



COPENHAGEN  
CONSENSUS  
CENTER

# POPULATION AND DEMOGRAPHY

ASSESSMENT PAPER

*Benefits and Costs of the Population and Demography  
Targets for the Post-2015 Development Agenda*

Hans-Peter Kohler

Jere R. Behrman

# Benefits and Costs of the Population and Demography Targets for the Post-2015 Development Agenda

---

Post-2015 Consensus

Hans-Peter Kohler  
*University of Pennsylvania*

Jere R. Behrman  
*University of Pennsylvania*

# Highlights

---

Within population and demography, the programs that have the highest benefit-cost ratios are:

- Achieving universal access to sexual and reproductive health (SRH) services by 2030, and eliminating unmet need for modern contraception by 2040.
- Reduction of barriers to migration within low- and middle-income countries, as well as between low- and middle-income countries and high-income countries.

Priorities with probably high, but difficult to quantify, benefit-cost ratios include:

- Elimination of age-based eligibility criteria for retirement, and the development of public pension systems that are based on expected years of remaining life given fixed characteristics.
- Selected interventions, dependent on particular contexts, that make more efficient and more equitable inevitable urbanization by achieving balance between functions for which there are considerable economies of scale such as transportation and communication networks and functions for which decentralization is likely to lead to the best responses to heterogeneous local conditions and preferences.

Policies with relatively low benefit-cost ratios include

- Maintenance and expansion of public pension eligibility at “relatively young old ages”
- Family policies aimed at increasing low fertility in high-income countries (with the exception of the expansion of early childhood education and high-quality day care)

It is also important to highlight that “population quality”, including human capital such as health and education, is an important further aspect of population dynamics that is essential for addressing the challenges of future population changes and for realizing the benefits of population dynamics for social, economic and environmental development. Population quality therefore needs to be seen as an inherent component of population dynamics, and in some areas—like for instance policies addressing population aging—population quality-related policies are primary policies. We discuss important dimensions of population quality that should be part of the post-2015 development agenda in Section 6, and related discussions are contained in the Post-2015 Copenhagen Consensus Project papers by Jamison et al. (2014) and Psacharopoulos (2014).

<b>BACKGROUND .....</b>	<b>3</b>
<b>THEMATIC PRIORITY 1: HIGH FERTILITY AND POPULATION GROWTH.....</b>	<b>4</b>
UN GLOBAL CONSULTATION PRIORITIES.....	5
PRIORITIES/TARGETS WITH HIGH BENEFIT-COST RATIOS .....	6
INDICATORS .....	9
DISCUSSION .....	10
<b>THEMATIC PRIORITY 2: LOW FERTILITY AND POPULATION AGING.....</b>	<b>10</b>
UN GLOBAL CONSULTATION PRIORITIES.....	11
PRIORITIES WITH HIGH BENEFIT-COST RATIOS.....	11
INDICATORS AND TARGETS .....	15
DISCUSSION .....	15
<b>THEMATIC PRIORITY 3: MIGRATION AND HUMAN MOBILITY .....</b>	<b>17</b>
UN GLOBAL CONSULTATION PRIORITIES.....	18
PRIORITIES WITH HIGH BENEFIT-COST RATIOS.....	19
INDICATORS AND TARGETS .....	21
DISCUSSION .....	22
<b>THEMATIC PRIORITY 4: URBANIZATION .....</b>	<b>22</b>
UN GLOBAL CONSULTATION PRIORITIES.....	23
DISCUSSION .....	24
<b>POPULATION QUALITY: A KEY ASPECT OF THE DEVELOPMENT AGENDA ON POPULATION AND DEMOGRAPHY IN THE 21ST CENTURY .....</b>	<b>24</b>
EDUCATION AND SCHOOLING .....	24
HEALTH AND NUTRITION.....	26
<b>DISCUSSION: PRIORITIZATION OF TARGETS AND POLICIES .....</b>	<b>27</b>
<b>APPENDIX .....</b>	<b>30</b>
DETAILED BENEFIT COST CALCULATIONS.....	30
CHALLENGES OF BENEFIT-COST ANALYSES OF POLICIES TARGETING POPULATION DYNAMICS.....	30
BENEFIT-COST ANALYSES FOR POLICIES TARGETED AT REDUCING POPULATION GROWTH .....	33
<i>Costs of Contraception and Family Planning Programs .....</i>	<i>34</i>
<i>Benefits I: Reduced Expenditures on Health, Schooling, Etc. ....</i>	<i>36</i>
<i>Benefits II: Evaluating Reduced Infant and Maternal Mortality .....</i>	<i>38</i>
<i>Benefits III: life cycle, distributional and intergenerational benefits of family planning programs .....</i>	<i>40</i>
<i>Benefits IV: Contributions of reduced fertility to per-capita income growth .....</i>	<i>40</i>
<i>Benefit-cost ratios for family planning programs .....</i>	<i>44</i>
<b>NOTES.....</b>	<b>49</b>
<b>REFERENCES.....</b>	<b>52</b>
<b>LIST OF FIGURES.....</b>	<b>64</b>
<b>LIST OF TABLES .....</b>	<b>64</b>

## Background

Prioritizing the Post-2015 UN Development Agenda on Population and Demography requires a recognition that national demographic trajectories are currently more diverse than in the middle and late 20th century. Wealthy countries of Europe, Asia and the Americas face rapid population aging, while Africa and some countries in Asia prepare for the largest cohort of young people the world has ever seen. And many of the world's poorest countries, particularly in sub-Saharan Africa, continue to face premature mortality, high fertility and often unmet need for contraception.

In April 2013, the United Nations released the Report of the Global Thematic Consultation on Population Dynamics (UNFPA, UNDESA, UN-HABITAT, IOM 2013; thereafter GTC-PD Report). Cognizant of the contemporary global demographic context, the GTC-PD Report highlights three central aspects of how population dynamics affect the Post-2015 development agenda:

1. *Population dynamics are at the centre of the main development challenges of the 21st century, and must therefore be addressed in the post-2015 development agenda.*
2. *Mega population trends—population growth, population aging, migration and urbanization—present both important developmental challenges and opportunities that have direct and indirect implications for social, economic and environmental development.*
3. *Demography is not destiny. Rights-based and gender-responsive policies can address and harness population dynamics.*

Building on these overarching principles, the GTC-PD Report then groups the specific policy options for the area of population dynamics in four thematic priority areas: high fertility and population growth, low fertility and population aging, migration and human mobility, and urbanization. The policy recommendations of the GTC-PD Report in these thematic areas are discussed below. Closely related recommendations were adopted as part of the International Conference on Population and Development (ICPD) Beyond 2014 Global Report (UNFPA 2014), which is the culmination of a landmark UN review of progress, gaps, challenges and emerging issues in relation to the ICPD Programme of Action. The GTC-PD Report and the ICPD Beyond 2014 Global Report are important because they are likely to shape the international agenda on population. These reports have correctly recognized the central mega population trends—population growth, population aging, migration and urbanization—that present both important developmental challenges and opportunities for sustainable social, economic and environmental development agendas in the coming decades. Based on the evidence presented in this ICPD Report, the UN Secretary General, for example, concluded that the current evidence supports a consensus that : “sexual and reproductive health and rights, and an understanding of the implications of population dynamics are critical foundations for sustainable development.” He also highlighted that “protecting and fulfilling the human rights of young people and investing in their quality education, effective livelihood skills, access to sexual and reproductive health services and information, including comprehensive sexuality education, as well as employment

opportunities, are necessary for the development of their resilience and create the conditions under which they can achieve their full potential.”

The goal of this paper is to discuss the Post-2015 Development Agenda in the area of Population and Demography, focusing primarily on aspects of population size, age structure and geographic distribution.<sup>1</sup> It is important to highlight that “population quality”, including human capital such as health and education, is an important further aspect of population dynamics that is essential for addressing the challenges of future population changes and for realizing the benefits of population dynamics for social, economic and environmental development (Behrman and Kohler 2014). Population quality therefore needs to be seen as an inherent component of development priorities in the area of population and demography, and in some areas—for instance policy addressing population aging—policies related to population quality are primary policies. This is also recognized in the GTC-PD Report, which emphasizes human development throughout the life course—including investments in the education and health of populations—as one of four overarching priority areas.<sup>2</sup> While discussions of development targets on health and education are part of other Copenhagen Consensus Project on Post-2015 Development Goals chapters (Jamison et al. 2014; Psacharopoulos 2014), and are therefore not discussed here in detail, we highlight some potential development policies related to health and education that are importantly related to population and demography (Section 6).

## **Thematic Priority 1: High Fertility and Population Growth**

The GTC-PD Report correctly highlights ongoing rapid population growth as one important development challenge during the 21st century. It is important to recognize that a significant part of 21st century population growth will result from ongoing expansions of life expectancy and from the unfolding of population momentum. In the former case, future population growth is therefore the “byproduct” of important successes in improving individual and population health as part of past development strategies, and in the latter case, future population growth is an ongoing implication of past high fertility that has resulted in a “youth bulge” and large number of young adults who will enter or are still in primary reproductive ages. In both of these cases, development strategies will have to focus on accommodating population growth, including through migration, urbanization and investments in human capital/health, and on reaping potential benefits from changing age structures and expanding life expectancies (“demographic dividends”).

Nevertheless, a significant part of 21st century population growth—and a significant part of the uncertainty about the size of the world population at the end of the 21st century—will result from population growth in countries that continue to have relatively high levels of fertility while having experienced significant declines in child and adult mortality. For example, a report prepared for the 2012 World Economic Forum (Global Agenda Council on Population Growth 2012), identified 58 high-fertility countries, defined as countries with net reproduction rates (NRR) of more than 1.5, that have intrinsic population growth rates of 1.4% or higher.<sup>3</sup> The high-fertility countries are concentrated in Africa, where 39 out of the 55 countries on the continent have high fertility, but also exist in Asia (9 countries), Oceania (6 countries) and Latin America (4 countries). Almost two-thirds of

these high-fertility countries are classified by the United Nations as least developed, and 38 out of the total of 48 countries that are classified as least developed have high fertility. Despite having currently only about 18% of the world population, high-fertility countries account today for about 38% of the 78 million persons that are added annually to the world population. After 2060, world population is projected to grow exclusively as a result of population growth in the current high-fertility countries. During the 21st century, therefore, the current high-fertility countries will be the major contributors to continued world population growth.

### ***UN Global Consultation Priorities***

The GTC-PD Report states the following priorities in the area of high fertility and population growth:

1. Accelerate implementation of universal access to quality, accessible, affordable and comprehensive sexual and reproductive information, education, services and supplies across the life cycle including for preventing unintended pregnancy, unsafe abortion, maternal mortality and morbidity, increasing the prevention, early detection and treatment of HIV, sexually-transmitted infections and non-communicable diseases of the reproductive system, especially breast and cervical cancer. Services should be culturally sensitive and in conformity with international human rights standards.
2. Eliminate all forms of gender-based violence against women and girls, including harmful practices, through prevention efforts engaging young people and men, and ensuring access to health, social and legal services for all victims.
3. Eliminate early and forced marriage.

