an even greater reduction for couples where the husband reported wanting more children than the wife (see Annex 6 for the details). Randomized experiments can shed light on important behaviors that have yet to be studied.

1.83 ***The need to strengthen the monitoring and evaluation framework is essential for success.*** Very few Ugandan population policies and development strategies offer a coherent set of performance indicators. And when provided, such indicators are not always realistic. No nationwide mechanism has been set up for an ongoing monitoring and evaluation of policy interventions, apart from the successive demographic and health surveys that are usually carried out with external assistance funding. A major effort is therefore needed in the area of monitoring and evaluation, in order to monitor the impact of the proposed policy interventions. This is all the more necessary as it is anticipated

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<sup>13</sup> Field et al. “Contraceptive Adoption, Fertility and the Family in Zambia”. 2006

that the population and reproductive health programs will need to expand dramatically to meet the country's demographic and developmental challenges.

1.84 ***Last but not least, the institutions that design and manage the policies and specific interventions, i.e., the National Planning Authority, the Population Secretariat, and the line ministries, will need to work closely together.*** These institutions, both under the auspices of the Ministry of Finance, Planning and Economic Development, will need to engage proactively with their stakeholders and constituencies. In fact, various Ugandan institutions are responsible for a lion's share of the overall population and reproductive health programs. For instance, the Ministry of Health is in charge of family planning programs, the Ministry of Education and Sports fosters female education, and so forth. Currently, the Population Secretariat and the National Planning Authority appear to need more staff and more leverage in order to be able to coordinate effectively the national population and reproductive health programs and, in particular, to harmonize all existing policies and strategies. Therefore, given the population challenges facing the country, what is required at this juncture will be to strengthen the current coordinating institutions and, especially, to ensure that they receive strong political backing by the country's higher authorities.

## **10. Conclusions**

1.85 ***The most important demographic issue for Uganda related to the age structure rather than the overall size of its population.*** Very young population represents a major challenge for Uganda in the short and medium term. Uganda needs to accelerate its demographic transition. Once (infant and child) mortality and fertility rates begin to fall, young age dependency ratio will, with some lag, follow the same trend. This will have positive - and quite possibly major - implications for the economic growth.

1.86 ***Given the high fertility over the last several decades, Uganda's population will be growing fairly rapidly over the next several decades.*** If Uganda manages to make further substantial progress in increasing the life expectancy, in 2050 its population will be growing more rapidly than the world's population is growing today even under assumption of much lower fertility.

1.87 ***Focusing government's efforts on increasing life expectancy as different from encouraging high fertility will also contribute to population growth.*** It will, however, do so in a way consistent with accelerating the demographic transition, as fall in infant and child mortality is likely to trigger decline in fertility, which will in turn increase female life expectancy.

1.88 ***Accelerating the demographic transition and capturing the demographic dividend could make a major impact on the well-being of the current and future generations of the Ugandans.*** It will also increase the size of the internal market and the country's economic and political weight by increasing its GDP.

1.89 ***Reducing the number of children per working-age individual will help Uganda to transform its oil wealth into a more balanced combination of human and physical***

**capital.** Halving total fertility rate during the oil era helps to more than double per capita growth of expenditures on public services of all categories, dramatically improving both fiscal space and the country's MDG indicators.

1.90 ***Fertility rates in Uganda are associated with the following variables.*** Fertility in urban areas – and especially in Kampala – is lower, and actual number of children is closer to the desired one. Education is a significant predictor of fertility, and so is the increase in the age at the first sexual intercourse. Unmet need for family planning makes a significant impact on fertility. Increasing the number of households with access to electricity, especially in the country side, can also help decrease fertility through enhanced access to mass media communication. Women who earn some cash from their work have fewer children than those who do not.

1.91 ***Child mortality in Uganda is associated with the following variables.*** Breast-feeding has a huge impact on the probability of surviving beyond the fifth birthday. Prenatal care also increases substantially the child's chances to survive. A type of toilet used by the household affects the child's survival. Mother's education is important too, and spacing of births helps to increase the children's chances to survive. Child's weight at birth affects her/his chances for survival. Finally, the household's source of drinking water is important in urban areas.

## Annex 1. Demographically based forecasting model for GDP

This annex builds on the work of Lindh and Malmberg (2007), who have developed a demographically based forecasting model for GDP. The model includes a number of demographic variables and allows for some systematic country heterogeneity as well as for time-specific effects. With the notation  $y$  for GDP per capita,  $e_0$  for life expectancy at birth, and  $a$  for an age group's share in the population, the regression equation has been specified as

$$y_{it} = \alpha \log e_{0it} + \sum_{k=0-14}^{65+} (\beta_k + \gamma_k \log e_{0it}) a_{kit} + \eta_i + \nu_t + \varepsilon_{it}$$

The interaction terms allow for changing age-share coefficients contingent on how far the demographic transition has progressed. The  $\eta_i$  and  $\nu_t$  account for country- and time-specific effects. The subdivision into age groups is as follows: children 0–14 years old, young adults 15–29 years old, mature adults 30–49 years old, middle-aged adults 50–64 years old, and old dependents 65 years and older.

Following Kelley and Schmidt (2005), life expectancy is included to capture human capital effects. Increases in life expectancy and years of schooling are mutually reinforcing (longer life span encourages greater investment in education, and the other way around), and in many countries the relationship between them nearly linear.<sup>14</sup> By controlling for country-specific effects some country heterogeneity is allowed for, specifically that which could be accounted for by omitted variables remaining constant over the estimation period. Further, controlling for time-specificity allows for influences in time which are the same for the whole sample, such as the world business cycle, world market price fluctuations, and so forth.<sup>15</sup>

The model was first estimated on a world sample including 108 countries with sufficiently long time series (minimum 25 years) for annual purchasing power parity GDP. Panel estimation with fixed country and time effects was used, with the level of GDP per capita as the dependent variable.

The fact that the variables are trended raises questions of spurious regression. Lindh and Malmberg (2007) show that the age variables can probably be treated as if co-integrated with GDP. Even if this were not true, the panel context makes spurious results less likely. However, the crucial argument is that the forecasting performance of the model out-of-

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<sup>14</sup> Technological change and other trends are also accounted for by this variable, at least to some extent.

<sup>15</sup> However, there will always be more complex heterogeneity, such as differences in technology and preferences that vary over time and across countries. The estimation result must therefore be interpreted as valid for an average country conditional on the controls. In the sample individual countries will be distributed around the average model with deviations that may be more or less important. To take an obvious example, the genocide in Rwanda causes large deviations from the average model. To the extent that this has affected life expectancy and age structure, it is accounted for in the model, but the disturbance to production of that kind of event is much larger than the demographic repercussions can account for. Events like the tsunami in the Indian Ocean will also cause deviations from the average model.

sample is quite good on average and yields very reasonable long-term predictions for growth rates. Spurious regression parameters would not perform that well.

Further, the impact of demographic variables depends on several factors, such as policies that are conducive (or not) to the increase of employment and labor force participation as the supply of potential workers increases, and some favorable or less favorable circumstances, which might be related, for example, to geography or the prevalence of diseases.

To the extent that such circumstances are inherent and constant disadvantages, this will be picked up by country-specific intercepts in the regressions, but when these factors are episodic and changing over time we would expect them to turn up in the form of systematic underperformance or over performance relative to the model we estimate. Using the global regression with all 111 countries as the standard we can subdivide the sample into two: over-performers (countries which on average have higher growth rates than those predicted by the model for 1950-2007) and underperformers.

Table A1-1 reports estimation results for the full sample as well as subsamples. The results were used to produce the forecasts for Uganda presented in this note.

**Table A1-1: Regression output for the full sample**

Variable	Coeff	Std Error	T-Stat	Signif
*****				
1. LNE0	-0.26508161	1.81055295	-0.14641	0.88360365
2. LNS014	3.81893881	2.27448387	1.67904	0.09320111
3. LNS1529	13.92616622	1.63673588	8.50850	0.00000000
4. LNS3049	5.74820295	1.40505352	4.09109	0.00004354
5. LNS5064	-6.13962018	0.81501059	-7.53318	0.00000000
6. LNS65W	-2.32989776	0.60862945	-3.82811	0.00013055
7. LNS014LNE0	-0.99210272	0.52208829	-1.90026	0.05745067
8. LNS1529LNE0	-3.23098261	0.37713160	-8.56726	0.00000000
9. LNS3049LNE0	-1.14915107	0.32706496	-3.51353	0.00044571
10. LNS5064LNE0	1.56717850	0.19383054	8.08530	0.00000000
11. LNS65WLNE0	0.61884423	0.14676567	4.21655	0.00002520

Panel Regression - Estimation by Fixed Effects

Dependent Variable LNGDPCAP

Panel(58) of Annual Data From 1//1950:01 To 108//2007:01

Usable Observations 5758 Degrees of Freedom 5583

Total Observations 6264 Skipped/Missing 506

Centered R\*\*2 0.965196 R Bar \*\*2 0.964111

Uncentered R\*\*2 0.999403 T x R\*\*2 5754.561

Mean of Dependent Variable 8.3691275320

Std Error of Dependent Variable 1.1059085087

Standard Error of Estimate 0.2095082644

Sum of Squared Residuals 245.05859876

Regression F(174,5583) 889.8122

Significance Level of F 0.00000000

Log Likelihood 918.31764

Most coefficients are different from zero at conventional significance levels. The coefficient pattern indicates that with increasing life expectancy the positive correlations of the younger active age groups will tend to become smaller or even negative.

Measuring the difference in actual and predicted growth rate between 1950-2007, overperforming countries were defined as having a higher growth rate than the demographically predicted and underperforming as having a lower growth rate than the demographically predicted. This cut the country sample into two groups of 58 countries and 52 countries, respectively, see Table 1 in report.

For each of the sub-samples the same regression was performed.

