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Recently published IIASA research proves unambiguously: education is a fundamental determinant not only of health, demographic trends, and individual income, but also of a country's aggregate level of economic growth. This gives policymakers a new perspective on international education goals and the most promising routes towards sustainable development.

## Economic Growth in Developing Countries: Education Proves Key

### Summary

- New research proves the long held expectation that human capital formation (a population's education and health status) plays a significant role in a country's economic development. Better education leads not only to higher individual income but is also a necessary (although not always sufficient) precondition for long-term economic growth.
- Investment in secondary education provides a clear boost to economic development, much more than can be achieved by universal primary education alone. Hence, the current focus of the United Nations Millennium Development Goals on universal primary education is important but insufficient. Universal primary education must be complemented with the goal of giving broad segments of the population at least a completed junior secondary education.
- Only broad based secondary education and universal primary education is likely to give poor countries the human capital boost necessary to bring large segments of the population out of poverty. For more industrialized countries, tertiary education of younger adults also plays a key role in economic growth.
- For international policymakers, more and better education should become the top priority because it empowers the people to help themselves and thus helps to improve governance and to reduce corruption. A concerted effort for much more primary and secondary education combining national and international forces would appear to be the most promising route out of poverty and toward sustainable development.

## Solving an old puzzle with new data

Data deficiencies are responsible for previous research study findings which show that changes in educational attainment are largely unrelated to economic growth. In this new study, IIASA researchers completed a full reconstruction of the education attainment distribution by age and sex for 120 countries for the years 1970–2000. The advantages of this dataset compared to others arise from its detail (four educational categories for five-year age groups of men and women), its consideration of differential mortality, and its strict consistency of the definition of educational categories over time. This level of detail allows researchers to perform more detailed statistical analyses of the relation between education and economic growth than had previously been possible.

## Introduction

It is commonly assumed that education has an important positive effect on economic growth, but to date the evidence for this assumption has been surprisingly weak. Evidence shows that, at the individual level, more years of schooling lead to higher income. But, at the macroeconomic level, empirical evidence relating changes in education measures to economic growth has so far been ambiguous.

Now, in a unique study, researchers from the International Institute for Applied Systems Analysis (IIASA) and the Vienna Institute of Demography (VID) of the Austrian Academy of Sciences have unraveled this puzzle. The key to doing this was the new dataset on educational attainment by age and sex, described in *Solving an old puzzle* (page top).

This fresh approach provides unambiguous evidence of consistently positive, statistically significant effects of education on a country's economic development. Rigorous analysis of the data provides policymakers with proof that education is the necessary (although not always sufficient) precondition for long-term economic growth.

## Four alternative growth scenarios: putting education in the picture

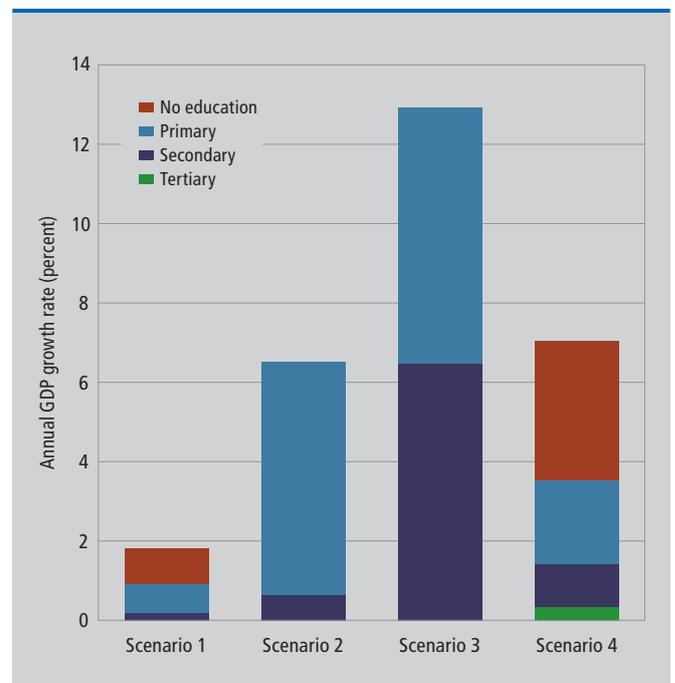
Based on new education attainment data (see *Solving an old puzzle*, page top), researchers from IIASA suggest four scenarios to illustrate the impact of four alternative educational level distributions on annual GDP growth rates (Figure 1). These four scenarios roughly resemble alternative hypothetical education policy strategies for an African developing country.