**Table 1: Summary of costs, benefits and benefit-cost ratios for voluntary family planning programs**

<b>Annual Net Benefits and Costs (3 per cent discount rate )</b>		<b>Annual benefits</b>	<b>Annual costs of satisfying unmet need in developing countries</b>	<b>BCR</b>
<b>Benefit Component:</b>	<b>Assumptions</b>	<b>Billion USD</b>	<b>Billion USD</b>	
Reduced Infant and Maternal Mortality	Low (DALY = 1K)	110	3.6	30
	High (DALY = 5K)	180		50
Income Growth (including life cycle, distributional and intergenerational benefits)	Low	216	3.6	60
	High	360		100
<b>Total, Family Planning programs (sum)</b>	<b>Low</b>	<b>326</b>	<b>3.6</b>	<b>90</b>
	<b>High</b>	<b>470</b>		<b>150</b>

See Appendix and Kohler (2013) for details of the benefit-cost calculations

### ***Priorities/Targets with High Benefit-Cost Ratios***

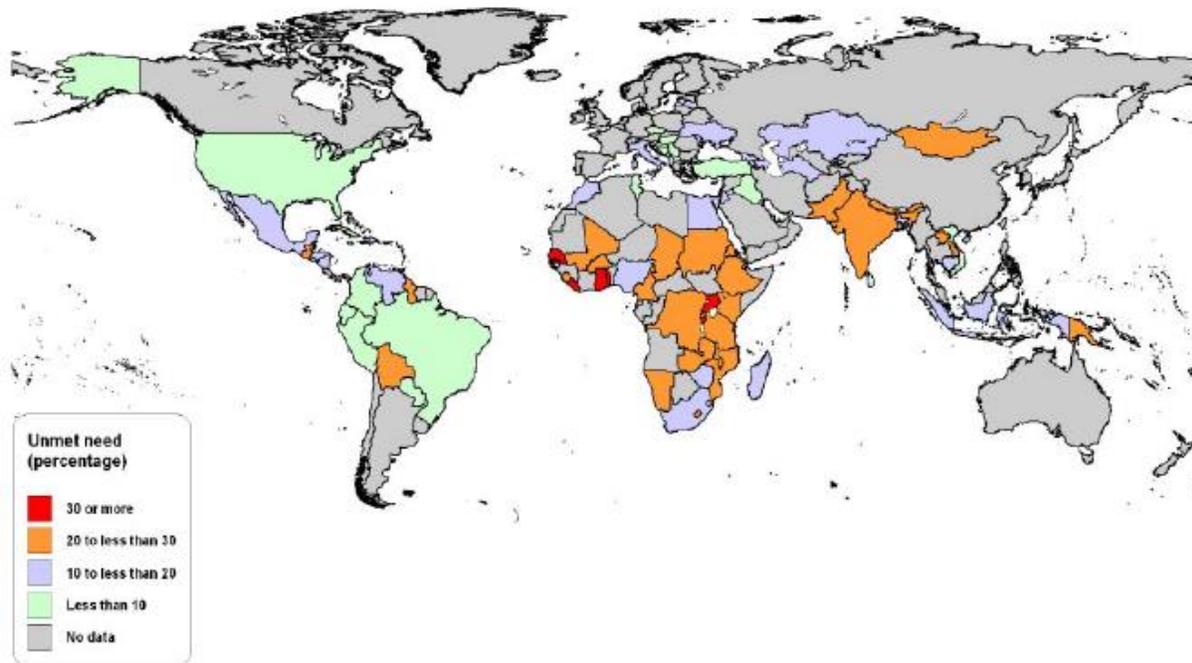
In terms of development priorities with high benefit-cost ratios, we propose for the post-2015 development agenda a continuation of the current Millennium Development Goal 5 (MDG 5) “Improve Maternal Health”, including the SRH-related priority/target of:

- Post-2015 Development Priority 1a: Achieving universal access to sexual and reproductive health (SRH) information, education and services by 2030

The benefit-cost ratios of expanding access to SHR information, education and services through voluntary family planning programs is likely to be large (Table 1). In addition to this focus on expanding information, education and services in the areas of SRH, we also propose a stronger focus on unmet need for modern contraception. Unmet need is an indicator that measures the proportion of women who are fecund and sexually active but are not using any method of contraception, and report not wanting any more children or wanting to delay the birth of their next child for at least two years. Unmet need was included in MDG 5 as an indicator, but recent evidence suggests that unmet need should be elevated to an explicit target. For example, during 2003–12, the number of women wanting to avoid pregnancy and therefore needing effective contraception increased substantially, to a significant part due to population growth, from 716 million (54%) of 1,321 million in 2003, to 827 million (57%) of 1,448 million in 2008, to 867 million (57%) of 1,520 million in 2012 (Darroch and Singh 2013). Due to increases in the use of modern contraception, the overall proportion of women with unmet need for modern methods among those wanting to avoid pregnancy decreased from 29% (210 million) in 2003, to 26% (222

million) in 2012. However, the absolute number of women with unmet need increased, and unmet need for modern contraceptives continued still to be very high in 2012 (Figure 1), especially in sub-Saharan Africa (53 million [60%] of 89 million), south Asia (83 million [34%] of 246 million), and western Asia (14 million [50%] of 27 million) (Darroch and Singh 2013).

**Figure 1:** Percentage of women with an unmet need for family planning (any method) among those aged 15-49 who are married or in a union: most recent data available



Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2013). World Contraceptive Patterns 2013. New York: United Nations.

Because of this importance of unmet need, we propose to elevate it to an explicit priority for the post-2015 development agenda, for instance along the following lines:

- Post-2015 Development Priority 1b: Eliminate unmet need for modern contraception by 2040

The above targets of universal access to SHR services and the elimination of unmet need reflect the 1994 ICPD Programme of Action that “...women and men have information and access to the widest possible range of safe and effective family-planning methods in order to enable them to exercise free and informed choice” (United Nations 1996). It is also important to emphasize that the implementation of these priorities is likely to have particularly high returns among vulnerable populations, including adolescents and poor individuals, who are often most affected by limited access to SHR information and services, and youth, who present a large and growing fraction of the population in many low and middle income countries.

The rationale for the above priorities regarding high fertility and population growth is based on recent research that has strengthened the evidence that (a) reduced fertility in high-fertility contexts results in improved child outcomes (including better child health and more schooling), reduced maternal mortality and increased female human capital, and more rapid economic development; and (b) voluntary family planning programs, which provide SRH information, education and services, can make important contributions towards reducing fertility (for a review, see Kohler 2013).

Ongoing information deficits about contraceptive technologies and the benefits of reduced fertility, low status and limited autonomy of women, and inadequate health systems in many high-fertility contexts imply “market failures” and “policy failures” resulting in insufficient market provision and governmental subsidization of many family planning programs. Policies that improve access to voluntary family planning programs and related SRH information, education and services have therefore large benefit-cost ratios (Table 1) and should be high priorities in the Post-2015 Development Agenda, especially when combined with programs that promote investments in health and other human capital in early childhood. A detailed discussion of the benefit-cost ratios for the expansion of family planning programs is provided in the Appendix.

This importance of SHR information, education and services is consistent with ICPD’s emphasis that sexual and reproductive health and rights (SRHR), which include access to SRH services, constitute a basic human right and are thus foundational to sustainable development (UNFPA 2014; United Nations 1996). And while our benefit-cost analyses necessarily take a somewhat narrow focus on evaluating the benefits and costs of expanding family planning programs in terms of their effect of population growth, we agree with this broader importance of SRHR and universal access to SRH information, education and services, including for instance the effects of such programs towards improving the rights and status of women and other vulnerable populations.

Despite this importance of family planning programs, it is important to highlight that fertility decline during the demographic transition is not only due to family planning programs and related SRH services. Economic development, urbanization, increased education and labor force participation (particularly for women) have been important drivers in the past (and historically, these factors were possibly more important than family planning programs). These factors are likely to remain important drivers of fertility trends in the future, as economic and social changes have important impacts on the “demand for children,” that is, the number of children that are desired by women and men. Because unmet need draws attention to the gap between women’s (and men’s) reproductive intentions and their contraceptive behavior, we believe that it is important as part of the post-2015 Development Agenda to combine priorities that focus on the expansion of access to SHR services with priorities that focus on unmet need for family planning. We have done so in our proposed Post-2015 Development Priority 1a & 1b).

Because the benefits of reduced fertility are critically related to the ability of populations to benefit from reduced population growth and the resulting age-structure changes during

the demographic transitions, policies targeting the priority area of high fertility and population growth need to be implemented as part of a range of social policies that support sustainable development. For example, in low- and middle-income countries that have experienced the onset of significant fertility declines and are currently or will soon experience large increases in the working-age share of their population, institutions and policies should therefore be adopted to permit exploitation of the “demographic dividend,” (Bloom et al. 2002) through higher economic growth. A number of East Asian countries appear to have done so successfully during the late 20th century. For example, to realize the potential benefits resulting from a demographic dividend, formal labor market flexibility should be increased and barriers to labor transitions reduced. Governmental restrictions that limit formal sector flexibility (e.g., required severance pay, limits on wages) and incentives to participate in the formal sector (e.g., tying subsidized pensions to work in the formal sector) need to be adjusted accordingly.

Investment in human capital across the life-course, including increasing access to, enrollment in and quality of formal schooling, is an essential component of population-related development strategies (Section 6). Targets and benefit-cost ratios for schooling-related policies and intervention are developed in Psacharopoulos (2014), and increasing school enrollment ratios and school attendance in sub-Saharan Africa are among the targets with the highest benefit-cost ratios. It is important to highlight in the present context that increasing school enrollment of girls (including incentives for girls to remain in school) is also one of the most promising strategies for reducing early marriage in sub-Saharan Africa, South Asia and other contexts where early marriage continues to be widespread (Malhotra et al. 2011; Walker 2013).

### ***Indicators***

Our above discussion highlights expansion of SRH information, education and services through voluntary family planning programs as high-priority policies for addressing concerns about high fertility and population growth. The indicators to measure the achievement of these targets are essentially indicators that were used as part of the Millennium Development Goals (MDG). We propose a continuation of the following existing MDG 5 indicators as part of the post-2015 development agenda. We also suggest including a differentiation of these indicators by age, gender (where applicable), rural/urban and major race/ethnic group to draw attention to within-country differentials in the attainment of important development priorities.

- Maternal mortality ratio (MDG 5a)
- Proportion of births attended by skilled health personnel (MDG 5a)
- Access to SRH services (MDG 5b)
- Contraceptive prevalence rate (MDG 5b)
- Adolescent birth rate (MDG 5b)
- Antenatal care coverage (MDG 5b)four visits)
- Unmet need for family planning (MDG 5b)

## ***Discussion***

Current UN projection suggest that the global population will increase by 2050 by an additional 32% to a level of 9.5 billions. The response to this ongoing population growth in all likelihood needs to be two-fold. On the one hand, population growth in coming decades will importantly result from population momentum (that is, ongoing population growth, despite relatively low fertility, due to a population age structures with relatively large number of individuals at reproductive ages) and expected further increases in longevity. This population growth thus results from past “successes” in achieving important development goals, and policy responses will need to focus on (1) accommodating additional population growth through urbanization, migration and increases in population density, (2) increasing investments in health and human capital, and (3) institutional reforms that will facilitate the realization of potential demographic dividends as a result of the age structure changes during the demographic transition.

On the other hand, while the majority of the population is now estimated to live in regions with below replacement fertility, high fertility, poor reproductive health outcomes and relatively rapid population growth remain an important concern in a number of low-income countries. International and national spending devoted to family planning, however, has declined significantly in recent years. Recent research has brought about a revision in the understanding of the interactions between population growth and economic development, as well as the effects of voluntary family planning programs in terms of reduced fertility, improved reproductive health outcomes and other life cycle and intergenerational consequences. Based on recent evidence that suggests high benefit-cost ratios for such programs, we argue that an ongoing investment in and expansion of SRH information, education and services should be a high-priority component of development policies in the next decades. We also highlight that such policies targeting high fertility and population growth need to be implemented within a human-rights based framework (United Nations 1996) and as part of a range of social policies that support sustainable development (UNFPA 2014). For instance, this might include social policies that aim at improvements in human capital (including health) or policies for institutional reforms that are critical for societies and individuals to benefit from lower population growth and potential demographic dividends.

The GTC-PD Report also highlights the elimination of gender-based violence. In our assessment, this is a very important target from a human rights and gender perspective, while the overall effect of these policies on population dynamics is probably relatively small. The GTC-PD Report also highlights the elimination of early and forced marriage as important policies for addressing population dynamics as part of the post-2015 development agenda, and we believe that policies aimed at the expansion of schooling for girls (including programs aimed at keeping girls in school) can provide an important and cost-effective mechanism for achieving this aim.

## **Thematic Priority 2: Low Fertility and Population Aging**

Populations are aging in high-income and increasingly also in middle-income and even low-income countries. As a result of continued progress in reducing mortality (including at old

and oldest ages) and decades of low—sometimes very low—fertility, many high-income countries face very rapid population aging in the next decades. The most rapidly growing age segments in these countries—sometimes the only growing age segments—are the old or very old. Old-age dependency ratios are therefore going to increase significantly in most high-income countries. Population aging, however, is no longer a concern that is restricted to high-income countries, and while the pace and levels of aging are lower, population aging is emerging as an important trend and policy challenge in many middle-income countries (Beard et al. 2012).

Population aging implies that the median age of the population increases, as does the fraction of the population above, say, age 65.4 Population aging in high-income countries occurs in societies with well-developed social institutions, including extensive intergenerational transfer schemes, the sustainability of which is importantly affected by changes in the population age structure. Population aging potentially also affects productivity, innovation, and social, economic, and psychological well-being.

An accelerating trend in coming decades will be the emergence of rapid population aging in middle-income and selected low-income countries. Slogans such as “China may get old before it gets rich” capture concerns that population changes in such countries pose unique challenges from the perspective of people and societies, including the need to provide health services to and prevent poverty among the elderly. Average ages are projected to increase most in coming decades in Latin America and the Caribbean and in South Asia, not in high-income or East Asian countries, where the population is already relatively old. The increases in the proportions of the population older than 60 or 65, however, will continue to increase most rapidly in high-income countries and in East Asia in the next few decades. This is a particularly relevant group for intergenerational transfers, given age-related retirement and morbidity patterns (Lee and Mason 2011).