The regression output for the overperforming sample is as follows:

The magnitude of the coefficients differs from the full sample regression and the precision of estimates are less secure but the coefficient pattern is similar and comparing the predicted GDP paths for Uganda (see Figure 2 in the presentation) the resulting models are not that different.

The underperforming sample regression also shows similar patterns but here the 65+ coefficients are the only non-significant, and the predicted GDP path is substantially different from the other two models.

**Table A1-2: Regression output for overperforming sample**

Variable	Coeff	Std Error	T-Stat	Signif
*****				
1. LNE0	10.56993678	2.20143379	4.80139	0.00000165
2. LNS014	-10.97222146	2.58033041	-4.25225	0.00002182
3. LNS1529	7.03802809	2.04346572	3.44416	0.00058078
4. LNS3049	3.48703136	1.86917336	1.86555	0.06220345
5. LNS5064	-9.30083431	1.11565378	-8.33667	0.00000000
6. LNS65W	-6.02517897	0.85535160	-7.04410	0.00000000
7. LNS014LNE0	2.52693818	0.59590441	4.24051	0.00002298
8. LNS1529LNE0	-1.63071744	0.47514542	-3.43204	0.00060727
9. LNS3049LNE0	-0.58102940	0.43730030	-1.32867	0.18405793
10. LNS5064LNE0	2.34915187	0.26357636	8.91260	0.00000000
11. LNS65WLNE0	1.47093636	0.20457668	7.19015	0.00000000
Panel(58) of Annual Data From 1//1950:01 To 108//2007:01				
Usable Observations	3089	Degrees of Freedom	2964	
Total Observations	6264	Skipped/Missing	3175	
Centered R**2	0.978073	R Bar **2	0.977156	
Uncentered R**2	0.999566	T x R**2	3087.659	
Mean of Dependent Variable	8.3999084672			
Std Error of Dependent Variable	1.1941005563			
Standard Error of Estimate	0.1804788837			
Sum of Squared Residuals	96.545267777			
Regression F(124,2964)	1066.2426			
Significance Level of F	0.00000000			
Log Likelihood	969.50370			

**Table A1-3: Regression output for under-performing sample**

Variable	Coeff	Std Error	T-Stat	Signif
*****				
1. LNE0	6.984016850	2.625260572	2.66031	0.00785565
2. LNS014	-5.531168880	3.680816441	-1.50270	0.13303973
3. LNS1529	7.914255461	2.405163557	3.29053	0.00101361
4. LNS3049	5.169876831	1.803113035	2.86720	0.00417524
5. LNS5064	-9.519201797	0.994662909	-9.57028	0.00000000
6. LNS65W	-3.930900740	0.686799202	-5.72351	0.00000001
7. LNS014LNE0	1.126353037	0.835269390	1.34849	0.17762026
8. LNS1529LNE0	-1.890923790	0.545987970	-3.46331	0.00054237
9. LNS3049LNE0	-1.116727337	0.411904756	-2.71113	0.00675035
10. LNS5064LNE0	2.365646111	0.236728650	9.99307	0.00000000
11. LNS65WLNE0	1.019039078	0.165422949	6.16020	0.00000000
Panel(58) of Annual Data From 1//1950:01 To 108//2007:01				
Usable Observations	2669	Degrees of Freedom	2552	
Total Observations	6264	Skipped/Missing	3595	
Centered R**2	0.973701	R Bar **2	0.972506	
Uncentered R**2	0.999632	T x R**2	2668.017	
Mean of Dependent Variable	8.3335028379			
Std Error of Dependent Variable	0.9931521699			
Standard Error of Estimate	0.1646785484			
Sum of Squared Residuals	69.207750027			
Regression F(116,2552)	814.5374			
Significance Level of F	0.00000000			
Log Likelihood	1086.90919			

## **Annex 2: Data**

The country sample has been limited to 108 countries with fairly complete data from at latest 1960 or 1961 and onwards.

Data on GDP per capita 1950-2007 in 2005 PPP USD have been extracted from Penn World Table Version 6.3 (August 2009). The specific measure used is RGDPCH, a chain index obtained by first applying the component growth rates between each pair of consecutive years,  $t-1$  and  $t$  ( $t=1951$  to 2000) to the current price component shares in year  $[t-1]$  in order to obtain the domestic currency expressed in international dollars (DA) growth rate for each year. This DA growth rate for each year  $t$  is then applied backwards and forwards from 1996, and summed to the constant price net foreign balance to obtain the chain GDP series.

Demographic annual data 1950-2010 have been extracted from World Population Prospects: The 2008 Revision by United Nations, Department of Economic and Social Affairs, Population Division (2009, CD-ROM Edition). For Uganda also the projections for the 2010-2050 have been used. 5-year age groups have been aggregated to children (0-14), young adults (15-29), mature adults (30-49), middle-aged adults (50-64), and elderly (65+). This roughly represents clearly distinguishable life phases with differences in economic behavior and the resources available. Population shares for the different age groups have then been computed. Life expectancy at birth has also been extracted.

The fertility assumptions are as follows:

### ***Medium-fertility assumption***

Total fertility in all countries is assumed to converge eventually toward a level of 1.85 children per woman. However, not all countries reach this level during the projection period, that is, by 2045-2050. Projection procedures differ slightly depending on whether a country had a total fertility above or below 1.85 children per woman in 2005-2010.

Fertility in high- and medium-fertility countries is assumed to follow a path derived from models of fertility decline established by the United Nations Population Division on the basis of the past experience of all countries with declining fertility during 1950-2000. The models relate the level of total fertility during a period to the average expected decline in total fertility during the next period. If the total fertility projected by a model for a country falls to 1.85 children per woman before 2050, total fertility is held constant at that level for the remainder of the projection period (that is, until 2050). Therefore, the level of 1.85 children per woman represents a floor value below which the total fertility of high- and medium-fertility countries is not allowed to drop before 2050. However, it is not necessary for all countries to reach the floor value by 2050. If the model of fertility change produces a total fertility above 1.85 children per woman for 2045-2050, that value is used in projecting the population.

In all cases, the projected fertility paths yielded by the models are checked against recent trends in fertility for each country. When a country's recent fertility trends deviate considerably from those consistent with the models, fertility is projected over an initial

period of 5 or 10 years in such a way that it follows recent experience. The model projection takes over after that transition period. For instance, in countries where fertility has been declining very slowly or where it has stalled, fertility is projected to fall more slowly over the first 5 or 10 years of the projection period than it would have according to the model. After that transition period, the model pattern of change is used.

### ***High-fertility assumption***

Under the high variant, fertility is projected to remain 0.5 children above the fertility in the medium variant over most of the projection period. By 2045-2050, fertility in the high variant is therefore half a child higher than that of the medium variant. That is, countries reaching a total fertility of 1.85 children per woman in the medium variant have a total fertility of 2.35 children per woman in the high variant at the end of the projection period.

### ***Low-fertility assumption***

Under the low variant, fertility is projected to remain 0.5 children below the fertility in the medium variant over most of the projection period. By 2045-2050, fertility in the low variant is therefore half a child lower than that of the medium variant. That is, countries reaching a total fertility of 1.85 children per woman in the medium variant have a total fertility of 1.35 children per woman in the low variant at the end of the projection period.

### ***Constant-fertility assumption***

For each country, fertility remains constant at the level estimated for 2005-2010.

### ***The mortality assumptions are as follows:***

#### **Normal-mortality assumption**

Mortality is projected on the basis of models of change of life expectancy produced by the United Nations Population Division. These models produce smaller gains the higher the life expectancy already reached. The selection of a model for each country is based on recent trends in life expectancy by sex. For countries highly affected by the HIV/AIDS epidemic, the model incorporating a slow pace of mortality decline has generally been used to project a certain slowdown in the reduction of general mortality risks not related to HIV/AIDS.

#### ***The impact of HIV/AIDS on mortality***

In the *World Population Prospects: 2008 Revision*, countries where HIV prevalence among persons aged 15 to 49 was ever equal to or greater than one per cent during 1980-2007, including Uganda are considered as affected by the HIV/AIDS epidemic and their mortality is projected by modeling explicitly the course of the epidemic and projecting the yearly incidence of HIV infection. Also considered among the affected countries are those where HIV prevalence has always been lower than one per cent but whose population is so large that the number of people living with HIV in 2007 surpasses 500,000 (i.e., Brazil, China, India, the Russian Federation and the United States of

America). In total, 58 countries are considered to be affected by the HIV/AIDS epidemic in the *2008 Revision*.

The model developed by the UNAIDS Reference Group on Estimates, Modeling and Projections<sup>16,17</sup> is used to fit past estimates of HIV prevalence provided by UNAIDS for each of the affected countries<sup>18</sup> so as to derive the parameters determining the past dynamics of the epidemic in each of them. For most countries, the model is fitted assuming that the relevant parameters have remained constant in the past. Beginning in 2007, the parameter PHI, which reflects the rate of recruitment of new individuals into the high-risk or susceptible group, is projected to decline by half every twenty years. The parameter R, which represents the force of infection, is projected to decline by half every thirty years. The reduction in R reflects the assumption that changes in behavior among those subject to the risk of infection, along with increases in access to treatment for those infected, will reduce the chances of HIV transmission.