**Scenario 1** presents the reference case of a country with a young age structure (70% of the working age population in the 15- to 40-year-old group and 30% in the 40- to 65-year-old group), a low starting level of income and investment rate and the following educational structure: half of the population with no formal schooling, 40% with some primary, and 10% with at least completed junior secondary school (but no tertiary education). The education groups used in the analysis (no education, primary, secondary, and tertiary) are non-overlapping. This roughly fits the demographic structure of some Latin American and African countries

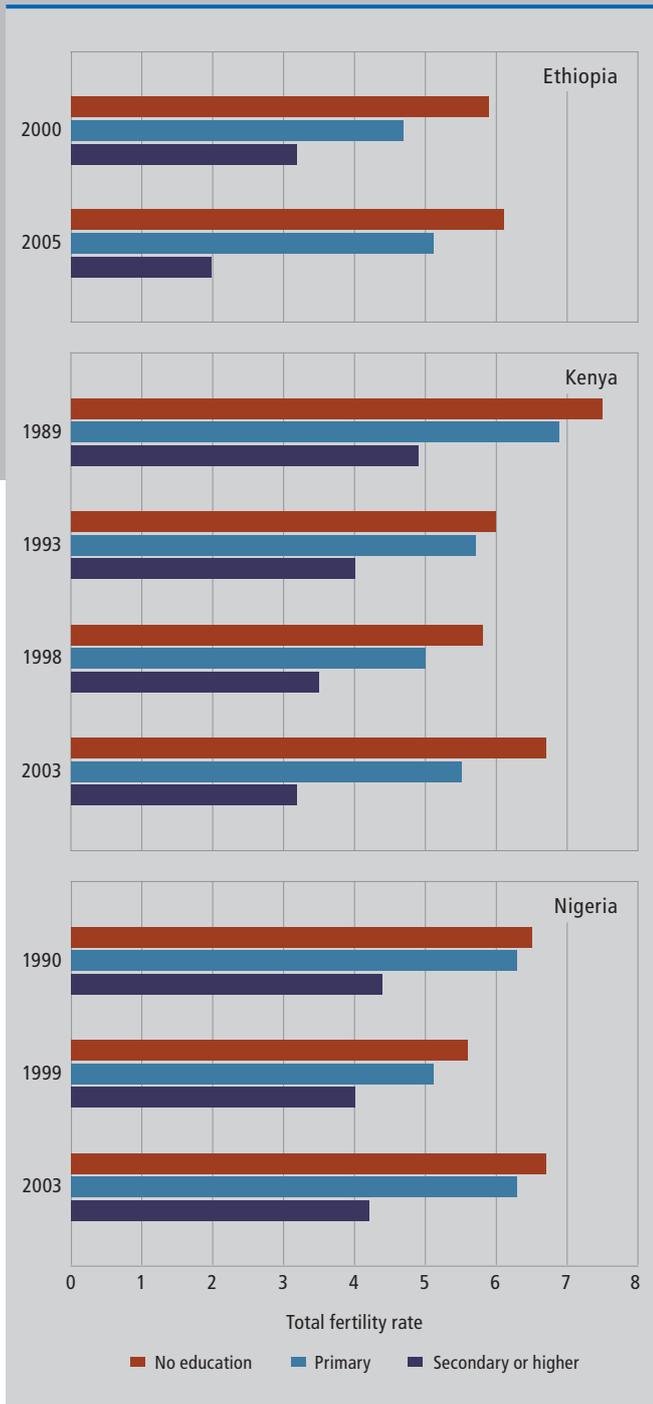
in the IIASA study sample, e.g., Guatemala, Honduras, Kenya, Rwanda or Uganda. On the basis of the estimated model, such a country would have rather slow economic growth.

**Scenario 2** considers an otherwise identical country under the hypothetical assumptions that it has a long time ago met the Millennium Development Goal (MDG Goal 2) – ‘achieve universal primary education’ – and that the previously uneducated half of the adult population now has primary education. This case would lead to somewhat higher average growth of GDP.

**Scenario 3** considers a possible new MDG effort that adds widespread secondary education (assuming 50% of the population achieves at least some secondary schooling) to universal primary. The model simulations indicate that this additional investment in



**Figure 1**  
Annual GDP growth rates according to four alternative educational attainment distributions.



**Figure 2**  
Total fertility rates by level of educational attainment  
(Source: Several Demographic and Health Surveys).

The two key conclusions to be drawn from these scenarios are:

**1. Education matters in economic growth** The scenarios show that investment in education pays off in terms of higher long-term economic growth.

More specifically, the data enables researchers to explore the education effects of different age and education structures. The findings show that there are differences in the impact of educational attainment on economic growth across age groups. In particular, tertiary education of younger adults (20-39), for instance, matters more in terms of economic growth than that of older adults, while the opposite is the case for secondary education.

**2. Make secondary education a goal** In 2000 world leaders meeting in New York announced the United Nations Millennium Development Goals (MDGs). One goal that featured prominently was that of universal primary education by 2015.