### ***UN Global Consultation Priorities***

The GTC-PD Report states the following priorities in the area of low fertility and population aging:

1. Eliminate discrimination based on age in order to ensure that people of all ages are able to contribute to society.
2. Provide increased coverage and adequate levels of social protection, including pensions and health care.
3. Develop appropriate technologies and infrastructure to accommodate the needs of older persons and persons with disabilities.
4. Provide special support measures for older women. Promote policies that make it easier for people in care-giving roles to combine and share work and domestic responsibilities.

### ***Priorities with High Benefit-Cost Ratios***

To consider policy options and targets, it is important first to recognize that (a) population aging is to a significant degree the result of increases in life expectancies and related

improvements in health, and (b) successes in reducing fertility rates and advancing through the demographic transition. Population aging is therefore a consequence of past “successes” in social, economic and human development. In terms of population dynamics alone, increases in fertility rates in low fertility countries are the primary demographic mechanisms that can affect rates of population aging. The effect of increases in fertility is however long-term, and few empirically-supported policy options exist for doing so (Dahl et al. 2013; Kohler et al. 2006; Luci-Greulich and Thévenon 2013; Salles et al. 2010). Current evidence suggests that policies and institutional reforms that increase gender equality and the compatibility of child-rearing with labor force participation are most promising in terms stabilizing and/or moderately increasing fertility levels in high-income countries with very low TFR levels (Luci-Greulich and Thévenon 2013; Myrskylä et al. 2009), but even in the presence of such policies, below-replacement fertility is likely to persist in many high-income and middle-income countries.

Migration is an important adjustment mechanism through which the effects of population aging on the size and quality of the labor force can be managed. However, migration is generally not able to stop or even reverse the general trend towards increasing population aging in middle- and high-income countries during the 21st century (UN Population Division 2000).

In light of significant future population aging in high- and middle-income countries over the next decades, the most promising policy options in the area of low fertility and population aging should be focused on accommodating aging populations in social, economic and environmental development, and creating institutional environments where possible negative consequences of population aging are lessened.

In this context, a large body of research has emphasized that the benefits of the elimination of incentives for early retirement in terms of increasing individual incomes and reducing the societal costs of population aging are likely to be very substantial (e.g., National Research Council 2012; Wise 2010). A key policy priority for addressing the fiscal and economic consequences of population aging with a potentially very high benefit-cost ratio therefore is:

1. Post-2015 Development Priority 2: Public pension systems should eliminate incentives for retiring at specific ages and be designed to be actuarially neutral (possibly taking individual characteristics that are fixed long before retirement age into account).<sup>5</sup> To address the inherent inequality resulting in pensions systems from differential life expectancies, pension systems should also be based on expected years of remaining life given fixed characteristics (for example, gender, race/ethnicity, birth year), characteristics fixed long before typical retirement ages (for example, formal schooling), and perhaps some measure of income or wealth rather than years since birth (though there is some risk of creating negative incentives for income generation and wealth maintenance; to a lesser extent, this risk also applies to formal schooling). Basing pension eligibility on remaining life years, given fixed characteristics, rather than accumulated life years (that is, age) would reduce the bias toward the better-off (who have longer life expectancies).

While the benefit-cost ratio for pension reforms along the above line are likely to be high, specific benefit-cost calculations are beyond the scope of this paper. The benefits, while probably substantial (National Research Council 2012; Wise 2010), depend critically on the specifics of national pension systems, and the details of the proposed pension reform within a national context and the specific generational redistribution that is achieved by a specific public transfer or pension program. The assessment of benefits is further complicated as issues related health care and health insurance reform are often closely tied to reforms of pension systems. While benefits are difficult to evaluate, the estimation of costs of pension reforms is even more complex. Specifically, the primary costs are those of an institutional reform and associated legal changes, both of which are very difficult to assess in general (e.g., see Clements et al. 2013).

Despite this limited evidence, we believe that these costs are relatively small compared to the benefits resulting from the elimination of incentives for early retirement. We therefore conclude that current evidence provides only limited information with which conduct generalizable benefit-cost analyses for the above priorities. Benefit-cost considerations would have to be specific for detailed reform proposals that are analyzed within specific national contexts.

Other reviews of the macroeconomic implications of population aging, including the fiscal implications on pension and related intergenerational transfer systems, have come to similar conclusions that the benefits of pension and related reforms are high, while a specific quantification of benefits and costs is challenging. For instance, a U.S. National Research Committee assessing the macroeconomic consequences of population aging recently concluded National Research Council (2012): “While population aging is likely to result in a larger fraction of national output being spent on consumption by older persons, output being spent on consumption by older persons, this does not pose an insurmountable challenge provided that sensible policies are implemented with enough lead time to allow companies and households to respond.” While acknowledging that there are many topics, including reform of intergenerational transfer programs, “for which more knowledge would help inform the decision-making process”, the Committee also called attention to the cost of delaying the response to population aging: “The longer our nation delays making changes to the benefit and tax structures associated with entitlement programs for older individuals, the larger will be the ‘legacy liability’ that will be passed to future generations. The larger this liability, the larger the increase in taxes on future generations of workers, or the reduction in benefits for future generations of retirees, that will be required to restore fiscal balance. Decisions must be made now on how to craft a balanced response.”

In addition to the above priority of pension reform, promising other policy priorities related to low fertility and population aging in our opinion include:

1. Social safety nets and health and pension systems should be untied from formal labor market participation, to reduce distortions and benefit the poorer members of society, who tend to work in informal employment or home production that is not covered by formal sector benefits.

2. Renewed efforts to assess formal and informal means of making education over the life cycle more effective through transparent and open institutions (rather than institutions captured by groups of employers or employees) may yield high rates of return. These efforts are important as social returns to more general education (learning how to learn) and to education over the life cycle are likely to increase in an aging and rapidly changing world.
3. Promote investments in adult health and human capital, especially in contexts where “healthy aging” can facilitate higher labor force participation and productivity at older ages (see also Jamison et al. 2014; WHO 2013).
4. Institutions and legal restrictions should be adapted to accommodate child-rearing that occurs outside of two-parent households, when parents are older and more educated, and when parents are often jointly active in the labor market (for example, time off from work for both fathers and mothers, more support for child-care and preschool programs, neutrality regarding adult household composition for related policies).
5. Promote more effective market provision of care of elderly, disabled and vulnerable populations, and improve access to insurance markets enabling individuals to insure against care-taking responsibilities and care-taking needs.

Within the topics of low fertility and population aging, it is also important to highlight several policy priorities that are regularly discussed as part of the policy response to population aging, but in our opinion would have fairly low benefit-cost ratios. For example, the benefit-cost ratios for policies to increase fertility through generous parental leave, child benefit and related social program in low-fertility settings are likely to be fairly low. For many policy options that have been considered, the empirical support for sustained effects on fertility levels is relatively weak (Kohler et al. 2006; Luci-Greulich and Thévenon 2013; Salles et al. 2010), despite substantial private and/or social costs of such policies. A recent detailed analyses of the expansion of Norwegian maternal leave policy, for instance, concluded: “[T]he large increases in public spending on maternity leave imply a considerable increase in taxes, at a cost to economic efficiency. Taken together, our findings suggest the generous extensions to paid leave were costly, had no measurable effect on outcomes [such as children’s school outcomes, parental earnings and participation in the labor market] and regressive redistribution properties” (Dahl et al. 2013). In contrast to the weak evidence for the expansion of maternal leave policies, there is some recent evidence that the expansion of day care facilities has contributed to increases in fertility (or, at least, a slowing down of fertility decline) (Bauernschuster et al. 2014; Luci-Greulich and Thévenon 2013; Rindfuss et al. 2004). Increasing access to early child care is therefore a potentially promising option for policy makers concerned about very low levels of fertility in high-income countries. A similar conclusion is reached by a very comprehensive evaluation of family-related government programs in Germany, which collectively spend about 200 billion Euros per year on family-related tax credits, child payments, subsidies for day care, etc. The overall evaluation of these programs concludes that programs are often not integrated and often provide incentives for conflicting outcomes and goals of family policies. In many cases, the programs cannot be shown to have been effective in terms of achieving their aims, revealing a generally low cost-effectiveness of large-scale family-related government programs and policies. A

possible exception, consistent with other studies on this topic, is the expansion of high-quality day care for preschool children, which facilitates increased labor force participation of parents with small children, makes important contributions to the human-capital formation of small children (see also Section 6), and has modest effects towards increasing fertility.

The above lack of well-documented benefits of many policies that aim at increasing fertility in high-income low-fertility countries leads us to conclude that the benefit-cost ratios of such policies are low and most likely below one. Possible exceptions are the expansion of early childhood education and high-quality day care, where several studies have indicated sizable benefit-cost ratios in high-income countries. Heckman et al. (2010), for example, estimate a benefit-cost ratio of 7–12 for the HighScope Perry Preschool Program using a 3% discount rate. Benefit-cost ratios may even be higher in low income countries, for which (Psacharopoulos 2014) estimate benefit-cost ratios of up to 37.

### ***Indicators and Targets***

Possible measurable targets to evaluate the above priorities in the area of low fertility and population aging include:

- To make pension systems more actuarially neutral, eliminate age-based eligibility criteria for retirement (indicators to track this target for instance include the implicit social security tax<sup>6</sup> developed by the international Social Security Project; Wise 2010).
- Reduce inequalities in pension benefits by basing retirement benefits on expected years of remaining life given fixed characteristics (for example, gender, race/ethnicity, birth year), and characteristics fixed long before typical retirement ages (for example, formal schooling).
- In low- and middle-income countries, whose population will have rapidly growing numbers of persons at older ages, develop or expand health and pension systems that are untied from formal labor market participation.
- Improve cognitive abilities among adults aged 50–60 by 25% by 2050 (using some standardized testing)
- Reduce activities of daily living (ADL)-disabilities among adults aged 50–60 and 60–70 by 25% by 2050
- Expand availability of private and/or public day care for children at 2 to 5 years of age to 90%, including the provision of subsidized day-care for children in poor households.

### ***Discussion***

The rise of low fertility and population aging in high- and (increasingly) middle- and even some low-income countries is the result of the unfolding demographic transition, and the remarkable progress during recent decades in terms of increasing life expectancy, reducing fertility and improving human capital of individuals across the globe. From the narrow perspective on population dynamics that this chapter addresses, there do not seem to be policies and/or interventions with high benefit-cost ratios that can significantly affect or

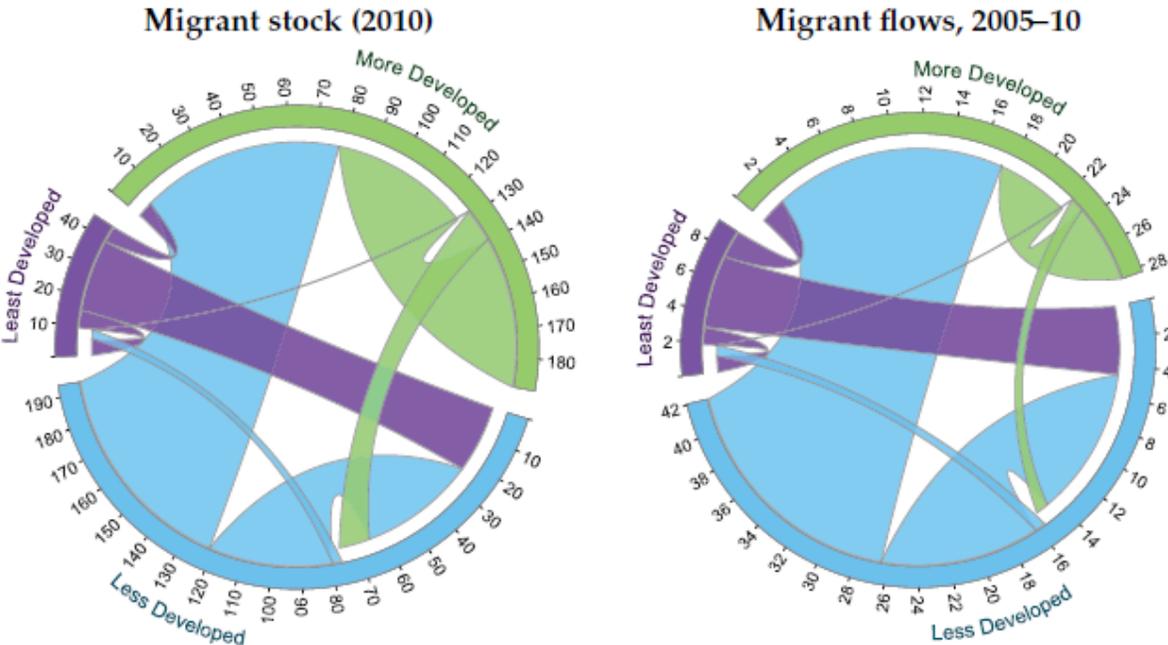
reverse these broad trends towards persistent low fertility and increasingly older populations. And as low fertility and population aging is largely the result of attaining previous development goals related to improving health and longevity, reducing fertility, and improving reproductive health, these consequences of the unfolding demographic transition should importantly frame—rather than be the target of—future development policies. These patterns have already been a long-standing reality in many high-income countries that have had near- or below-replacement fertility since early/middle of the 20th century and that have already experienced significant population aging, which is expected to continue. Several middle-income countries, including countries in Latin America and South Asia, will experience the most significant and rapid population aging in the next half century as measured by indicators such as the average age of the population. The policy challenge in the next decades will be adjust to this reality of low fertility and longer lives, and develop social, economic and policy contexts that are sustainable with these demographic trends. While it is not within the scope of this chapter to develop such programs in detail, policy options with high benefit-cost ratios include reforms of pension systems to eliminate age-based incentives for retirement, focus on remaining life years as compared to accumulated life years, an untying of social safety nets and health and pension systems from formal labor market participation, renewed efforts to assess formal and informal means of making education over the life cycle more effective through transparent and open institutions (as noted in Section 3.2), investments in adult health and human capital in contexts where “healthy aging” can facilitate higher labor force participation and productivity at older ages, and the development of institutions and legal frameworks that support parenting in a context where parents are generally older and more educated and often jointly active in the labor market.