In the *2008 Revision*, interventions to prevent the mother-to-child transmission of HIV are modeled on the basis of estimated country-specific coverage levels that, in 2007, averaged 36 per cent among the 58 affected countries, but varied from 0 to 99 per cent among them (with 22 countries having less than 20 per cent coverage of pregnant women in 2007, and only 8 countries with more than 75 per cent coverage). These coverage levels are projected to reach 60 per cent on average by 2015, varying between 40 per cent and 99 per cent among the affected countries.<sup>19</sup> After 2015, the coverage of interventions to prevent mother-to-child transmission of HIV is assumed to remain constant until 2050 at the level reached in each of the affected countries in 2015. Among women receiving treatment, the probability of transmission from mother to child is assumed to vary between 2 per cent and 19 per cent depending on the particular combination of breast-feeding practices (mixed breast-feeding, replacement feeding, exclusive breast-feeding), its duration in the population and the type of treatment available (single-dose nevirapine, dual-prevention, or triple-prevention antiretroviral treatment). These assumptions produce a reduction in the incidence of HIV infection among children born to HIV-

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<sup>16</sup> Ghys P.D., Walker N., McFarland W., Miller R., Garnett G.P. (2008). Improved data, methods and tools for the 2007 HIV and AIDS estimates and projections. *Sexually Transmitted Infections*. August 2008, Volume 84, Supplement 1, pp. i1-i4; doi:10.1136/sti.2008.032573 - [http://sti.bmj.com/cgi/content/full/84/Suppl\\_1/i1](http://sti.bmj.com/cgi/content/full/84/Suppl_1/i1).

<sup>17</sup> Brown T., Salomon J.A., Alkema L., Raftery A.E., Gouws E. (2008). Progress and challenges in modelling country-level HIV/AIDS epidemics: the UNAIDS Estimation and Projection Package 2007. *Sexually Transmitted Infections*. August 2008, Volume 84, Supplement 1, pp. i5-i10. doi:10.1136/sti.2008.030437 - [http://sti.bmj.com/cgi/content/full/84/Suppl\\_1/i5](http://sti.bmj.com/cgi/content/full/84/Suppl_1/i5).

<sup>18</sup> UNAIDS/WHO. (2008). *2008 Report on the global AIDS epidemic*. UNAIDS/08.25E / JC1510E. Geneva. Aug. 2008. 362 p. - [http://www.unaids.org/en/KnowledgeCentre/HIVData/GlobalReport/2008/2008\\_Global\\_report.asp](http://www.unaids.org/en/KnowledgeCentre/HIVData/GlobalReport/2008/2008_Global_report.asp) - See online table: "Adult (15-49) HIV prevalence percent by country, 1990-2007 (with 95 percent confidence intervals)": [http://data.unaids.org/pub/GlobalReport/2008/080813\\_gr08\\_prev1549\\_1990\\_2007\\_en.xls](http://data.unaids.org/pub/GlobalReport/2008/080813_gr08_prev1549_1990_2007_en.xls).

<sup>19</sup> UNAIDS, UNICEF, WHO (2008). *Children and AIDS - Third Stocktaking Report*. (with Statistical Annexes). Dec. 2008. See Table 1. Preventing mother-to-child transmission of HIV (pp. 33-35) and Table 2. Providing paediatric treatment (pp. 36-38). URL: [www.unicef.org/uniteforchildren](http://www.unicef.org/uniteforchildren) - [http://www.uniteforchildren.org/uniteforchildren/knowmore/files/StocktakingReport08\\_Full\\_110708.pdf](http://www.uniteforchildren.org/uniteforchildren/knowmore/files/StocktakingReport08_Full_110708.pdf).

positive women, but the size of the reductions varies from country to country depending on the level of coverage that treatment reaches in each country.<sup>20</sup>

The survivorship of infected children<sup>7</sup> takes account of varying access to paediatric treatment. In the *2008 Revision*, HIV-infected children are divided into two groups: (i) those infected in-utero, among whom the disease progresses rapidly and whose average survival is set at 1.3 years, and (ii) those infected through breast-feeding after birth, among whom the disease progresses slowly and whose average survival is set at 15.2 years without treatment.<sup>21</sup> Explicit inclusion of paediatric treatment is done via country-specific coverage levels which average 34 per cent in 2007 but vary between 0 and 99 per cent among the 58 affected countries (with 15 countries having less than 10 per cent coverage in 2007 and only 12 countries having a coverage level above 75 per cent). By 2015, the projected coverage is expected to reach 60 per cent on average in the 58 affected countries, varying from 40 per cent to 100 per cent. Coverage levels are assumed to remain constant from 2015 to 2050 at the level reached in each country by 2015. The annual survival of children receiving treatment is 80 per cent during the first year, 90 per cent the second year, and 95 per cent thereafter, so that their mean survival time is 31.1 years and the median survival time is 20.5 years in the absence of other causes of death.

The *2008 Revision* incorporates a longer survival for persons receiving treatment with highly active antiretroviral therapy (ART). The proportion of the HIV-positive population receiving treatment in each country is consistent with estimates prepared by the World Health Organization,<sup>22</sup> which averaged 36 per cent in 2007 among the 58 affected countries, but varied between 8 per cent and 99 per cent. Coverage is projected to reach between 40 per cent and 100 per cent by 2015, averaging 60 per cent for the affected countries. Between 2015 and 2050, coverage levels are assumed to remain constant at the level reached in each country by 2015. It is assumed that adults receiving treatment have, on average, an 85 per cent chance of surviving on the first year of treatment, and a 95 per cent chance of surviving each year thereafter in the absence of other causes of death. Under this assumption, mean survival time after the initiation of therapy is 19.3 years and the median survival time is 10.9 years, in the absence of other causes of death. Therapy is assumed to start at the time full-blown AIDS develops. Without treatment, infected adults have a mean survival time of 3.2 years (and a median survival time of 3.0 years) after the onset of full-blown AIDS.

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<sup>20</sup> Stover J, Johnson P, Zaba B, Zwahlen M., Dabis F., Ekpini R.E. (2008). The Spectrum projection package: improvements in estimating mortality, ART needs, PMTCT impact and uncertainty bounds. *Sexually Transmitted Infections*. August 2008, Volume 84, Supplement 1, pp. i24-i30. doi:10.1136/sti.2008.029868 - [http://sti.bmj.com/cgi/content/full/84/Suppl\\_1/i24](http://sti.bmj.com/cgi/content/full/84/Suppl_1/i24).

<sup>21</sup> Marston M., Zaba B., Salomon J.A., Brahmabhatt H., Bagenda D. (2005) - Estimating the Net Effect of HIV on Child Mortality in African Populations Affected by Generalized HIV Epidemics. *JAIDS Journal of Acquired Immune Deficiency Syndromes*. Volume 38, Number 2, February 1 2005. pp. 219–227 ; Newell, M-L. Coovadia H., Cortina-Borja M., Rollins N., Gaillard P., Dabis F. (2004). Mortality of infected and uninfected infants born to HIV-infected mothers in Africa: a pooled analysis. *Lancet*. Vol. 364. October 2, 2004, pp: 1236–43.

<sup>22</sup> WHO/UNAIDS/UNICEF. *Towards universal access: scaling up priority HIV/AIDS interventions in the health sector, progress report 2008*. Geneva, WHO, June 2008. [http://www.who.int/entity/hiv/pub/towards\\_universal\\_access\\_report\\_2008.pdf](http://www.who.int/entity/hiv/pub/towards_universal_access_report_2008.pdf).

## **DEMOGRAPHIC DATA**

A wealth of demographic data is available through the Uganda Bureau of Statistics (UBOS) in Kampala. Three principal sources of demographic data are used in this study.

*National Populations Censuses:* UBOS regularly conducts Population and Housing Censuses which offer the most comprehensive information on the total number of people, distribution by age and sex (age structure), and population growth rates. Censuses also provide information on fertility, mortality, and migration. Currently, Uganda is preparing for the 2012 Population and Housing Census and data are not yet available. Previous censuses took place in 1969, 1980, 1991, and 2002. Prior to independence in 1962, two censuses (using modern techniques) were conducted in 1948 and 1959.

*Demographic and Health Surveys:* Four Demographic and Health Surveys (DHS) were completed in 1988, 1995, 2000-2001, and 2006. The most recent survey is the first to cover the entire nation since security issues restricted the scope of previous three surveys. The DHS provides data on the situation of the population, particularly on health and nutrition outcomes. More specifically, such a survey provides relevant information on fertility levels and preferences, awareness and use of family planning methods, child mortality, maternal and child health, maternal mortality, sexual activity, and awareness and behavior regarding sexually transmitted infections (including HIV/AIDS).

*Supplemental Surveys:* Less extensive demographic health surveys were conducted in Uganda and provide valuable additional information. In southwestern Uganda fertility surveys were conducted in the mid-1980s to study the determinants of fertility (May et al. 2007). A negotiating reproductive health outcomes study in 1995-96 concentrated on key gender and reproductive health issues that were addressed at the International Conference on Population and Development (ICPD) in Cairo 1994. In 2002, a national health facilities survey was conducted to evaluate access and quality of health care services. Finally, a national sero-prevalence survey from 2003-04 was used to estimate HIV/AIDS indicators.

## **MAIN POPULATION POLICY DOCUMENTS AND DEVELOPMENT STRATEGIES**

*1995 National Population Policy:* Uganda's original population policy was developed in 1995 following the International Conference on Population and Development of 1994 (ICPD) held in Cairo, Egypt. The plan outlines strategies for achieving goals in the areas of migration, urbanization, education, family health, employment, nutrition, housing, the environment, the role of men and women in family welfare, youth, the elderly, and persons with disabilities. It emphasizes the importance of achieving population and development goals through wide-ranging reproductive health services.

*2008 National Population Policy for Social Transformation and Sustainable Development:* In 2008, the Government of Uganda issued a second population policy document, updating the previous document written more than ten years before. This policy revised its focus and addressed its changing demographics and rising population growth rate. The new policy placed more emphasis on family planning, child spacing,

and the prevention of risky pregnancies. It calls for improved health through strengthening of referral systems, the deployment of skilled human resources for reproductive health, and youth-friendly reproductive health services. Despite the policy's recognition of the connections between population, health, poverty, and the environment, its population reduction strategies remained broad.

*National Development Plan (2010/11 – 2014/15)*: In 2010, Uganda released a comprehensive poverty reduction plan with the theme of growth, employment and social-economic transformation for prosperity. Within the plan, the Government reiterated the need for sustainable population growth, dedicating a section to the issue. The objectives listed (nine in total) were identical to those in the previous *2008 National Population Policy for Social Transformation and Sustainable Development*. The strategies and interventions outlined were expanded upon, but the plan still lacked clear indicators or benchmarks.