These scenarios, however, highlight the benefits of complementing universal primary education with broad based secondary education. Only this step is likely to give initially poor countries the human capital boost that is necessary to bring large segments of the population out of poverty.

## Addressing Africa's population explosion

Education, particularly women's education, has the potential to play a key role in the achievement of more sustainable development in Africa.

Population projections for Sub-Saharan Africa over the 21st century suggest a likely tripling of the population in 2000 to 1.5 billion in 2050 and 2 billion in 2100. Population growth depends, of course, on the uncertain future courses of fertility and mortality. But evidence published in 2008 by the Population Council of a "stalled fertility transition" shows that expected declines in fertility in Africa cannot be taken for granted. Today, two-thirds of the population of Sub-Saharan Africa are under 25 years of age and the average fertility rate is still above five children.

Women with higher levels of educational attainment almost universally have fewer children than women with lower levels of education. Figure 2 illustrates this point. The effect of education on fertility is shown for three African countries with a large

secondary education provides a huge boost to economic growth, over five times the level of the baseline scenario and also much more than in the scenario of universal primary education alone.

**Scenario 4**, which somewhat resembles the case of India, presents another possible direction of improvement from the baseline. In this scenario half of the population remains without education even though 5% have tertiary, 15% secondary, and 30% have primary education. This case of elitist education, in a country with half of the population without any schooling, clearly does better than the baseline and even better than the universal primary education combined with 10% secondary and no tertiary. However, falls far short of the economic growth implied by universal primary combined with 50% secondary and no tertiary education.



IIASA Policy Briefs present the latest research for policymakers from IIASA—an international, interdisciplinary research institute sponsored by scientific organizations in Africa, the Americas, Asia, and Europe. The research presented in this briefing is from IIASA's World Population Program and the Vienna Institute of Demography (VID) of the Austrian Academy of Sciences. The views expressed herein are those of the researchers and not necessarily of IIASA.

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*A classroom in Eva Orango school in Orango Island of Bijago Archipelago in Guinea-Bissau, February 2008.*  
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## Conclusions

The new dataset enables researchers to assess the impact of education, particularly secondary education, on economic development. But, in future, this new data resource can be used to analyze the wide range of other factors that education is assumed to influence positively. Health and survival rates, fertility levels and even the quality of a country's governance and institutions can plausibly be assumed to be linked to a country's levels of educational attainment. Detailed analysis of this new dataset will enable researchers to formulate and test these conjectures more fully.

## Further information

For details of IIASA's World Population Program visit:  
[www.iiasa.ac.at/Research/POP](http://www.iiasa.ac.at/Research/POP)

For details of the topics covered by this briefing, see:

Lutz W, Goujon A, KC S & Sanderson W (2007). Reconstruction of populations by age, sex and level of educational attainment for 120 countries for 1970–2000. *Vienna Yearbook of Population Research 2007*, pp. 193–235. Available at <http://hw.oeaw.ac.at>.

Lutz W, Crespo Cuaresma J & Sanderson W (2008). The Demography of Educational Attainment and Economic Growth. *Science* 319(5866):1047–1048. Available at [www.sciencemag.org](http://www.sciencemag.org).

Crespo Cuaresma J & Lutz W (2007). Human Capital, Age Structure and Economic Growth: Evidence from a New Dataset. IIASA Interim Report IR-07-011. Available at [www.iiasa.ac.at/Publications/Documents/IR-07-011.pdf](http://www.iiasa.ac.at/Publications/Documents/IR-07-011.pdf).

Lutz W, Goujon A & KC S (2008). Education: The Key to Development. *Options* (Summer 2008):12–15. Available at [www.iiasa.ac.at/Admin/INF/OPT/Summer08/opt-08sum.pdf](http://www.iiasa.ac.at/Admin/INF/OPT/Summer08/opt-08sum.pdf).

population: Ethiopia, Kenya and Nigeria. The figure shows that the fertility of well-educated women has declined over time (except in Nigeria after 1999), whereas for less-educated women, fertility actually shows increases since the late 1990s. Hence Figure 2 supports the view that without strong government-supported family planning programs, fertility decreases only where population groups have passed a certain developmental threshold that makes them desire fewer children and better opportunities for those they have. Education, it seems, is the key factor in this process.

Better education also results in better health for mothers and children because of better access to crucial information and health care. In Ethiopia, women with at least some secondary education are 260 per cent more likely to receive antenatal care than women with no education. In essence, being educated has significant health advantages for both adults and children.

Higher rates of female education, coupled with renewed family planning efforts, could prove crucial in slowing a population growth rate, which at present places undue stress on existing infrastructure and natural resources. The new study suggests that in Sub-Saharan Africa education is the key policy variable that in tandem with reproductive health services can reduce poverty, improve health, and help people move beyond the current state of emergency.