We disagree with some of the implications of the policy aim (2) in the GTC-PD Report that states: “Provide increased coverage and adequate levels of social protection, including pensions and health care.” Specifically, in many high-income countries, the negative consequences of population aging for pension and related social transfer schemes, but possibly also for individual well-being, are exacerbated because pension systems provide incentives for individuals to retire relatively early even if they are healthy with fairly long life expectancies and in some cases provide incentives for females to retire earlier and in many cases at the same ages as men even though they have higher life expectancies (Wise 2010). This early retirement contributes to rapidly increasing dependency burdens, and potentially unsustainable pensions and transfer systems. There is also some evidence that relatively early retirement results in reduced well-being through declines in cognitive abilities, higher levels of depression and sometimes worse overall health (Rohwedder and Willis 2010; Sahlgren 2013). Hence, an important development target in aging societies with extensive social transfer systems in the next decades will be to reduce incentives for early retirement, which may mean that at “young old ages” the eligibility for public pensions is made more restrictive and incentives for individuals to remain in the labor force are strengthened.

### Thematic Priority 3: Migration and Human Mobility

As a result of the differential timing of the demographic transition, population growth differs significantly across different regions and types of economies and is projected to continue to do so. These differences primarily reflect differences in fertility and mortality rates, but they are also affected some by international migration. In 2010, the global stock of migrants (defined as people living in a country other than the one in which they were born) is estimated to have been 214 million. Although this number is large—3.4 times the population of France—it represents just 3.1 percent of the world population. Of course, migrants are not distributed equally across types of countries or regions (Figure 2a). As would be expected from simple “push and pull” models of migration, migrants are concentrated in more developed regions, which accounted for 128 million migrants, or almost 60 percent of the total. But historically, migrant destinations have not been limited to the more developed regions of Europe, Northern America, Japan, Australia, and New Zealand. Almost 40 percent of all migrants—more than 86 million people—lived in less developed regions in 2010. Focusing on flow rather than stock data, recent estimates suggest that the largest population movements occur between South and West Asia, from Latin to North America, and within Africa (Abel and Sander 2014), and that significant migration flows occur both within and across regions defined by economic development (Figure 2b).

**Figure 2:** Migration stock and flow across regions defined by economic development, late 2000s



Notes: The direction of the flow is encoded by both the origin country’s color and a gap between the flow and the destination country’s segment. The volume of the movement is indicated by the width of the flow. Tick marks on the circle segments show the number of migrants.  
 Source: Abel and Sander (2014).

And if the relatively high economic growth rates of developing countries on average in recent decades compared to the developed countries continues, both push and pull factors would seem to lead to an increasing share of international migrants in developing countries.

The age distribution of migrants tends to be different from that of their destination populations. Globally, people born in other countries tend to represent relatively large shares of the prime working age population (people 20- to 64-years-old) and people 65 and over (Table 2). But there are striking differences between more- and less-developed regions, in both the shares of foreign-born inhabitants and their age patterns. In more-developed regions, migrants represent 12.8 percent of the 20–64 segment of the population (19 percent in Northern America and 21 percent in Oceania), 4.8 percent of the population under the age of 20, and 8.5 percent of the population 65 and older. In less-developed regions, the largest percentage of migrants is in the 65 and over group (2.4 percent); migrants represent just 0.9 percent of people under the age of 20 and 1.8 percent of people 20- to 64-years-old. The smaller shares of migrants in less-developed regions are partly offset by their large total populations. As a result, the absolute number of migrants is about two-thirds as large as in more-developed countries.

**Table 2:** *International migrant stock as percentage of total population, by age range, 2010*

Region	International migrant stock as a percentage of the total population by age		
	0–19	20–64	65+
World	1.3	4.0	4.7
More developed regions	4.8	12.8	8.5
Less developed regions	0.9	1.8	2.4
Africa	1.0	2.8	2.3
Asia	0.9	1.7	2.3
Europe	4.9	11.5	8.1
Latin America and the Caribbean	0.8	1.5	2.3
Northern America	5.2	18.6	12.8
Oceania	5.9	20.8	27.5

Source: *UN Population Division (2010)*

### ***UN Global Consultation Priorities***

The GTC-PD Report states the following priorities in the area of migration and human mobility:

1. Eliminate policies that create barriers for migrants to access their human rights such as laws that criminalize migrants in an irregular situation and to explore alternatives in the form of non-custodial measures, in particular in the case of migrant children and families.
2. Respect equal treatment with regard to employment, wages, working conditions, and social protection and other social benefits including health care; and implement measures to regulate the work of recruitment agencies in order to ensure the protection of migrant workers, especially domestic workers, and to lower costs of migration.
3. Reinforce and establish bilateral, regional and global partnerships on migration in order to address vulnerability of migrants and to promote the realization of the full development potential of migration. Within such partnerships there is also need for the engagement of civil society, the private sector, social partners and other stakeholders including diaspora groups.
4. Promote the preservation and portability of social security entitlements, recognition of educational qualifications, and development of skills to better match labor supply and demand within and between countries through comprehensive bilateral, regional and multilateral mechanisms.
5. Ensure that migration is mainstreamed in national and sectoral development policies, in regional and global development agendas and development agencies through the strengthening of policy and institutional coherence at all levels of multi-stakeholder engagement.
6. Engage within existing international frameworks for instance UNFCCC7 and its National Adaptation Plans of Action, and within a post-Hyogo framework,<sup>8</sup> to address climate change related movements as well as factoring in migration into efforts in relation to disaster risk reduction.

### ***Priorities with High Benefit-Cost Ratios***

If workers are much more productive in one country than in another, restrictions on immigration lead to large efficiency losses. For example, Kennan (2012) quantifies these losses, using a model in which efficiency differences are labor-augmenting and free trade in product markets leads to factor price equalization so that wages measured in efficiency units of labor are equalized across countries. He estimates that the gains from removing immigration restrictions within a simple static model of migration costs are about as large as the gains from a growth miracle that more than doubles income levels in developing countries. Mukand (2012) examines the effect of movement by half of the developing world's workforce to developing countries if migration closes a quarter of the migrants' productivity gap. He estimates that migrants' average income would rise by \$7,000, increasing global output by 30 percent. Pritchett (2007) estimates that even a modest easing of restrictions could produce high returns: a 3 percent increase in the labor force in developed countries through migration would yield annual benefits larger than those from eliminating remaining trade barriers. A survey of the literature on the impact of immigration on domestic wages finds that few studies report a negative impact (Blau and Kahn 2012). D'Amuri and Peri (2014) find that immigration encourages non-migrants in Western Europe to take on more complex work. They find that such "job upgrades" are

responsible for a 0.6 percent increase in non-migrants' wages for each doubling in migrants' share of the labor force. Recent work has also reduced concerns about a potential "brain drain" from developing countries, in part because emigration increases the returns to human capital investments and thus induces increased investments. In addition, recent research on the relationship between migration and development has also emphasized the positive—and often very significant—contributions of remittances on migrant-sending countries (Kapur and McHale 2012).

From a global perspective, liberalizing international migration in the developed countries would produce considerable output gains benefiting poorer people in developing countries. Thus, migration liberalization is likely to be a major "win-win" option on the global agenda. Of course, some people will lose out from competition with migrants' labor, and adjustment costs will be incurred. Despite these costs, however, liberalizing international migration would seem to have major potential. The studies summarized above estimate that the benefits from liberalization of international migration are likely to be considerable. They also suggest that millions of people could move from developing countries to developed ones without reducing wages in developed countries, particularly if the pace of movement is slow enough to allow investment to adjust. In the area of international migration, we therefore propose the following policy priority that is likely to have a high—although difficult to quantify—benefit-cost ratio:

- Post-2015 Development Priority 3: Reduce barriers to migration within low- and middle-income countries as well as between low- and middle-income countries and high-income countries.

While there is a widespread perception that reducing barriers to migration is beneficial, with gains for both sending and receiving countries, explicit benefit-cost calculations for reducing barriers to migration are difficult to conduct. In an attempt to do so for the 2004 Copenhagen Consensus Project, Martin (2004) concludes that such benefit-cost assessments for migration are distinct from other policy areas because the benefits, rather than the costs, are measurable in higher incomes, while the costs—including in particular the costs of migration reform and the costs of changing the public perception that immigration imposes costs—are extremely difficult to measure. While not offering specific benefit-cost ratios, Martin (2004) nevertheless concludes that the "unique aspect of migration as a global challenge is that [private] benefits exceed costs, as long as there is voluntary movement."

A subsequent effort by the Copenhagen Consensus Project to quantify the benefit and costs of migration reform considered migration as part of a broader challenge of reducing international trade and migration barriers as part of the Doha international trade negotiations. In this project, Anderson and Winters (2009) use a computable general equilibrium model and estimate benefit-cost ratios of reducing barriers to migration of 112–336 globally (using a 3% discount rate; the benefit-cost ratios are 45–137 with a 6% discount rate), and 229–838 for developing countries (using a 3% discount rate; the benefit-cost ratios are 100–299 with a 6% discount rate). Nevertheless, these benefit-cost considerations do not include the costs of achieving migration reform and a reduction in

the barriers to migration. Anderson and Winters (2009) thus conclude that reducing migration barriers is clearly an extremely high payoff activity, “if only the political will to bring about a successful conclusion to the Doha round can be found.” And that the Doha negotiations have stalled and that migration reform in the U.S. continues to be postponed suggest that the costs of achieving this political will might be substantial (or are at least perceived to be substantial).<sup>9</sup>

Consistent with the above studies, we therefore conclude that the benefits of reducing barriers to migration within low- and middle-income countries as well as between low- and middle-income countries and high-income countries are likely to be substantial. Benefits are likely to be incurred by migrants and non-migrants, and in both receiving and sending countries. But the history of migration reform also suggests that the process of achieving this aim is challenging, and that the political costs of migration reform and societal “adjustment costs”—which are ignored in benefit-cost calculations such as in Anderson and Winters (2009)—are perceived to be substantial. And there is little guidance from the research literature that allows an informed estimation of such costs. Nevertheless, our assessment is that the costs of the institutional reforms and political changes that are required for reducing barriers to migration are relatively small as compared to the substantial benefits, and despite the considerable uncertainty about both costs and benefits, we agree with earlier studies that have suggested high benefit-cost ratios for reducing barriers to migration, both within low- and middle-income countries as well as between low/middle-income countries and high-income countries.

In addition, the following policy priorities are closely related to reducing barriers to migration and we consider them as important targets for the post-2015 development agenda:

1. Receiving countries should develop migration policies that are better informed by their demographic, economic, and social needs.
2. Criteria for any restrictions on migration should be rationalized. They should be based on well-defined efficiency and distributional criteria, not family connections.
3. Frameworks should be created that allow for more transitory migration between countries and improved monitoring of transitory movements across countries and regions that affect the transmission of infectious diseases.

### ***Indicators and Targets***

Possible measurable targets for liberalizing international migration include:

1. Countries should agree to increase their annual immigration caps by double their annual per capita income growth in the previous quinquennium.
2. Special treatment of potential immigrants based on family connections should be phased out by reducing the share of immigrants in the total due to family connections by 10% per year.

The first of these would lead to focus of immigration into countries that have growing labor demands and capacity for absorbing immigrants and adjusting employment for existing citizens of such countries. The second would phase out immigration based on family connections, but in absolute numbers more slowly in countries with more rapidly growing absorption capacities if the first target is adopted as well.