### **Annex 3: Econometric Analysis for the Intermediate Determinants of Fertility**

Tables 1 and 2 present the results for the total number of children and the probability of having given birth in the last five years previous to the interview. Table 1 includes all fertile aged (15 to 49 years old) women and table 2 separates them into subgroups depending on the current region of residence (rural / urban.)

The first five coefficients in the first column of results in table 1 illustrate the age effects. Specifically, a woman aged between 35 and 39 years has given birth to one child less than a woman aged between 40 to 49 years, everything else equal. Likewise, women aged 30 to 34 years old have given birth to two children less compared to similar women in their forties. The positive relationship between age and the total number of births exists throughout the whole fertile period such that teenagers (ages 15 to 19) have given birth to six children less than women aged 40 to 49 who have similar characteristics regarding education, marital status, religion, region of residence, wealth, etc. as them. The second column of table 1 shows that being older than 15 years old but younger than 40 always increases the probability of having given birth in the last five years compared to women in their forties, assuming that one has average characteristics in all the other covariates. The relationship is that of an inverted U-shape. That is, women aged 15 to 19 (35 to 39) have a probability of having given birth in the last five years 24 (27) percent higher than similar women in their forties. The increase is however of 45 to 47 percent for women in their twenties, *ceteris paribus*. These comparisons hold for women with mean values in all the other covariates.

Women who have ever been in a union (currently or previously married or cohabiting) have about one child more than similar women who have never cohabited. They are also much more likely (62 percent) to have given birth in the last five years compared to similar women who have never cohabited. This is assuming that women in both groups (ever married and never cohabited) have average values in the other variables.

Muslim women have also slightly more children than similar Christian women (either protestant or catholic.)

Wealth is also an important proximate determinant of total current fertility as well as of the probability of having given birth in the last five years. In particular, women at the third (fourth) (fifth) wealth quintile have a probability of having given birth in the last five years 7.1 (9.3) (19.4) percent lower than similar women in the lowest wealth quintile. This is assuming that all these women have mean values in all the other covariates.

Once one has controlled for the variables whose effects have been described above, the current region of residence has few to add to the explanation of the variation of fertility. Like this, one finds that only women residing in the West Nile region (which encompasses the districts of Adjumani, Arua, Koboko, Nyadri, Nebbi, and Yumbe) have had slightly fewer births than similar women in Kampala. This final result should however be taken with caution as it is based on less than 750 unweighed women.

**Table 1: Correlates of Fertility, Women 15-49**

	(1) Total children born	(2) Any birth in the last 5 years
age15_19	-6.307*** (0.109)	0.240*** (0.0224)
age20_24	-5.174*** (0.0987)	0.473*** (0.0115)
age25_29	-3.650*** (0.101)	0.453*** (0.0104)
age30_34	-2.154*** (0.107)	0.388*** (0.0117)
age35_39	-1.061*** (0.122)	0.272*** (0.0146)
prim_some	-0.0353 (0.0737)	0.0426** (0.0216)
prim_ormore	-0.324*** (0.0874)	0.0564* (0.0288)
age1stint	-0.188*** (0.00961)	0.00154 (0.00317)
ever_marr	0.774*** (0.0524)	0.619*** (0.0180)
unmet	0.854*** (0.0527)	0.232*** (0.0162)
earns	-0.127*** (0.0454)	0.00788 (0.0174)
rel_muslim	0.145** (0.0648)	0.0361 (0.0231)
rel_other	0.0589 (0.0707)	-0.0352 (0.0262)
electr	-0.401*** (0.0847)	-0.0490 (0.0338)
quintile_2	-0.109 (0.0708)	-0.0411 (0.0259)
quintile_3	-0.179** (0.0757)	-0.0714** (0.0301)
quintile_4	-0.159* (0.0812)	-0.0932*** (0.0323)
quintile_5	-0.377*** (0.103)	-0.194*** (0.0364)
rural	0.219* (0.114)	0.0563* (0.0299)
Central1	0.101 (0.129)	0.0417 (0.0433)
Central2	0.188 (0.129)	0.0351 (0.0472)
East_Central	0.136 (0.141)	0.0731 (0.0459)
Eastern	-0.0378 (0.138)	0.0616 (0.0426)
North	-0.197 (0.128)	0.0462 (0.0413)
West_Nile	-0.293** (0.147)	0.0484 (0.0420)

Western	0.00779 (0.137)	0.0376 (0.0459)
Southwest	0.0532 (0.128)	0.00739 (0.0446)
Constant	9.485*** (0.236)	
Mean births	3.612646 (.0398357)	
Mean prob. birth in last 5 years		.5975123 (.0066727)
Observations	8,054	8,054
R-squared	0.710	

*Source:* Estimation using data from the Ugandan DHS 2006. (1) OLS estimation, (2) Marginal effects from a logit model. Clustered standard errors in parentheses. Asterisks denote the significance level (double sided) \*: 10 percent, \*\*: 5 percent, \*\*\*: 1 percent

***Description of variables (omitted category in brackets)***

- Age group [40-49]

age\_x\_y = the interviewed woman was between x and y years old at the time of the interview (2006).

- Education [no formal education]

prim\_some = incomplete primary school  
prim\_ormore = at least complete primary

- Marital status [never married or cohabiting]

ever\_marr = currently or previously<sup>23</sup> in a formal or informal union.

- Religion [Catholic or Protestant]

rel\_muslim = the interviewed woman is Muslim.  
rel\_other = the interviewed woman practices the Pentecostal, the Seventh-day Adventist, or other religion.

- Wealth quintile [first quintile]

quintile\_2 = the interviewed woman belongs to the second quintile of the wealth distribution in Uganda. Similarly:  
quintile\_3 = third quintile  
quintile\_4 = fourth quintile  
quintile\_5 = fifth quintile

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<sup>23</sup> Currently widowed, divorced or separated.

- Other variables

age1stint = age at first birth sexual intercourse, current age for those who have not yet had sex.

unmet = unmet need for family planning (either for spacing or for limiting births) = the interviewed woman reports that she does not want to have any more children or wants to wait at least two years to have one but is not using contraceptives and is having an active sexual life.

earns = the interviewed woman earns some cash for her work.

electr = the woman has electricity in her dwelling.

rural = the interviewed woman currently resides in the countryside.

- Region [Kampala] (Northern region for the rural subsamples)

Central1: The interviewed woman currently resides in a district that lies within the Central 1 region (Kalangala, Masaka, Mpigi, Rakai, Lyantonde, Sembabule, and Wakiso districts.) Similarly:

Central 2: Kayunga, Kiboga, Luwero, Nakaseke, Mubende, Mityana, Mukono, and Nakasongola

East Central: Bugiri, Busia, Iganga, Namutumba, Jinja, Kamuli, Kaliro, and Mayuge

Eastern: Kaberamaido, Kapchorwa, Bukwa, Katakwi, Amuria, Kumi, Bukedea, Mbale, Bududa, Manafwa, Pallisa, Budaka, Sironko, Soroti, Tororo, and Butaleja

North: Apac, Oyam, Gulu, Amuru, Kitgum, Lira, Amolatar, Dokolo, Pader, Kotido, Abim, Kaabong, Moroto, and Nakapiripirit

West Nile: Adjumani, Arua, Koboko, Nyadri, Nebbi, and Yumbe

Western: Bundibugyo, Hoima, Kabarole, Kamwenge, Kasese, Kibaale, Kyenjojo, Masindi, and Buliisa

Southwest: Bushenyi, Kabale, Kanungu, Kisoro, Mbarara, Ibanda, Isingiro, Kiruhura, Ntungamo, and Rukungiri

### **Analysis with disaggregation by rural/urban residence**

Given that current area of residence was found to be an important factor in the explanation of fertility, Table 2 repeats the exercise for two sub-groups: women in the country side (first two columns of results) and those in urban areas (last two columns of results.)

As 83 percent of all women who were interviewed reside in the country side, the results for the rural sub-sample are qualitatively and quantitatively very similar to those shown in table 1. The only difference is that in the country side, average women who have some primary school experience are not more (nor less) likely to have given birth in the last five years than similar women with no formal education.

Given that the whole Kampala region is urban, the North was chosen as the default region for the rural subsample. We then find that women residing in the Northern country side have given birth to fewer children than similar women in any other rural area in Uganda. Regarding the probability of having given birth in the last five years, only East Central residence increases such probability. This is assuming that the women that are being compared have average characteristics in all the other covariates.

As for the urban sub-sample, average women older than 15 years old but younger than 40 still have a larger probability of having given birth during the last five years than similar women in their forties. The relationship between this birth indicator and age now finds its maximum at the age group 20 to 24. That is, women in their early twenties (20-24 years old) have a probability of having given birth in the last five years 63 percent higher than similar women in their forties. In contrast, teens (15 to 19 years old) are only 43 percent more likely to have given birth in the last 5 years than similar women in the default age group (40-49 years old.) These comparisons hold for women who have average characteristics in all the other covariates. Despite the higher probability of having given birth in the last five years, women younger than 40 but older than 15 have given birth to fewer children than similar women in their forties. Specifically, teenagers (ages 15 to 19) have given birth to four children less than similar women in their forties. As it can be expected, the difference steadily decreases as women get older such that there exists a difference of less than one child between women in their late thirties and similar women in their forties.

Women with some primary education residing in urban areas (towns or cities) have a probability 20 percent higher of having given birth in the last five years than similar women with no formal education. This holds for women with mean values in all the other variables. Taking into account their whole birth history and not only the most recent one, women who have at least completed the primary school have given birth to fewer children than similar women with null school experience.

As it was the case in the pooled and in the rural sample, a five year increase in the age at the first sexual intercourse decreases the total number of births by almost one child among urban women *ceteris paribus*. As it was already explained, this figure constitutes a lower bound.

Ever married or cohabitating women have about one child more than similar women who have never cohabited. They have also a probability of having given birth in the last five years 56 percent higher than similar women who have never cohabited. This as usual hold only for women with average values in all the other covariates.

Women residing in an urban area with an unmet need for family planning have had more children than similar women in the default group (using contraceptives, trying to get pregnant, abstaining, or sterile, amenorrheic, etc.) They are also 20 percent more likely to have given birth in the last five years (assuming that they have average characteristics in the other variables.)

In this urban context, neither religion nor wealth affects fertility. In contrast, having electricity at home decreases the total number of births a woman has had.

Finally, the region of residence has also an impact on fertility. Specifically, women residing in an urban area in the Central<sup>24</sup> or in the West Nile region have given birth to slightly more children than similar women in Kampala. On the other hand, East Central residence has a negative effect on total current fertility as well as on the probability of having given birth in the last five years. Women in the North or in the Western region have a probability of having given birth in the last five years 19 and 9 percent respectively, higher than similar women in Kampala.

**Table 2: Correlates of Fertility: Rural and Urban Women 15-49 years old**

	Rural (1) Total children born	Rural (2) Any birth in the last 5 years	Urban (3) Total children born	Urban (4) Any birth in the last 5 years
age15_19	-6.534*** (0.111)	0.207*** (0.0221)	-4.625*** (0.271)	0.434*** (0.0621)
age20_24	-5.403*** (0.100)	0.425*** (0.0123)	-3.861*** (0.261)	0.631*** (0.0395)
age25_29	-3.773*** (0.107)	0.428*** (0.0106)	-2.752*** (0.249)	0.546*** (0.0396)
age30_34	-2.240*** (0.113)	0.350*** (0.0125)	-1.511*** (0.285)	0.536*** (0.0316)
age35_39	-1.091*** (0.131)	0.247*** (0.0149)	-0.779** (0.309)	0.360*** (0.0501)
prim_some	0.0287 (0.0772)	0.0271 (0.0218)	-0.0848 (0.238)	0.203*** (0.0703)
prim_ormore	-0.211** (0.0905)	0.0665** (0.0290)	-0.564** (0.277)	0.114 (0.0793)
age1stint	-0.188*** (0.0110)	0.000303 (0.00321)	-0.172*** (0.0171)	0.00784 (0.00815)
ever_marr	0.841*** (0.0617)	0.637*** (0.0214)	0.870*** (0.0903)	0.559*** (0.0315)
unmet	0.865*** (0.0543)	0.223*** (0.0164)	0.457*** (0.170)	0.198*** (0.0602)
earns	-0.138*** (0.0488)	0.00302 (0.0183)	0.0500 (0.104)	0.0338 (0.0411)
rel_muslim	0.128* (0.0740)	0.0383 (0.0254)	0.184 (0.115)	0.0323 (0.0491)
rel_other	0.0261 (0.0814)	-0.0508* (0.0277)	0.105 (0.128)	0.00649 (0.0616)
electr	-0.588***	-0.0809	-0.287***	-0.0147

<sup>24</sup> Find the list of districts in each region is page 8 of this document.

quintile_2	(0.172) -0.130* (0.0731)	(0.0600) -0.0428 (0.0262)	(0.0715) 0.0511 (0.590)	(0.0393) -0.00309 (0.0913)
quintile_3	-0.198*** (0.0760)	-0.0737** (0.0304)	-0.629 (0.813)	-0.000468 (0.171)
quintile_4	-0.208** (0.0839)	-0.107*** (0.0336)	-0.0357 (0.696)	0.0582 (0.108)
quintile_5	-0.387*** (0.108)	-0.197*** (0.0416)	-0.247 (0.725)	-0.0790 (0.111)
Central1	0.344*** (0.115)	0.00415 (0.0334)	0.274*** (0.0724)	0.100 (0.0676)
Central2	0.396*** (0.118)	0.00331 (0.0336)	0.386*** (0.0795)	0.000526 (0.0805)
East_Central	0.440*** (0.0909)	0.0558* (0.0302)	-0.383*** (0.121)	-0.0926* (0.0516)
Eastern	0.160** (0.0804)	0.0315 (0.0244)	0.346 (0.218)	-0.0258 (0.0630)
North			0.308 (0.280)	0.186** (0.0813)
West_Nile	-0.157 (0.101)	0.00965 (0.0279)	0.389** (0.190)	0.106 (0.0650)
Western	0.267** (0.105)	0.00186 (0.0337)	-0.0938 (0.107)	0.0865** (0.0351)
Southwest	0.274*** (0.0912)	-0.0300 (0.0300)	0.178 (0.160)	0.0177 (0.0740)
Constant	9.516*** (0.238)		8.000*** (0.915)	
Mean births	3.866615 (.0481)		2.353468 (.1128105)	
Mean prob. birth in last 5 years		.6228422 (.0082454)		.4719267 (.0194066)
Observations	6,703	6,703	1,351	1,351
R-squared	0.711		0.679	

*Source:* Estimation using data from the Ugandan DHS 2006. (1) & (3) OLS estimation. (2) & (4) marginal effects from a logit model. Clustered standard errors in parentheses. The Northern region, instead of Kampala, is the omitted region for the rural subsample as all communities in Kampala are urban. Asterisks denote the significance level (double sided) \*: 10 percent, \*\*: 5 percent, \*\*\*: 1 percent

#### Annex 4: Econometric Analysis for the Determinants of Under-five Mortality in Uganda

Table 3 presents the results for the probability of dying before the fifth birthday in Uganda. The first column shows results including all fertile aged (15 to 49 years old) women who have given birth at least once in the five years previous to the interview. They were asked whether each of their children was still alive. If not, they were asked how old the child was when she passed away. This is how the dependent variable was constructed. Column 2 includes only women residing in the country side, and column 3 those residing in towns or cities. Each column presents marginal effects which were calculated keeping all other variables constant at their mean values. The data was obtained from the Ugandan Demographic and Health Survey 2006. The results are as follows.

Once one has controlled for the variables whose effects have been described in the main text of the report, the current maternal region of residence is significant only in the rural sample. Specifically, children born from women currently residing in the Central 1 or in the Southwest regions are 1.34 percent less likely to die before their fifth birthday than similar children in the Northern region, *ceteris paribus*. Similarly, the probability of dying before age five is decreased by 1.59, 1.74 and 2.06 percent if residing in the Eastern, East Central or Central 2 regions, respectively. This is always compared to similar children whose mothers currently reside in the Northern region and keeping all other covariates constant at their mean values.

Note that several additional specifications were estimated before reaching this final model. In particular, there was a specification that controlled for an indicator of being of birth order higher than five instead of controlling for being the first child, and another one that controlled for birth at home along with the covariates included in the final model. The estimated coefficients for those two indicators turned out not to be statistically significant and had no effect on the estimated coefficients of the other covariates (so there is no correlation between them.) Because of this, it was decided to omit those two indicators such that this is the final specification.

**Table 3: Correlates of Under-five Mortality in Uganda**

	(1) All	(2) Rural	(3) Urban
teenager	0.00692 (0.00757)	0.00924 (0.00829)	-0.0120 (0.0170)
prim_some	-0.00203 (0.00646)	5.79e-05 (0.00661)	-0.0358 (0.0221)
prim_ormore	-0.0165** (0.00777)	-0.0138* (0.00776)	-0.0634* (0.0337)
rel_muslim	0.00753 (0.00870)	0.00527 (0.00919)	-0.00588 (0.0202)
rel_other	0.0127 (0.00819)	0.0137 (0.00858)	-0.0111 (0.0192)
subopt_int	0.0308** (0.0136)	0.0282** (0.0139)	0.0354 (0.0315)

no_prenatal	0.0989*** (0.00642)	0.103*** (0.00680)	0.0444*** (0.0161)
first	0.00300 (0.00739)	0.00252 (0.00757)	-0.00269 (0.0196)
female	-0.0114*** (0.00439)	-0.0118*** (0.00447)	-0.00421 (0.0127)
low_bweight	0.0263* (0.0142)	0.0248* (0.0143)	0.0288 (0.0387)
no_weight	0.0130** (0.00542)	0.0104* (0.00563)	0.0430** (0.0209)
subopt_bf	0.297*** (0.0168)	0.313*** (0.0186)	0.184*** (0.0297)
fem_hohh	0.0161*** (0.00607)	0.0145** (0.00623)	0.0363* (0.0198)
piped_water	-0.000107 (0.0122)	-0.0144 (0.0124)	0.0396 (0.0241)
uncov_water	0.0183* (0.0101)	0.0166 (0.0102)	-0.0335** (0.0163)
covered_water	0.00657 (0.00677)	0.00485 (0.00698)	0.0293 (0.0370)
flush	0.000837 (0.0345)		-0.0148 (0.0231)
latr_vip	0.0386** (0.0196)	0.0195 (0.0189)	0.0501* (0.0274)
latr_uncov	-0.00554 (0.00574)	-0.00575 (0.00575)	0.00677 (0.0290)
no_sanit	-0.00814 (0.00739)	-0.00640 (0.00736)	
composting	0.0918** (0.0422)	0.0921** (0.0433)	
electr	-0.00986 (0.0128)	-0.00786 (0.0202)	-0.0123 (0.0148)
quintile_2	0.000336 (0.00643)	0.00115 (0.00648)	0.0502 (0.122)
quintile_3	-0.00117 (0.00778)	-0.000520 (0.00786)	-0.00495 (0.0671)
quintile_4	0.00320 (0.00854)	0.00705 (0.00895)	-0.0222 (0.0561)
quintile_5	0.00317 (0.0110)	0.000401 (0.0117)	0.00679 (0.0740)
rural	-0.00524 (0.0124)		
Central1	0.00287 (0.0184)	-0.0134* (0.00729)	0.00405 (0.0340)
Central2	-0.00746 (0.0165)	-0.0206** (0.00848)	-0.0238 (0.0146)
East_Central	-0.00152 (0.0169)	-0.0174*** (0.00587)	0.000362 (0.0273)
Eastern	0.00222 (0.0192)	-0.0159** (0.00785)	0.0365 (0.0436)
North	0.0171 (0.0209)		0.00409 (0.0288)
West_Nile	0.0355 (0.0326)	0.00526 (0.0107)	0.0795 (0.0710)
Western	0.00651 (0.0197)	-0.0100 (0.00816)	-0.0158 (0.0195)