### ***Discussion***

The studies summarized in Section 4.2 above estimate that the benefits from liberalization of international migration are likely to be considerable. Good estimates of the resource costs from doing so are not available, but they are likely to be much smaller than the estimated gains, so the benefit-cost ratios are likely to be high. We support the priorities of the GTC-PD Report given above in Section 4.1. But what seems of primary importance to obtain these potential substantial global gains is widespread recognition that increased international migration is likely to have gains that, if undertaken at a moderate pace to allow internal adjustments, will be shared by both citizens of recipient and origin countries. Including in the international discussion about future goals explicit indicators of targets relating to international migration probably will help facilitate broader recognition of these possible gains.

### **Thematic Priority 4: Urbanization**

The global population will continue to rapidly urbanize during the next decades, with most rapid urbanization occurring in low- and middle-income countries (UN Population Division 2012). Recent changes have been dramatic. In 1950, there were more than two rural residents for every urban resident. By 2010, there were slightly more urban than rural residents. By 2050, there are projected to be more than twice as many urban as rural residents, and by 2100, there will be more than five times as many. Between 1950 and 2100, the number of urban residents is projected to increase by more than tenfold, while the number of rural residents is projected to peak around 2020 and decline by 2100 to below the 1950 level.

There are considerable differences in urbanization across major regions. In 1950, Europe had the most urban inhabitants, somewhat more than Asia, and Africa had a very small urban population, with only Oceania among the regions included having a smaller urban population. By 2010, the Asian urban population had expanded considerably, to almost four times the European level, and the African urban population had expanded beyond the North American level. But the percentage of the population that was urban in 2010 was relatively low for Africa (39 percent) and Asia (44 percent), in comparison with Oceania (71 percent) and Europe (73 percent) and particularly Latin America and the Caribbean (79 percent) and North America (82 percent). Projections for 2010–2100 are for enormous increases in the urban populations of Asia and Africa, which are projected to account for more than 80 percent of the world's urban population by the end of the 21st century. These projections are based on percentage changes in the urban population in these two regions between 2010 and 2100 that are more than 10 times as large as in the other regions. Also of note are the reductions projected in the rural populations in all regions except Africa,

where the rural population is projected to increase by 59 percent. The decline in the rural population is projected to be particularly large in Asia.

Megacities (cities with more than 10 million people) have been growing very quickly. In 1970, the world had just two megacities (Tokyo and New York), with a combined population of 40 million. By 2011, the number of megacities had increased to 23 (13 in Asia, 4 in Latin America, and 2 each in Africa, Europe, and North America), with a total population of 359 million. By 2025, the number of megacities is projected to increase to 37, with a total population of 630 million. Most of these megacities are projected to be in Asia (22), with a few of the larger ones in the Americas (6 in Latin America, 3 in North America) and some of the smaller ones in Europe and Africa. The populations of many of these megacities are projected to be on the order of magnitude of the populations of many countries.

### ***UN Global Consultation Priorities***

The GTC-PD Report states the following priorities in the area of urbanization.

1. Develop national development policies and plans backed up by reliable and evidence-based data that foster balanced urban, rural and regional development and guide population and economic growth in ways that protect natural environments, are socially inclusive and economically productive.
2. Enable and support city governments to prepare, implement and monitor participatory city development plans that promote sustainable cities and resilient populations by accommodating a growing number of urban residents, including the poor, and ensure affordable access to land, housing, water, sanitation, energy, ICT and transport as well as health, education and other essential services. Specifically, city plans must address the safety and public health concerns of women, girls, youth and vulnerable groups. These city development plans must be formulated, implemented and monitored through partnerships with communities and their residents in order to strengthen social cohesion, inclusiveness, local culture and economies and best respond to their needs and opportunities.
3. Minimize the environmental impact of cities by creating incentives to manage urban sprawl without hastening rural agricultural land conversion, avoiding encroachment of settlements in environmentally vulnerable areas and promoting planning for dense cities with higher energy efficiency in transport and in the built environment, and more environmentally-friendly and efficient provision of other public services and infrastructure.
4. Establish national incentives programs that embrace technological innovation and creativity of urban populations, especially in the green economy, and which empower growing urban populations with economic opportunity, including through business development. Enhance the economic, social and cultural amenities of smaller and medium-sized cities to increase their global attractiveness in order to create incentives for people to move/migrate to diverse cities and not only to the major business hubs.

5. Improve the quality of life of half of their country's slum dwellers, by 2030, including assurance of secure land tenure, durable housing, basic sanitation, potable water, better health services and adequate living space, through cooperative and inclusive approaches, including slum upgrading, that do not resort to forced evictions.

### ***Discussion***

Meaningful global benefit-cost ratios for changes to promote better urbanization are difficult to estimate because of the quite varying conditions among countries for what are basically national and subnational policies and regulations. Likewise establishing meaningful global targets is very challenging and not likely to be feasible. But it is possible based on some existing estimates that in many contexts the benefit-cost ratios for better urbanization policies and regulations are considerable. However it is a major challenge to devise global indicators and some risk in the absence of such global indicators that inadequate attention will be paid to possibly very productive policy changes not only by the global community but also by national and subnational governments. Selected interventions, are likely to have high benefit-cost ratios, depending on particular contexts. These have the potential to make urbanization more efficient and more equitable by achieving balance between functions for which there are considerable economies of scale such as transportation and communication network and functions for which decentralization is likely to lead to the best responses to heterogeneous local conditions and preferences.

## **Population Quality: A Key Aspect of the Development Agenda on Population and Demography in the 21st Century**

Population quality—including health, education and other forms of human capital—is an important dimension of the development agenda on population and demography, with important implications also for sexual and reproductive health, gender equality and human rights (particularly for girls and women) (Behrman and Kohler 2014). The GTC-PD Report does emphasize dimensions of population quality, and important aspects of population quality are captured in the related reports on health and education in the current Copenhagen Consensus Project on Post-2015 Development Goals. And while this paper tries to evaluate policy options and targets related to population quantity, our discussion would be incomplete if we did not highlight the importance of population quality, and some promising policies targeted at population quality—as part the overall evaluation of population dynamics within the post-2015 development agenda.

### ***Education and schooling***

Education should be broadly defined to include all acquisition of knowledge rather than limited to formal schooling. The highest social rates of return to investments in human capital are probably not to increased formal schooling, even if the social rates of return are fairly high compared with returns to investments in many assets other than human capital. In most societies, subsidies for formal schooling are much higher at higher schooling levels, the beneficiaries of which come primarily from middle- or upper-income households. From

the point of view of pro-poor concerns about distribution, shifting toward a more targeted subsidy system would seem to be justified, although the transition to such a system might be difficult because of the vested interests of the middle- and upper-income classes in the current system.

Programs to increase parental knowledge about the importance of and means of stimulating their children, particularly in the early years of life, are likely to yield high private and social rates of return and benefit particularly children from poorer families. The limited evidence suggests that the rates of return to such preschool investments in children in a variety of developing country contexts are likely to be high (Engle et al. 2007, 2011; Hoddinott et al. 2013a,b; Psacharopoulos 2014; Victora et al. 2008). For example, Psacharopoulos (2014) estimated benefit-cost ratios of up to 37 for increasing the preschool enrollment ratio in Sub-Saharan Africa from the present 18% to 59%, and benefit-cost ratios for ensuring secondary school completion to up to 4. Ongoing studies on scaling -up such programs in a variety of contexts, including in South Asia, are likely to be very informative for future policy development.

Preschool programs for children three- to five-years-old are likely to have high social rates of return. Moreover, expansion of such programs is likely to benefit primarily children from poorer families, given that current enrollment rates are higher for children from higher-income families. Benefit-cost estimates of reducing the gap between preschool enrollment for children from the highest income quintile and other quintiles based on data from more than 70 developing countries are well over 1 (Engle et al. 2011). Studies for the United States also indicate high rates of return to preschool children from poor families (Heckman 2006).

More than 100 million girls, most of them in low- and middle-income countries, have never been enrolled in school. Increased incentives for enrollment of girls at all levels of schooling in contexts in which significant numbers of girls are not enrolled are likely to yield high social rates of return and benefit members of poorer families.

Increased incentives for boys to progress through school on time are likely to yield fairly high social returns and benefit poorer families, as among students enrolled in school, boys tend to lag on average behind girls in almost all countries, particularly boys from poor families (see, for example Grant and Behrman 2010).

Private schooling has expanded rapidly in recent years (among poor households in rural South Asia, for example). Looking forward, it will be important to craft schooling policies that are neutral with regard to school ownership rather than favoring public ownership, successfully monitor and make available information about the nature and quality of schooling, and create appropriate incentives for improving schooling quality. Some recent studies suggest substantial promise for performance-based incentive systems, albeit with some qualifications concerning the types of behaviors that are induced to improve test scores (see, for example Behrman et al. forthcoming; Muralidharan and Sundararaman 2011; Thorne-Lyman et al. 2010).

Social returns to more general education (learning how to learn) and to education over the life cycle are likely to increase in an aging and rapidly changing world. Renewed efforts to assess formal and informal means of making education over the life cycle more effective through transparent and open institutions (rather than institutions captured by groups of employers or employees) may yield high rates of return, as noted in Section 3.2. Such efforts are likely to be warranted on efficiency grounds, given the public-goods nature of new knowledge and the social costs of hobbling potential workers by outdated knowledge. They may also be warranted on distributional grounds, although historically, investments in lifelong learning have been made by large formal sector employers and organized labor and have not served well the relatively poor.

### ***Health and Nutrition***

Human capital is multifaceted. It is not identical with schooling or even with education more broadly defined to include all acquisition of knowledge. It is important that analysts and policies recognize that there are likely to be important human capital investments in health and nutrition.

Nutritional investments are likely to yield high social rates of return, with beneficiaries concentrated among poorer families. Particularly important are macronutrients during pregnancy and just after birth in contexts in which women and children tend to be undernourished and micronutrients such as iron and iodine where they are inadequate. Such investments are particularly important in South Asia, in a number of countries in Sub-Saharan Africa, and in individual countries or regions within countries elsewhere (such as Guatemala). Recent estimates suggest high rates of return to investing in nutrition, particularly in early life (Adair et al. 2009; Behrman et al. 2009; Hoddinott et al. 2013a,b, 2008; Victora et al. 2008, 2010). Public support for improved nutrition in such contexts is likely to be “win-win,” as beneficiaries come primarily from poor families and efficiency improves as a result of filling gaps in knowledge and correcting market imperfections that primarily affect poor families.

Investments in adult health and human capital may yield significant returns, especially in contexts where “healthy aging” can facilitate higher labor force participation and productivity at older ages. Currently or in the near future, the most rapidly growing age groups in some relatively poor countries, including countries in Sub-Saharan Africa, will include adults over the age of 40, many of whom who are prematurely old and limited by chronic conditions and disabilities that might be treated with current knowledge. These investments are likely to be “win-win,” as beneficiaries would be primarily people from poor families who may be marginalized within their families because of their limited productivities and efficiency would improve as a result of filling gaps in knowledge and correcting market imperfections that primarily affect poor families.

Prevention of common chronic diseases through behavioral changes (for example, stopping smoking); regulatory changes (for example, requiring that nutritional information be provided and restricting the use of certain ingredients, such as salt and trans fats); and structural changes (such as creating walkable neighborhoods) may yield important returns

by maintaining the health and human capital of aging workforces and populations in many countries. Rapidly aging populations may mean that such changes yield high social rates of returns—by, for example, reducing the private and social pressures for private and public transfers to the rapidly growing older segments of the populations. Such changes in turn are likely to reduce the probability of the collapse of intergenerational transfers to support older populations who, in the absence of such transfers would in many cases be very vulnerable, with private and social consequences.

Health systems in low- and middle-income countries and international public and private agencies, including nongovernmental organizations and foundations, need to be reoriented to the changing realities of disease composition (the growing importance of non-communicable diseases and accidents relative to traditional communicable diseases, on which many health systems and international agencies currently focus). Doing so is likely to result in efficiency gains given the increasing prominence of non-communicable diseases in the developing world and various externalities associated with them. It is also likely to be somewhat pro-poor, given the relatively high incidence of diseases, including the “diseases of development,” among poorer members of societies.

Social safety nets and health and pension systems should be untied from formal labor market participation, to reduce distortions and benefit the poorer members of society, who tend to work in informal employment that is not covered by formal sector benefits.

## **Discussion: Prioritization of Targets and Policies**

We have discussed above the policy options and development targets in the four thematic priority areas used in the GTC-PD Report. We have also listed some specific targets by which these development aims can be measured, and we outline benefit-cost ratios for specific policies that can be obtained based on current evidence.

Broadly speaking, we support the general policy recommendations in the GTC-PD Report, including the need to address and harness population dynamics through human rights-based and gender-responsive policies. Nevertheless, our chapter highlights several specific priorities for targets and policies that differ in emphasis from the presentation in that report.

**Table 3:** Approximate benefit-cost ratios for key policy priorities in the area of population and demography (not including priorities in the area of population quality, many of which have high benefit-cost ratios and are discussed as part of other papers)

Priority	Approximate benefit-cost ratio (BCR)
<b>Priorities with high benefit-cost ratios</b>	
1. Achieving <i>universal access to sexual and reproductive health (SRH) services</i> by 2030, and <i>eliminating unmet need for modern contraception by 2040</i> (Section 2)	> 90 <sup>a</sup>
2. <i>Reducing barriers to migration</i> within low- and middle-income countries, as well as between low- and middle-income countries and high-income countries (Section 4)	> 45 <sup>b</sup>
<b>Priorities with probably high, but difficult to quantify, benefit-cost ratios</b>	
3. <i>Elimination of age-based eligibility criteria for retirement</i> , and the development of public pension systems that are based on expected years of remaining life given fixed characteristics (Section 3)	<i>high</i> , but difficult to quantify
4. Programs facilitating <i>more efficient and more equitable urbanization</i> (Section 5)	<i>high</i> , but difficult to quantify
<b>Priorities with relatively low benefit-cost ratios</b>	
5. Maintenance and expansion of public pension eligibility at “relatively young old ages” (Section 3)	<i>low</i> , but difficult to quantify
6. Family policies aimed at <i>increasing low fertility in high-income countries</i> (with the exception of the expansion of early childhood education and high-quality day care) (Section 3)	<i>low</i> , and most likely < 1 due to the limited effects of most policy interventions, but difficult to quantify in general

Notes: (a) see Appendix for details of benefit-cost calculations; (b) based on Anderson and Winters (2009); the cost entering these benefit-cost calculation do not include the political and institutional costs of migration reform

Table 3 summarizes the key findings of our discussion. Within population and demography, the priorities that have the highest benefit-cost ratios are:

- Achieving universal access to sexual and reproductive health (SRH) services by 2030, and eliminating unmet need for modern contraception by 2040.
- A reduction of barriers to migration within low- and middle-income countries, as well as between low- and middle-income countries and high-income countries.

There are also several priorities for which benefit-cost ratios are likely to be substantial, despite large uncertainties regarding their estimation. These priorities with probably high, but difficult to quantify, benefit-cost ratios include:

- Elimination of age-based eligibility criteria for retirement, and the development of public pension systems that are based on expected years of remaining life given fixed characteristics.
- Selected interventions, dependent on particular contexts, that make more efficient and more equitable the inevitable urbanization by achieving balance between functions for which there are considerable economies of scale such as transportation and communication network and functions for which decentralization is likely to lead to the best responses to heterogeneous local conditions and preferences.

Policies with relatively low benefit-cost ratios include:

- Maintenance and expansion of public pension eligibility at “relatively young old ages”
- Family policies aimed at increasing low fertility in high-income countries (with the exception of the expansion of early childhood education and high-quality day care).

We also highlight that “population quality” (or human capital), including aspects such as health and education, is an important further aspect of population dynamics that is essential for addressing the challenges of future population changes, for promoting gender equality and human rights, and for realizing the benefits of population dynamics for social, economic and environmental development. Population quality therefore needs to be seen as an inherent component of population dynamics, and in some areas—for instance policies addressing population aging—population quality-related policies to increase life-long learning and adaptability and to mitigate impacts of chronic diseases are primary policies.

## **Appendix**

### ***Detailed Benefit Cost Calculations***

Given the current debates in the areas of population dynamics, and the available evidence for conducting benefit cost analyses, we focus our detailed benefit-cost calculations on family planning programs, where an adequate literature exists on both the benefits and the costs of the programs. In evaluating the benefits of these programs, the discussion in this Copenhagen Consensus Perspective Paper focuses on the implications of population dynamics on economic development and the potential effects of the above-mentioned policies on various measures of individual well-being. It is important to point out that there are several other implications of population dynamics that are not considered here, including the role of population growth on climate change, political instability and conflict. While these aspects are potentially importantly related to the population dynamics that are predicted to unfold over the next decades, their evaluation is beyond the scope of this paper (for a discussion of these issues, suggesting possibly large benefits in terms of environmental sustainability and reduced climate change from slower population growth, see for instance the recent Royal Society of Science report on “People and the planet” by Sulston et al. 2012, or the analyses of carbon emissions and population growth in O’Neill et al. 2010). The benefit-cost ratios presented below therefore are likely to be lower bounds to the extent that reduced population growth would result in additional benefits in domains such as climate change, political instability and conflict.

### ***Challenges of Benefit-Cost Analyses of Policies Targeting Population Dynamics***

Conceptually, benefit-cost analysis is straightforward. Simply compare the benefits with the costs—if the benefits exceed the costs, or equivalently the benefit-cost ratio exceeds one, then an intervention is warranted (e.g., Belfield and Levin 2010). The benefits are simply the sum of the present discounted values of the weighted impacts of the interventions. Likewise the costs are simply the sum of the present discounted values of the real resource costs of the intervention. The devil—and the challenges—however, as usual are in the details. Before embarking on the benefit-cost considerations for the above-mentioned policies in the area of population dynamics, therefore, it is important to highlight the challenges in doing so. Our review of the literature highlights the many uncertainties in assessing, for example, the determinants of fertility decline across a range of very different social and institutional contexts. Moreover, the most robust empirical evidence on family planning is based on the Asian experience during the 2nd half of the 20th century, and the Matlab experiments in particular. The evidence on the effect of migration is primarily based on the U.S. and European experiences. The extent to which these findings are applicable to other contexts, including the low and middle-income countries where fertility continues to be high and migration is likely to grow most rapidly, is at least somewhat uncertain. But even after acknowledging the limitations of the empirical evidence for conducting benefit-cost calculations, other problems remain. Some examples follow (see also Behrman et al. 2004; Behrman and Kohler 2012):

1. Range of Impacts: Policies targeting population dynamics are likely to have a range of impacts. On the micro-level, these impacts are potentially incurred by individuals, their families, and their offspring and/or parents. On the macro-level, these impacts may include economic development, which we will consider as part of the assessments in this paper, but also aspects such as climate change, political instability and conflict, which are not considered here due the lack of detailed empirical studies that could inform benefit-cost evaluations in these domains.
2. “Prices”: Impacts generally are multiple and measured in different units, but must be combined into the same units (normally monetary units with prices as weights) in order to sum them and in order to compare them with costs. For some impacts conceptually at least the measurements are relatively straightforward—for instance, international market prices for the value of increased labor productivity or reduced use of medical goods and services under the assumption that such prices reflect the true social marginal value of the relevant good or service. But for other impacts, this evaluation is much more challenging. The key example for this project is the value of averting mortality. A range of methods have been proposed in the literature—for example, the lowest-cost alternative means of averting mortality (Summers 1992, 1994) and the revealed preference as reflected in wage-risk choices in labor markets (Aldy and Viscusi 2007; Hammitt 2007; Robinson 2007; Viscusi 1993, 2010). A related question is what prices should be used. For example, should prices (including wages) be used for a poor Sub-Saharan African developing country or for Denmark—under the argument that a life should be valued the same whether it be in a low- or a high-income country? How these questions are answered can make an enormous difference for the present project in which averted mortality is a major impact. For example, Summers (1992) reports that the cost of saving a life through measles immunization was on the order of magnitude of \$800 per life saved in the early 1990s or about \$1250 in 2004 (adjusting for inflation and the costs of raising resources Behrman et al. 2004), while in a recent publication Bartick and Reinhold (2010) use \$10.56 million per death in 2007 US dollars. For the present project, all of the Assessment Papers are using the same two alternatives—DALYS of \$1,000 per year and \$5,000 per year—to assure consistency within the project with regard to this critical assumption.
3. Range of costs: What is of interest for the costs are the total true resource costs to society. These are not identical to governmental budgetary expenditures, though often analysts seem to assume that they are. On one hand governmental budgetary expenditures in some cases include substantial transfer components (e.g., in Conditional Cash Transfer programs), which typically involve some but much smaller resource costs than the amount of the fiscal expenditures. On the other hand, private costs and distortionary costs of raising funds for governmental programs may be considerable. Many programs, for example, may require time inputs from individuals that are not typically covered by governmental expenditures. Distortion costs of raising resources for governmental expenditures

also have been estimated to be on the order of magnitude of 25% of those expenditures or more (e.g., Ballard et al. 1985; Devarajan et al. 1997; Feldstein 1995; Harberger 1997; Knowles and Behrman 2003, 2005). Because cost estimates vary considerably, it is important to present estimates that illustrate how robust the benefit-cost ratios are to different cost estimates.

4. Discounting: The costs and, probably even more the benefits, may be distributed over a number of years. But the value to society of resources in the future is less than the value of the same resources now because they can be reinvested if they are available now. Therefore future costs and benefits should be discounted to the present for comparability, particularly for costs and benefits that are likely to occur some time into the future. And the discount rate makes a difference. For instance, the present discounted value (PDV) of \$1,000 received in 20 years is \$553 if the discount rate is 3%, \$377 if the discount rate is 5% and \$149 if the discount rate is 10% (and for 40 years, the respective PDVs are \$306, \$142 and \$22). However there is a lack of agreement about what discount rates are appropriate, though rates in the 3%–10% range are common for the social sectors. For the present project, all of the Assessment Papers are using the same two alternatives—discount rates of 3% per year and 5% per year—to assure consistency within the project with regard to this critical assumption.
5. Interactions among policies: Of necessity we consider the above-mentioned policies in isolation. But clearly, these programs are often embedded in other policy interventions (such as programs targeting the HIV/AIDS epidemic in SSA), and even if they are not explicitly integrated in such programs, the impact of such policies will likely depend on policies that affect access to health care and/or schooling. We've highlighted these interactions for example with respect to the potentials of reaping the benefits of a demographic dividend after a significant decline in fertility. The all of the above-mentioned policies will also depend on social and economic institutions, as the extent to which such institutions changes as a result of either the development process itself or specific policy interventions. Hence, variation across countries with respect to institutional and policy contexts is likely to have substantial implications on the consequences future population trends, and of the policies that aim to influence population dynamics. But little systematic knowledge exists that would allow the incorporation of these aspects in the benefit-cost calculations pursued here.
6. Scale: Scale can come into estimation of benefit-cost ratios in at least four ways. First, there may be high benefit-cost interventions that are effective for only a small select population, and therefore are not likely to be of interest for the present project with its broad perspective. Second, there may be interventions that have high benefit-cost ratios on a small scale but that are difficult to scale-up because critical dimensions of the small-scale intervention (e.g., high-quality and particularly dedicated staff) cannot be maintained if the intervention is scaled-up. Third, there may be important aggregate effects that result from, for example, reduced fertility due to family planning programs, or other policies that affect

population dynamics, including important aggregate impacts on economic growth. Family planning programs that are implemented on a large—possibly national or even regional—scale can potentially affect population change, and through the effects of reduced population growth and changes in age structure, can affect economic development and individual incomes. Programs that are implemented on a smaller scale, however, are unlikely to affect aggregate population dynamics, and any feedback from aggregate population change on the benefits resulting from family planning program is likely to be absent or minimal. In our analyses, we have assumed fairly large scale comprehensive programs that have implications on both the micro and macro level. And while detailed analyses of how the scale of programs affects the benefits (and possibly costs) resulting from such program seem impossible given the state of the literature, it is important to acknowledge the scale of programs in interpreting the results.

7. Estimation challenges: The estimation challenges for obtaining benefit-cost ratios are enormous not only for the reasons noted above, but because of the difficulties in obtaining good response estimates due to endogenous behavioral choices, unobserved variables, selectivity of samples, and different market and policy contexts to which large numbers of academic studies have been devoted. Our above review of the literature reflects these uncertainties. For example, for many family planning programs, both program effects and the costs associated with potentially effective programs are difficult to pin down, and scaled-up programs may have different effects and be subject to different costs than programs that have been implemented as part of research studies. Moreover, an important body of evidence on fertility changes stems from one specific program, the Matlab family planning in Bangladesh, that was relatively expensive relative to GDP per capita and the findings of which may nor may not translate to other contexts. The estimation problems are even larger in the area of migration, where existing research has primarily focused on the U.S. and European experiences, often focusing on the benefits (or lack thereof) of increased migration, while very little research exists on the costs of implementing various migration policies. One could therefore conclude that the task of estimating benefit-cost ratios is so difficult that it would be better to abandon it. But that would leave society with little systematic guidance about policy choices in this important area. Therefore, in hopes of improving the basis for policy guidance, we swallow hard and proceed boldly and hopefully creatively (and hopefully not too foolhardily) to make the best estimates that we can given the present very imperfect information and strong assumptions necessary, with some efforts to explore the sensitivity of our estimates to important alternative assumptions.