Southwest	0.00269 (0.0181)	-0.0133* (0.00757)	-0.0195 (0.0149)
Mean prob. death	.0889513 (.0039716)	.0895769 (.0042748)	.0873988 (.0108531)
Observations	8,022	7,145	855

*Source:* Estimation using data from the Ugandan DHS 2006. Marginal effects from a logit model. Clustered standard errors in parentheses. Asterisks denote the significance level (double sided) \*: 10 percent, \*\*: 5 percent, \*\*\*: 1 percent The Northern region, instead of Kampala, is the omitted category for the rural subsample as all communities in Kampala are urban. 15 individuals whose dwelling has no sanitation facilities had to be dropped out of the analysis in the urban subsample as in that case, the dependent variable had no variation (i.e.: no child passed away before her fifth birth in those cases.) For the same reason, seven individuals residing in the country side whose dwelling has access to a flush toilet were dropped out from the analysis. This is why the total number of observations in the rural sub-sample plus that of the urban sub-sample do not add up to the pooled sample.

### *Description of variables (omitted category in brackets)*

#### **Maternal characteristics**

- Education [no formal education]

prim\_some = the baby's mother has incomplete primary school at the time of the interview

prim\_ormore = the baby's mother has at least complete primary at the time of the interview

- Religion [Catholic or Protestant]

rel\_muslim = the baby's mother is Muslim

rel\_other = the baby's mother practices the Pentecostal, the Seventh-day Adventist, or other religion

- Wealth quintile [first quintile]

quintile\_2 = the baby's mother currently belongs to the second quintile of the wealth distribution in Uganda. Similarly:

quintile\_3 = third quintile

quintile\_4 = fourth quintile

quintile\_5 = fifth quintile

- Other variables

teenager = the baby's mother was younger than 20 years old when the baby was born

no\_prenatal = the baby's mother did not have any prenatal care revision during her pregnancy

#### **Infant characteristics**

subopt\_int = suboptimal birth interval = the baby was conceived less than six months after the birth of her last sibling.

first = the baby is the first birth for her mother

female = the baby is a girl

low birth weight = low birth weight = the baby was born weighing less than 2.5 kilograms

no weight = the baby was not weighed after being born

subopt\_bf = suboptimal breast-feeding = the baby was breast-fed for less than six months

### **Household characteristics**

- Head of household's gender [male]

fem\_hohh = the head of the household is female

- Main source of drinking water for household members [surface (river, lake or dam) or rainfall water]

pipewater = piped water (piped into the dwelling, into the yard or plot, or there is a public tap.)

uncoverwater = uncovered water = water from an unprotected well or spring (which is either public or is to be found in the dwelling's yard.)

coverwater = covered water = water from a protected well or spring, a tanker truck, a water vendor, a borehole, bottled water, or gravity flow water.

- Type of toilet facility usually used by household members [covered pit latrine with or without slab]

flush = flush toilet

latr\_vip = ventilated improved pit latrine

latr\_uncover = uncovered pit latrine (with or without slab)

no\_sanit = no sanitation = bush

composting = composting toilet

- Other variables

electr = the dwelling where the baby resides has electricity

rural = the baby resides in the country side

- Region [Kampala] (Northern region for the rural subsample)

Central1: The baby's mother currently resides in a district that lies within the Central 1 region (Kalangala, Masaka, Mpigi, Rakai, Lyantonde, Sembabule, and Wakiso districts.) Similarly:

Central 2: Kayunga, Kiboga, Luwero, Nakaseke, Mubende, Mityana, Mukono, and Nakasongola

East Central: Bugiri, Busia, Iganga, Namutumba, Jinja, Kamuli, Kaliro, and Mayuge

Eastern: Kaberamaido, Kapchorwa, Bukwa, Katakwi, Amuria, Kumi, Bukedea, Mbale, Bududa, Manafwa, Pallisa, Budaka, Sironko, Soroti, Tororo, and Butaleja

North: Apac, Oyam, Gulu, Amuru, Kitgum, Lira, Amolatar, Dokolo, Pader, Kotido, Abim, Kaabong, Moroto, and Nakapiripirit

West Nile: Adjumani, Arua, Koboko, Nyadri, Nebbi, and Yumbe

Western: Bundibugyo, Hoima, Kabarole, Kamwenge, Kasese, Kibaale, Kyenjojo, Masindi, and Buliisa

Southwest: Bushenyi, Kabale, Kanungu, Kisoro, Mbarara, Ibanda, Isingiro, Kiruhura, Ntungamo, and Rukungiri

## **Annex 5: Simulations of Alternative Demographic Scenarios for Uganda with MAMS model**

Uganda has one of the most rapidly growing populations of the world, primarily related to its relatively high total fertility rate (TFR). This Annex explores the impact of alternative demographic scenarios for the period 2010-2050. The analysis relies on an economy wide simulation model, MAMS (Maquette for MDG Simulations).

The base scenario incorporates the UN 2008 high variant population projection which, according to the assessment of current trends, reflects a likely demographic future for Uganda under current policies. In an alternative policy scenario, the UN medium variant is introduced, which assumes a more rapid decline in the TFR, in conjunction with an expansion in family planning (FP) services that, according to available evidence, would likely accomplish this decline in fertility.

In a set of additional “vision” scenarios, the findings presented in Section 3 are expanded on, in which econometric cross-country analysis is used to project GDP and GDP per capita under alternative UN population variants. More specifically, the vision scenarios of this Annex simulate the medium, low and constant fertility population variants with the same GDP growth as in Section 3.

In outline, the scenario BASE is presented and subsequently contrasted with a set of alternative scenarios – the policy scenario based on the UN medium variant and the three vision scenarios, winding up with a set of conclusions.

### BASE

The scenario BASE is designed to generate a plausible evolution of the economy up to 2050, drawing on current trends and policies as well as the findings of Section 3 in terms of aggregate GDP growth. It serves as a benchmark for comparisons when analyzing the effects of alternative developments in terms of policy and other changes.

For the period 2003-2009, the BASE replicates observed growth in real GDP at factor cost. For the period starting from 2010, drawing on results from Section 3 for the high UN population projection, an annual growth rate of 4.5 percent is imposed. On the spending side, government service consumption (disaggregated by function), investments in infrastructure (split into roads and agriculture), and domestic government transfers are exogenous shares of absorption (total domestic final demand); this means that government spending on these items will be adjusted in response to changes in GDP growth, the trade balance, and terms of trade changes. The private sector benefits (across the board) from the productivity gains that stem from increased investments in public infrastructure.

On the government receipt side, grant aid is assumed to remain constant (in real foreign currency terms) while the government budget, starting from 2011 will receive foreign exchange earnings from oil, with gradual increases up to 2024 when a peak is reached, followed by a gradual decline up to 2045 when oil revenues come to an end. Government foreign and domestic borrowing is set so as to keep foreign and domestic debt stocks roughly unchanged relative to GDP. Effective rates of import tariffs are unchanged over

time. Domestic tax rates (direct and indirect) are scaled to ensure that the government stays within the limits of available fiscal space.

Simulation results and assumptions are summarized in Tables 1-7, all of which refer to the period 2009-2050. For most macro aggregates, annual growth is at 4-5 percent (Table 1). Total factor productivity (TFP) grows a modest pace, a reflection of a modest aggregate growth rate for GDP and growth in factor employment (most importantly labor and capital) at a rate close to the GDP growth rate. The labor force grows slightly more rapidly than employment, between 2009 and 2050 leading to an increase in the unemployment rate from 26 percent to 35 percent.<sup>25</sup> Relative to GDP, most items in the government budget change only moderately, with the exception of foreign transfers (defined to include grant aid and net oil revenues) which decline, reflecting the assumption that grant aid stays at the 2009 level in constant dollar terms, as a result declining relative to GDP, while government revenues from oil by 2050 has ceased (Table 2). Real household consumption per capita increases by close to 67 percent during the period 2009-2050 along with a significant decline in the headcount poverty rate (at the alternative poverty lines of \$2 and \$1.25 PPP a day) and improvements in the three non-poverty MDG indicators that are monitored: MDGs 2 (defined as the expected on-time completion rate for the 1<sup>st</sup> year primary school age cohort if the net intake and promotion rates of the year in question would prevail throughout their primary cycle), 4, and 7 (Table 3).<sup>26</sup> As shown in Table 4, all gross enrollment and completion rates are higher in 2050 for BASE than in 2009. The only exception is the primary gross enrollment rate which declines as the entry of non-age cohort students gradually declines and the internal efficiency of the primary cycle increases due to a fall repetition rates.<sup>27</sup>

The fact the government spending in different areas expands at the same pace as absorption means that real government services, with the exact rates varying depending on different price developments for different functions. Table 5 shows government service growth in per-capita terms; for education using the population in the relevant age groups for each cycle in the denominator.

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<sup>25</sup> Unemployment should be viewed as covering both un- and under-employment, providing a rough idea of the extent to which the labor force can put in more hours of work. Given the importance of the subsistence agriculture and the informal sector, official unemployment statistics do not properly reflect this.