### ***Benefit-Cost Analyses for Policies Targeted at Reducing Population Growth***

Kohler (2013) has recently conducted a detailed review of the literature on population growth, and the potential roles that family planning programs have made towards reducing fertility and population growth during the demographic transition. This review highlights

the fact that the research in the last two decades has substantially strengthened the case for family planning programs, documenting for example significant effects of these programs towards reducing fertility, increasing female (mother's) education, improving women's general health and longer-term survival, increases in female labor force participation and earnings, increased child health and increased child human capital. In the remainder of this section, we update the benefit-cost calculations in Kohler (2013).

### **Costs of Contraception and Family Planning Programs**

Several recent studies provide estimates of the costs of expanding family planning programs and contraceptive services in developing and high fertility countries. Evaluations of family planning programs during the 1980s have estimated the costs per averted birth in developing countries ranging from around \$45 (Philippines, Jamaica, Thailand, Sri Lanka) to \$260 (Latin America and the Caribbean), with some estimates being higher (reported in Pritchett 1994, and converted to 2010 USD). Levine et al. (2006) estimates costs of birth averted that range from \$87 in Latin America and the Caribbean to \$131 in sub-Saharan Africa and \$163 in East Asia and the Pacific (all 2001 USD).

Because recent research has demonstrated the broader implication of family planning programs for health and economic outcomes (Kohler 2013), the recent literature on family planning de-emphasizes the costs per birth averted and focuses on the costs of service and cost of different health outcomes associated with family planning programs (see below). For example, some estimates of the costs of family planning programs focus on satisfying the demand for contraception as indicated by unmet need. Estimates by the Guttmacher Institute suggest that of the 818 million women who want to avoid a pregnancy (in 2008), 603 are using modern contraceptives and 215 million are not and are considered as having unmet need (Singh et al. 2010). The majority of women with unmet need are estimated to live in sub-Saharan Africa, and the Guttmacher Institute Report (Singh et al. 2010) shows that the current annual cost of providing modern family planning services to 603 million users in the developing world was about \$3.1 billion (about \$5 per women using family planning), including costs of contraceptives and related supplies, labor costs of health workings and program and other public health systems costs. These services are paid for by a combination of domestic sources including taxes and private sector contributions, employer and employee contributions to health insurance, and out of pocket payments by service users. Expanding family planning services to all women with unmet needs—a total of 215 million women—would require an additional annual expenditures of \$3.6 billion, bringing the total to \$6.7 billion annual. 75% of these additional expenses would be required for program and other systems costs related to expanding family planning services, while only 16% would be required for the supplies and contraceptive commodities.<sup>10</sup> Based on these estimates, the per-person costs of expanding service to women with unmet needs in developing countries is close to \$17, more than three times the costs as for current users of family planning services. These costs are broadly consistent with estimates for a sub-Saharan context (Kenya) (USAID Health Policy Initiative 2010) that range from \$2.74 (IUD) to \$13.42 (implant) per couple-year of protection. Costs at NGO facilities are estimated to be somewhat higher. Increasing the contraceptive prevalence of modern methods by 1 percentage point during one year in Kenya—from 39.5% (2008) to 40.4%—requires an additional 97,200 users (accounting for

population growth) and is estimated to require expenditures of about \$1.4 millions in terms of commodities and personnel (given current distribution of family planning methods), or about \$14 per additional user. The costs are estimated to be considerably higher per additional user if the contraceptive prevalence were to be increased by about 20 percentage points as such an increase would require substantial additional investments in health service infrastructure that is not required for a more modest increase of only 1 percentage point (for a recent discussion of the health systems strengthening efforts that are required for the implementation of successful family planning programs, see Population Council 2012, Ch. 3).

It is also important to emphasize that a mere improvement in supply of and access to family planning is unlikely to be adequate to achieve significant changes in family planning use, and the concept of unmet need is correctly criticized for suggesting this (Bongaarts and Bruce 1995; Lam 2012; Pritchett 1994). In addition to supply-side factors, the reasons for the non-use of family planning often include fears about side effects, husband/familial disapproval, or lack of information/knowledge about contraception and/or the benefits of reduced fertility (Sedgh et al. 2007). Peer pressures and social network influences can also be important factors resulting in non-use (Kohler et al. 2001; Lyngstad and Prskawetz 2010). And, of course, the level of desired fertility—which the notion of unmet needs takes as a given—can be targeted by policies that affect the costs and/or benefits of children or the costs of fertility regulation (Easterlin and Crimmins 1985; Pritchett 1994; Schultz 2007). Hence, in order to be effective, family planning programs often include demand generation through media campaigns and related behavior change communication in order to stimulate and/or motivate individuals to desire birth spacing or limiting, seek out family planning services and adopt contraceptive method use (Population Council 2012, Ch. 4). Interpersonal communication through community leaders, health workers and has been shown to be an important aspect contributing to the effectiveness of family planning programs (Arends-Kuenning 2001; Freedman and Takeshita 1969; Munshi and Myaux 2006; Phillips et al. 2006; Sunil et al. 1999; Valente and Saba 1998), as are program designs that increase women's autonomy in contraceptive decision-making (Ashraf et al. 2010). Several studies have also documented the effects of media campaigns and related behavioral change communication on the adoption of contraception and family planning (Freedman 1997; Jensen and Oster 2009; La Ferrara et al. 2008; Valente and Saba 2001), which is expected based on emphasize the diffusion of innovation and social interactions (Bongaarts and Watkins 1996; Cleland and Wilson 1987; Kohler 2001; Montgomery and Casterline 1996). Based on the existing literature, however, the costs of these components of family planning programs are difficult to assess in general and are likely to be relatively country-specific. Rather than trying to account for these costs directly, we conduct in our concluding section sensitivity analyses that document the robustness of our benefit-cost ratios with respect to a potential underestimation of program costs.

A different approach of assessing the costs of family planning is taken by Moreland et al. (2010), who try to estimate the family planning implications of the different UN projection scenarios.<sup>11</sup> The (undiscounted) cumulative family planning costs for the 45-year period between 2005–50 for sub-Saharan is estimated to be \$178 billions for the

median variant, with costs ranging from \$156 billions for the high fertility variant and \$198 billions for the low fertility scenario (the present value of family planning costs, discounted at 4%, are \$60.7 billions (medium variant), \$68.4 billions (low variant) and \$52.6 billions). The costs include commodities and personnel costs, but not necessarily the costs of scaling up the health systems to facilitate the service provision for these scenarios. Three aspects of these estimates are particularly noteworthy: first, the contraceptive costs of achieving the any of the three UN scenario are fairly substantial, with the discounted family planning costs for the 45-year period (excluding health systems cost such as potentially required expansions of the health care system; see Population Council 2012 Ch. 3 for a discussion) corresponding to about 6% of the sub-Saharan annual GDP. Second, the difference in discounted family planning costs between the UN high and low scenario is about 30%, corresponding to a difference in 2050 projected SSA population of about 478 millions and a difference in the 2005–50 population growth rate of .58 percentage points (between the 2.24% growth rate during 2005–50 in the high and the 1.66% growth rate in the low fertility scenario). Third, based on the difference in UN population projections for 2050, an averted birth during the period 2005–50 corresponds to family planning costs of \$32, and a reduction in the 2050 sub-Saharan Africa population of 1 person entails discounted family planning costs of about \$33. Or stated differently, by extrapolating these numbers, a reduction in the population growth rate by 1 percentage point during 2005–50 would entail discounted family planning costs of about \$27 billion (or about 3% of current SSA GDP).

Rather than estimating family planning costs based on the commodity and personnel costs required for attaining specific fertility trajectories, such as the UN median scenario (see above), it is also informative to consider costs of past family planning programs. The Matlab family planning experiment is widely considered to have been fairly expensive (and was thus potentially financially unsustainable), with annual program expenditures of about 10% of per capita GDP per fertile woman; in contrast, the Profamilia program in Colombia had program costs of about .1% of GDP per capita (or about 1/100th of the Matlab cost relative to income) (Miller 2010; Pritchett 1994). The reasons for these large differences in program costs are not fully transparent; they are possibly related to the fact that the Matlab program was explicitly established to evaluate a best-practice family planning program in a resource-poor context, with considerable resources devoted to the program implementation and the development of the relevant infrastructure; the Colombian family planning program, on the other hand, built on existing health infrastructure within a more developed context (and higher initial per capita GDP).

### **Benefits I: Reduced Expenditures on Health, Schooling, Etc.**

The benefit of family planning programs has often been assessed in terms of savings on social programs as a result of a less rapidly growing size of birth cohorts, with savings including a reduced need for expanding the school system, providing education, implementing immunization programs or providing health care for children. Family planning program also reduces costs of maternal health programs or programs to provide water and sanitation due to less rapid population growth. In a recent policy brief on “What would it take to accelerate fertility decline in the least developed countries?”, the UN estimates that “for every dollar spent in family planning, between two and six dollars can

be saved in interventions aimed at achieving other development goals” (UN Population Division 2009; based on calculations in Bernstein 2006). A related report for Kenya estimates that family planning expenditures of \$71 million during period 2005–15 are associated with social sector cost savings of \$271 millions—a benefit-cost ratio of close to 4:1 (USAID Health Policy Initiative 2009). Corresponding estimates in the literature vary widely. For example, due to smaller costs associated with satisfying the demand for unmet needs, USAID Health Policy Initiative (2009) estimates a ratio of social cost savings for each dollar spent on family planning of 13 to 1 for El Salvador, and a 1984 study estimated of costs savings in government programs of up to \$16 for each dollar spend on family planning programs in Thailand for the period 1972–2010 (the ratio is 7:1 for the first nine years of the program) (Chao and Allen 1984).

Estimates along the above lines are frequently used to argue that “Family planning is a good investment” (Bongaarts and Sinding 2011; UN Population Division 2009; USAID Health Policy Initiative 2009) because social cost savings as a result of reduced fertility and improved health outcomes significantly exceed the expenditures on family planning programs. However, it is important to note that the estimates of these social cost savings mostly result from “accounting” for lower fertility and improved health outcomes; these estimates do generally not reflect that reduced fertility may results in shifts from child quantity to child quality, which is likely to increase demands for schooling and potentially other health services. Hence, the social costs savings highlighted in some existing studies (USAID Health Policy Initiative 2009) may be misleading in terms of reductions in social costs if family planning programs also result—as is suggested by much of the recent literature—in shifts in the demand for child quality (including for instance child health and schooling).

**Table 4: Benefits resulting from modern contraceptive use among women who want to avoid a pregnancy, according to contraceptive use scenario, 2008**

<b>Measure (000s)</b>	<b>Current use of modern methods</b>	<b>Fulfillment of unmet need for modern methods</b>	<b>Total</b>
<b>Unintended pregnancies averted</b>	187,800	53,460	241,260
Unplanned births	53,550	21,820	75,370
Abortions	112,310	24,800	137,100
Miscarriages	21,940	6,840	28,780
<b>Deaths averted</b>			
Newborn	1,170	640	1,810
Maternal	230	150	380
<b>Children who would not become orphans</b>	740	600	1,340
<b>DALYs saved</b>			
Women	24,640	12,430	37,070
Newborns	46,350	23,710	70,060
<b>No. contraceptive users</b>	603,090	214,450	817,540

Source: Singh et al. (2010)

### **Benefits II: Evaluating Reduced Infant and Maternal Mortality**

The recent research and policy literature on family planning emphasizes the positive reproductive health outcomes associated with increased availability of contraceptives that allows women and couples to satisfy unmet need (Cleland et al. 2012). Table 4, for example, reports findings from the above-mentioned Guttmacher Institute report (Singh et al. 2010), arguing that in 2008 modern contraceptive use prevented 188 million unintended pregnancies, 1.2 million newborn deaths, and 230,000 maternal deaths and other negative health outcomes that would have occurred in the absence of any modern method use. According to this report, expanding family planning programs so that (current) unmet need were fulfilled would result in 640,000 fewer newborn deaths, 150,000 fewer maternal deaths (more than 50,000 fewer from unsafe abortion and more than 90,000 fewer from other pregnancy-related causes), and 600,000 fewer children who lose their mother. The report also estimates that satisfying unmet need results in 36 million fewer healthy years of life lost (12 million fewer among women and 24 million fewer among newborns) (for related analyses, reaching generally similar conclusions, see Ahmed et al. 2012). In a related study, Ross and Blanc (2012) decomposes declines in maternal mortality into the contributions resulting from changes in the numbers of women, the number of births, and fertility rates, concluding that declines in fertility averted approximately 1.7 million maternal deaths in developing countries during 1990–2008, corresponding to a 54%

reduction in the maternal mortality rate. Relating fertility declines to changes in contraceptive use, Cleland et al. (2012) argues—with some leap of faith in terms of inferring causal relationships from observed associations—that, because increased contraceptive use accounts for 73% of the fertility decline, about 40% in the reduction in the maternal mortality rate is due to contraception. In analyses that control for potential confounders, Cleland et al. (2012) furthermore estimate that for each percentage point increase in contraceptive use, the maternal mortality rate decreased by 4.3 deaths per 100,000 births. Analyses of Demographic and Health Survey data furthermore suggest that about one third of maternal deaths in developing countries is preventable if the unmet need for family planning were satisfied and all women wanting to stop childbearing used effective contraception (Collumbien et al. 2004; Singh et al. 2010). Nevertheless, this progress in reduced maternal mortality—both in terms of risk per birth and the total number of maternal deaths—has occurred relatively unevenly within developed countries. For example, Ross and Blanc (2012) point out that, to date, SSA has experienced minimal declines in maternal deaths, resulting from the combined effect of increases in the number of women at risk and small declines in fertility and mortality. In addition to reducing maternal mortality, increased contraceptive use has been associated with reduced infant mortality, primarily as a result of reducing the frequency of relatively short birth intervals (Hobcraft et al. 1984; Rutstein 2005) and better child health outcomes (Dewey and Cohen 2007). Cleland et al. (2012) conclude based on a review the existing literature that the infant mortality rate would fall by about 10%, and mortality of children aged 1–4 by about 20%, if all children were spaced by a gap of at least two years.