<sup>26</sup> The headcount poverty calculation assumes a lognormal distribution. The 2005 result is calibrated to replicate World Bank data for this year: a Gini coefficient of 42.6 and a poverty rate of 75.6 (World Development Indicators). It is assumed the Gini coefficient does not change. MDG 2 is more specifically in each year  $t$  defined as  $NIR_t * PR_t^7$ , where  $NIR$  = net intake rate to grade 1;  $PR$  = promotion rate in the primary cycle (uniform across all grades); and the primary cycle has seven years.

<sup>27</sup> The gross enrollment rate (GER) for a cycle is the number of enrolled expressed as percent of the total population in the theoretical age for the cycle; in Uganda, 6-12 years for the primary cycle. Like several other countries that have undergone rapid expansion in primary expansion, Uganda has a primary GER above 100 percent, reflecting that a large number of students in primary schooling are older than 12 years. As part of the development process, the GER will decline, stabilizing at very close to 100 percent for high income countries.

## Scenario for cost-benefit analysis of family planning policies

The non-BASE scenarios are all characterized by specific assumptions regarding the evolution of the population and its age composition under the four UN 2008 population projection variants that are considered. The high variant was used for BASE. The constant fertility variant is an outlier with much more rapid population growth and a roughly unchanged dependency ratio. For the other variants, population growth is slower and, more importantly, the dependency ratio declines, meaning that each working age person carries the burden of supporting a declining number of others.

The first scenario, MED-FP, differs from BASE in that (a) the UN medium population variant and (b) the cost of additional family planning that would be required according to expert opinion, covering a mixture of modern methods and related services are imposed. As shown in Table 6, the additional costs are moderate, in 2010 corresponding to see a mere 0.014 percent of 2010 GDP.<sup>28</sup> In addition, the government targets maintaining the same non-poverty MDG and education outcomes as under BASE.<sup>29</sup> Given smaller young cohorts and a lower youth dependency rates, this means that the government is able to reduce its MDG-related service provision, reduce taxes and free up resources for private consumption, savings and investment. The purpose behind this simulation design is to ensure that welfare changes from this policy change are summarized by changes in real household consumption per capita and poverty.

As shown in Tables 1 and 2, the macroeconomic and budgetary outcomes are virtually identical except from some reallocation of final demand from the government to the private sector (a result of MDG and education targeting). Under the surface, labor (employment and stock) growth declines slightly (by 0.1 percent per year) while capital growth accelerates to a similar extent, with no noticeable change in GDP growth. The 2050 headcount poverty rate declines more significantly, from 48 to 42 percent at \$2 per day and from 40 to 24 percent at \$1.25 per day. Tables 3-4 indicate that 2050 real household consumption per capita is around 17 percent higher than for BASE whereas the non-poverty MDG outcomes are identical (by construction) and other education indicators only change minimally.

While the macroeconomic effects of this policy change were minor, the results suggest that, relative to the cost, the simulated benefit is extremely large. In fact, only in 2010 and 2011 is real per-capita household consumption lower for MED-FP (by a small value). Table 6 shows that present value (PV) of the changes in family planning and real household consumption (both valued at base-year prices) for MED-FP compared to BASE for the full period (2009-2050). At discount rates between 0 and 20 percent, the ratios between the benefit and the cost range between 100 and 38 percent. In fact, the consumption benefit is a *net* benefit given that the economic system has absorbed the FP

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<sup>28</sup> For example, in 2010 the cost covers provision of family planning to roughly 118,000 additional women at a cost of around US\$15 per woman.

<sup>29</sup> For MDGs 4 and 7, the MDG indicator is targeted year by year. For education, the promotion rates in primary, secondary and tertiary education are targeted, also on an annual basis. Other rates that reflect developments in education (rates of net intake to primary education and continuation to higher cycles) may differ marginally from the base outcome.

cost (by marginally raising taxes); i.e. at a discount rate of 10 percent, the PV net benefit is 40 percent of 2009 GDP from a government cost increase of 0.6 percent of GDP.<sup>30</sup>

On the basis of the equivalent variation (EV) results, the internal rate of return (the discount rate at which the net present value of this family planning program is zero) was computed; it is 628 percent. This large figure reflects the fact that the policy change raises consumption-based welfare in all years except the first, 2010; and that the initial welfare loss is minimal compared to subsequent gains.<sup>31</sup>

### Scenarios for analysis of the impact of demographic changes during the oil era

In a set of additional scenarios, labeled MED, LOW and CF, this Annex explores the broader economic consequences of the results in Section 3 for the medium-, low- and constant-fertility UN variants. Methodologically, the approach in Section 3 is different as it, in an econometric analysis, exploits associations between demography and economic growth in a large cross-country panel data set (covering 108 countries during the period 1961-2007 or slightly longer). Empirically, those results suggest that Uganda would benefit more strongly from reduced fertility rates than indicated by the preceding comparison between BASE and MED-FP. This may reflect that demography has an impact on economic development through additional channels and synergies that were not captured in the preceding section.

As a complement to the econometric analysis in Section 3 (which is limited to GDP and population data), this Annex extract's a picture of what the scenarios of Section 3 may imply in terms of a wider range of economic and social indicators. For each scenario, this Annex imposes the annual GDP growth rate for the period 2010-2050 (uniform over time) from Section 3 for each of these three population variants. The government maintains unchanged revenue-raising policies and permits consumption and investment (across the board) to grow within fiscal limits. The population figures and dependency ratios for these simulations are shown in Tables A.1 and A.2 – at two extremes, LOW

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<sup>30</sup> When computing the change in household consumption in any given year, real per-capita consumption under each of the two scenarios (BASE and MED-FP) was first multiplied by the population figure under the medium variant; after that, a difference in total real household consumption was computed for each. Implicitly, no weight was assigned to the lost consumption of those who were not born due to lower fertility under the UN medium variant. This is an example of a more general dilemma for cost-benefit analysis in a setting where population size varies. Is a society with a per-capita consumption of 100 and a population of 1 million better off than a society with a per-capita consumption of 50 and a population of 2 million? The method in the net benefit calculation indicates that this question is answered in the affirmative.

<sup>31</sup> For each year, EV is defined as the payment (>0 or < 0) to the aggregate consumer that would keep here at the same per-capita welfare level as simulated in the absence of changes in prices and (other) income. In other words, in the base year,  $u_0 = u(p_0, y_0)$ ; if prices and income are  $p_0$  and  $y_0$ , then utility is  $u_0$ . After some change in price and income, to  $p_1$  and  $y_1$ , then utility is  $u_1$ , i.e.  $u_1 = u(p_1, y_1)$ . If instead, there were no changes in prices and income, i.e.,  $p_0$  and  $y_0$  still hold, EV is the payment to the consumer, that brings the consumer utility level to  $u_1$ ; i.e.  $u_1 = u(p_0, y_0, EV)$ . For more, see for example Sadoulet and de Janvry (1995, pp. 13-14). Welfare changes according to EV tend to be very similar to those indicated by real household per-capita consumption. For example, when using EV per capita instead of real household consumption per capita, the computed PV net benefit at a 10 percent discount rate is very similar, at around 43 percent of 209 GDP as opposed to 40 percent of 2009 GDP when real household consumption per capita is used (as reported in the text).

and CF have both the lowest and highest population growth rates and the lowest and highest dependency ratios.

Table 1 shows the implications for the different scenarios at the macro level. The imposed aggregate GDP growth rates are at 5.0, 4.9, and 3.9 percent for MED, LOW, and CF, respectively. Growth in most macro aggregates, including TFP, accelerates or decelerates accordingly. By design, the role of the government (as measured by the GDP shares of government-related payments) stays very close to those of BASE (Table 2). Given larger growth variations, both for private consumption and different government services and investment, these vision scenarios also bring about larger changes for the different welfare, MDG and education indicators as these are influenced by the availability of resources in per-capita terms (Tables 3-5). For MED and, even more pronouncedly for LOW (since lower population growth more than makes up for slightly slower aggregate growth than for MED), per-capita real household consumption and the indicators for the different MDGs (1, 2, 4 and 7) all perform significantly better. On the other hand, the scenario CF brings about a strong increase in the poverty rates compared to 2009 and considerable slower progress than for the other scenarios in terms of private consumption, education, and health.

The gains in MDG and education outcomes are influenced by per-capita gains (or losses) in private consumption and government services (Table 5). For the MED and LOW scenarios, most government services (including those related to human development and infrastructure) expand by an additional 0.5 and 0.7 percentage points per capita per year; this expansion is accompanied by a very similar expansion in the capital stocks related to these different government functions. The changes are across the board positive but of varying magnitudes in education primarily because the changes in the population growth rates differ from the changes in aggregate population growth. On the other hand, for CF, annual per capita service growth declines by around 1.5 percentage points for most government functions.

**Table 1. Real macro indicators by simulation (% annual growth 2009-2050)**

	2009	base	med-fp	med	low	cf
<b>Absorption</b>	22,794.8	4.4	4.4	4.7	4.6	3.6
<b>Consumption - private</b>	15,039.3	4.1	4.2	4.4	4.2	3.5
<b>Consumption - government</b>	2,721.3	5.7	5.3	5.9	5.8	4.9
<b>Fixed investment - private</b>	3,612.7	4.5	4.8	4.9	5.0	3.1
<b>Fixed investment - government</b>	1,419.3	4.0	3.5	4.4	4.3	3.0
<b>Stock change</b>	2.3	3.8	3.8	4.1	4.0	2.9
<b>Exports</b>	6,507.3	4.9	5.0	5.3	5.2	3.9
<b>Imports</b>	7,757.4	4.2	4.3	4.6	4.5	3.3
<b>GDP at factor cost</b>	18,516.7	4.7	4.7	5.0	4.9	3.9
<b>Total factor employment (index)</b>		4.4	4.4	4.5	4.4	4.0
<b>Total factor productivity (index)</b>		0.3	0.3	0.5	0.5	-0.1
<b>Real exchange rate (index)</b>		0.4	0.3	0.3	0.3	0.5
<b>Unemployment rate (%)</b>	26.1	34.5	33.2	31.9	31.8	40.6
<b>Headcount poverty rate (%)</b>	65.3	47.9	41.6	37.3	35.3	75.8

**Note:**

1. Unless otherwise noted, column for initial year shows data in bn US\$ at 2003 prices
2. For the unemployment and poverty rates, the base-year and simulation columns show base-year rate and simulation-specific final-year rates, respectively.

**Table 2. Government budget in 2009 and by simulation in 2050 (% of nominal GDP)**

Indicator	2009	2050				
		base	med-fp	med	low	cf
<b>Receipts</b>						
Direct taxes	6.5	6.5	5.5	6.5	6.5	6.3
Import tariffs	3.5	4.4	4.4	4.4	4.4	4.4
Other indirect taxes	10.6	10.6	9.0	10.7	10.8	10.3
Foreign transfers	2.6	0.5	0.5	0.5	0.5	0.7
Domestic borrowing	0.4	0.3	0.3	0.3	0.3	0.4
Foreign borrowing	0.7	0.7	0.7	0.6	0.6	1.0
<b>Total</b>	<b>24.3</b>	<b>23.1</b>	<b>20.4</b>	<b>22.9</b>	<b>23.1</b>	<b>23.2</b>
<b>Spending</b>						
Consumption	12.6	12.1	10.5	11.9	12.0	12.0
Fixed investment	6.6	6.0	4.9	6.2	6.2	5.8
Private transfers	4.1	3.9	3.9	3.9	3.9	3.9
Domestic interest payments	0.8	1.0	1.0	0.8	0.9	1.3
Foreign interest payments	0.1	0.1	0.1	0.1	0.1	0.2
<b>Total</b>	<b>24.3</b>	<b>23.1</b>	<b>20.4</b>	<b>22.9</b>	<b>23.1</b>	<b>23.2</b>

**Table 3. Welfare and MDG indicators in 2009 and by simulation in 2050**

	2009	base	med-fp	med	low	cf
Household consumption per capita (index 2009 = 100)	100.0	167.2	194.8	210.4	222.1	86.3
MDG 1: headcount poverty at \$2 a day (PPP) (%)	65.3	47.9	41.6	37.3	35.3	75.8
MDG 1: headcount poverty at \$1.25 a day (PPP) (%)	39.7	24.0	19.3	16.4	15.1	51.9
MDG 2: primary on-time completion (%)	8.0	77.5	77.5	90.2	94.0	27.3
MDG 4: under-five mortality (‰)	116.6	53.0	53.0	47.4	45.9	89.4
MDG 7: improved water access (%)	67.5	83.8	83.8	88.0	89.3	71.2

**Table 4. Enrollment and completion rates by cycle in 2009 and by simulation in 2050 (%)**

	2009	base	med-fp	med	low	cf
GER - primary	105.6	90.3	90.9	95.3	97.6	66.6
GER - secondary	23.0	42.0	42.3	48.3	51.3	21.4
GER - tertiary	4.8	12.2	12.3	14.5	15.6	6.3
GCR - primary	41.1	79.8	80.5	89.2	93.2	40.7
GCR - secondary	12.3	21.4	21.7	25.1	27.3	10.8
GCR - tertiary	2.8	7.9	8.0	9.7	10.4	3.9

**Note:**

**GER = Gross Enrollment Rate**

**GCR = Gross Completion Rate**

**Table 5. Real government services by simulation (% annual growth per capita 2009-2050)**

	2009	base	med-fp	med	low	cf
Primary education*	231.3	3.4	3.1	3.9	4.2	1.9
Secondary education*	91.4	1.4	1.4	1.6	1.8	1.1
Tertiary education*	65.4	0.4	0.4	0.5	0.5	0.3
Health	217.8	2.8	1.9	3.2	3.5	1.1
Water	13.7	2.8	2.3	3.2	3.5	1.1
Agriculture	24.9	3.0	3.3	3.5	3.7	1.3
Roads	101.1	3.5	3.8	4.0	4.3	1.8
Other	1,734.2	2.6	2.9	3.1	3.3	0.9
<b>Total</b>	<b>2,721.3</b>	<b>2.8</b>	<b>2.7</b>	<b>3.2</b>	<b>3.5</b>	<b>1.1</b>

Note: Column for initial year shows data in bn US\$ at 2003 prices

\*Growth per capita with population represented by those in the official age of the cycle.

**Table 6. Family planning cost under high and medium variant for UN Population Projection**

Year	Family Planning Cost -- modern methods (commodities + services (current US\$ mn)		Difference* (current US\$ mn)	Deflation factor to 2003 US\$	Difference (2003 US\$)	Difference (bn 2003 U.Sh)	Difference (% of 2010 GDP)
	High variant	Medium variant					
2010	20.719	22.501	1.782	1.230	1.449	2.846	0.014
2015	35.368	41.002	5.634	1.426	3.951	7.760	0.037
2020	58.229	70.488	12.259	1.653	7.417	14.564	0.070
2025	92.975	116.067	23.092	1.916	12.051	23.666	0.113
2030	143.657	184.519	40.862	2.221	18.395	36.124	0.173
2035	223.533	283.651	60.118	2.575	23.346	45.845	0.220
2040	333.835	422.157	88.322	2.985	29.586	58.099	0.279
2045	484.689	609.244	124.554	3.461	35.991	70.677	0.339
2050	688.491	856.524	168.032	4.012	41.884	82.248	0.394

\* = Additional family planning cost to switch the demographic scenario from the high to the medium variant

**Table 7. Benefit-cost analysis of increased family planning**

Discount rate (%)	2010-2050 change in	Present Value	
		(bn 2003 U.Sh.)	(% of 2009 GDP)
0	family planning cost	1,490.5	6.9
	household consumption	149,365.7	693.3
3	family planning cost	658.9	3.1
	household consumption	59,588.9	276.6
5	family planning cost	405.9	1.9
	household consumption	33,830.9	157.0
10	family planning cost	148.6	0.7
	household consumption	9,726.0	45.1
20	family planning cost	40.9	0.2
	household consumption	1,588.9	7.4

## **Annex 6: Contraceptive Adoption, Fertility and the Family in Zambia**

**Source: The Abdul Latif Jameel Poverty Action Lab**

### **Policy Issue:**

As much as 75 percent of all pregnancies worldwide are unplanned or unwanted, accounting for nearly 300,000 new pregnancies every day (Partners in Health, 2009). To the extent that rapid population growth can lead to low levels of human capital investment and continued poverty for future generations, the ability to control fertility can have broad social and economic consequences. Recent evidence suggests that access to contraceptives may improve economic outcomes and reduce poverty by allowing women to optimally time births, increasing women's investment in education and participation in the labor market at childbearing ages. There are also direct consequences for individual well-being: significant reported need for contraceptives suggests that fertility outcomes outstrip fertility desires in many parts of the developing world.

Women's unmet need for contraceptives is commonly explained by three factors: (i) insufficient supply of appropriate contraception; (ii) lack of information or misinformation about those methods; and (iii) restrictive social norms governing fertility control. An alternative hypothesis is that excess fertility reflects the outcome of bargaining between partners with divergent fertility preferences. In many countries men dominate decisions regarding sexual relations and contraception, and spousal discordance may be a prominent factor influencing fertility outcomes.

### Context of the Evaluation:

Zambia currently holds one of the world's highest maternal mortality ratios, with 729 maternal deaths per 100,000 live births (USAID 2009), and a similarly high infant mortality ratio with 103 deaths per 1,000 live births (UNICEF, 2009). Family planning and reproductive health services are not uniformly available throughout the country, and 60 percent of currently pregnant women in Lusaka report that the pregnancy was unwanted. Although 100 percent of women reporting unwanted pregnancies report being familiar with at least one method of modern contraception, only 48 percent have ever used any modern method of contraception, and only 37 percent currently use modern contraceptives.

### Details of the Intervention:

This study evaluates the effect of male involvement on female contraceptive use through an experiment designed to remove the factors of insufficient supply, lack of information, misinformation, and divergent fertility preferences. Study participants include 1,994 married women who had given birth in the last two years living in compounds serviced by Chipata Clinic in Lusaka.

Women in the study received vouchers that granted appointments with a family planning nurse at the local government clinic, without waiting more than one hour and with guaranteed access to the modern contraceptive method of their choice. An information session explaining all methods of family planning was also given to study participants at the time of voucher distribution. Women were randomized into two treatment groups. In the "individual" arm of the study, women were given these vouchers alone. In the "couples" arm, women were given these vouchers in the

presence of their husbands. In all other respects, the experimental protocol in the individual and couples arms was identical.

Results and Policy Lessons:

Take up of the voucher was high at 47 percent, indicating that women valued the substantial reduction in the time cost of an appointment associated with the voucher.

However, evidence suggests that sharing information about family planning services with husbands reduces the couple's propensity to utilize these services. Women who received the voucher in the presence of their husbands were 9 percentage points (18 percent) less likely to use the voucher to obtain an appointment at a family planning clinic. There is an even larger, 12 percentage point reduction in voucher use for couples where the husband reported wanting more children than the wife. Still a larger reduction in use is reported among younger couples, giving evidence for the hypothesis that differences in future preferences for fertility drive differences in demand for family planning services.

Male knowledge of the voucher led to a substantial reduction in use of these services, suggesting that policies or technologies that shift relative control of contraceptive methods from men to women may significantly increase contraceptive use and reduce average fertility in some contexts. This is important to note given that an increasing number of policymakers have started to promote "male involvement" in family planning. It also suggests that take up of particular modern contraceptive methods may be sensitive to the amount of control women can exercise relative to their husbands in the use of these methods.

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# UGANDA



- ⊙ DISTRICT CAPITALS
- ⊕ NATIONAL CAPITAL
- DISTRICT BOUNDARIES
- - - INTERNATIONAL BOUNDARIES
- ~ RIVERS
- MAIN ROADS
- RAILROADS

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