Given the fact that some empirical evaluations of family planning programs have documented effects of these programs on infant mortality (e.g., Joshi and Schultz 2013), but not in all cases where the effect on mortality was investigated (e.g., Miller 2010), it is difficult to evaluate if these specific assumptions about positive reproductive health outcomes from contraceptive use and satisfying unmet need in the above studies are realistic and reflect causal estimates of family planning programs rather than merely observed associations. Skeptical readers of the above evidence are likely to be worried that the above analyses of the number of maternal and infant/child death averted as a result of increased contraceptive use are overestimates since they are mostly derived from correlational studies that may not necessarily provide estimates of causal effects (for a discussion of these estimation issues, see Schultz 2010). Nevertheless, the recent economic literature on the careful evaluation of family planning programs reviewed in Kohler (2013) suggests a relatively convincing basis for concluding that positive health benefits for children and mothers of family planning programs do indeed exist, and that these positive effects persist after controlling for possibly endogeneity of contraceptive use. But these micro-studies are difficult to generalize to SSA or all developing countries for obtaining benefit-cost ratios. Hence, while acknowledging the potential limitations of these estimates for the benefit-cost analyses in this paper, we take the estimates in Singh et al. (2010) at face value, and evaluate the value of life according to the Copenhagen Consensus 2012 guidelines with \$1,000 per DALY, 3% discounting and life expectancy at birth (for newborn deaths) and at age 28 (for maternal deaths). In this case, the expansion of family planning programs to cover current unmet need in developing countries results in total benefits of \$110 billion. Given costs of satisfying the current unmet need of \$3.6 billion, these

calculations suggests a benefit-cost ratio of about 30:1 for the expansion of family planning programs to cover unmet need. This benefit cost ratio rises to 50:1 if the DALYs saved reported in Table 4 are valued at \$5,000, and the benefit-cost ratios would even be higher if the average costs of service provision, rather than the marginal costs of satisfying unmet need, were used in the calculations. However, these benefit-cost ratios are overestimates to the extent that the causal impacts of family planning programs are less than those estimated in Singh et al. (2010) and assumed in the above calculations.

### **Benefits III: Life Cycle, Distributional and Intergenerational Benefits of Family Planning Programs**

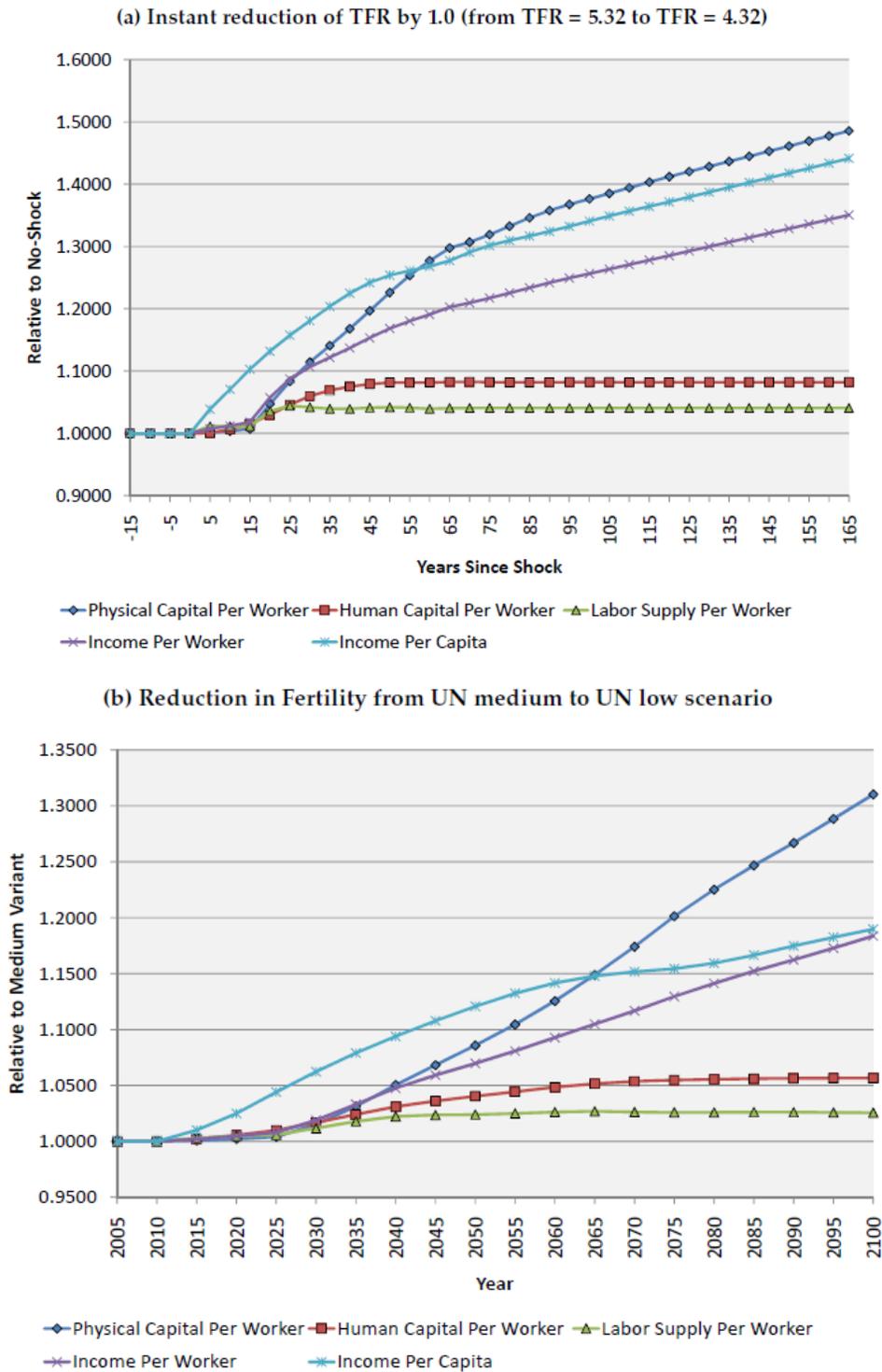
In addition to the effect of family planning programs towards reducing fertility and reducing maternal/child mortality, these programs have been shown to result in higher levels of female (mother's) education, improvements in women's general health (e.g., as indicated by BMI) and longer-term survival, increases in female labor force participation and earnings, increased child health (up and beyond the effect on reducing child mortality) and increased child human capital (including higher schooling levels) (e.g., Joshi and Schultz 2013; Miller 2010; Schultz 2009; see Kohler 2013 for a detailed discussion). Several of these program effects will affect individual's well-being because in large-scale family planning programs—the only ones that we evaluate here—these effects will make contributions to economic growth, which in turn will affect future income levels. The benefits resulting from increased economic growth—including (at least partially) the effects of improved health, human capital, female labor force participation and higher female earnings—will be considered in the next section. In addition, all of the above program effects will generally be considered desirable and beneficial because they reduce inequality, including gender inequality, contribute to an improved status of women, possibly reduce poverty, and potentially increase subjective well-being among adults (and especially females) and children. Nevertheless, within the current framework and given the available empirical evidence, it will be impossible to explicitly evaluate the benefits of these effects in terms of our benefit-cost calculations up-and-beyond their contributions to economic growth that are considered below.

### **Benefits IV: Contributions of Reduced Fertility to Per-Capita Income Growth**

The macro-level interactions between population growth and economic developments are among the key considerations in evaluating the potential benefits of investments in family planning programs. But despite decades of research on this topic with shifting consensus opinions, this aspect remains challenging to evaluate. We review, and then evaluate, in this section some of the prevailing perspectives. It is important to keep in mind that, even if we conclude below that benefit-cost ratios of family planning programs are likely to be significantly larger than one with respect to contributions to per-capita income growth, one should not have illusions about the ability of such programs to reduce global inequalities in income levels between developed and developing countries, or even between the least and other less developed countries. The contribution of reduced population growth to economic growth, pale in light of the about 20-fold differences in income levels that exist in global comparison. Hence, family planning program are not likely to be a substitute for other development efforts.

One possible approach to evaluate the benefits of family planning programs in light of the important linkages between economic growth and changes in the population size and structure is provided by Ashraf et al. (2011), who investigate the extent to which economic measures such as GDP per capita would change in response to reductions of fertility. Specifically, the model tries to account for four different effects through which population size and age structure may affect economic growth. The first two focus on the role of the population size: a Malthusian effect, reflecting the the congestion of fixed factors, such as land, through population growth; a Solow effect that captures the capital shallowing resulting from a growth in the labor force. In addition, several channels reflect potential effects of changes in the age structure the population and capture potential demographic dividends: a dependency effect that captures that, in a high-fertility environment, a reduction in fertility leads, at least temporarily, to a higher ratio of working-age adults to dependents and—if income per worker is held constant—mechanically raises income per capita; a life cycle savings effect that captures that a concentration of population in their working years may raise national saving, feeding through to higher capital accumulation and higher output; an experience effect that captures the shift of the working age population to higher ages, i.e., towards individuals with more experience and potentially higher productivity; a life cycle labor supply effect reflects that labor force participation may increase as a result of differential participation rates when the age structure shifts to older ages, and a child care effect reflects increases in female labor supply as a result of reduced fertility; finally, a child quality effect reflects that reductions in fertility may result in a quality-quantity trade-off, and increased child quality may foster economic growth. The model does not include one additional potential effect, a Boserup effect that would capture direct effects of the population size on productivity, for instance through economies of scale or induced institutional change.

**Figure 3:** The effect of reduced fertility on economic growth in a unified growth model calibrated to Nigeria.



Notes: Top panel: Instant reduction of TFR by 1.0 (from TFR = 5.32 to TFR = 4.32); after 50 years, the population is 25% smaller than under constant fertility. Bottom panel: Reduction in Fertility from UN

medium to UN low scenario; by 2050, the population in the low fertility scenario is 12% below that of the medium scenario.

Source: Ashraf et al. (2011)

Figure 3 shows the results for the development of GDP per capita (light blue line) along with some related indicators for two scenarios: First, an immediate decline of the TFR by 1 (from 5.32 to 4.32) that is compared to the TFR remaining constant at the 2005 level of 5.3. Second, a future trend of the TFR that follows the UN low scenario as compared to the medium scenario, resulting in a 12% smaller population as compared to the medium scenario. The surprising result from the simulations in Ashraf et al. (2011), which are based on an explicit economic model that includes interactions between economic development and the size and age-structure of the population—is that the findings are very consistent with the conclusions obtained from the RAPID model (Government of Kenya 2010; Government of Malawi 2010; Uganda Ministry of Finance, Planning and Economic Development 2010; Zambia Ministry of Finance and National Planning 2010). In the top panel of Figure 3, GDP per capita is about 26% higher after 50 years if the TFR declines by one child as compared to constant fertility. Since the population size is also about 25% lower in this case as compared to the constant fertility scenario, over the course of 50 years the more rapid growth in GDP per capita after a decline in TFR essentially mirrors the less rapid growth in the size of the population. A similar conclusion follows from the simulations that compare the UN low fertility scenario with the UN median fertility scenario. In the low fertility scenario, the population in 2050 is about 12% below that implied by the medium scenario. The simulations in Ashraf et al. (2011) associate with this less rapid growth in population a 12% higher GDP per capita (Figure 3, bottom panel). In summary, therefore, the analyses by Ashraf et al. (2011) suggest that, across two simulations with very different population and economic growth rates, an approximate calculation in which reductions in population growth rate increase growth in GDP per capita almost one-for-one is fairly accurate over a 50 year horizon.<sup>12</sup> And while the analyses by the USAID Health Policy Initiative using the RAPID model can be correctly criticized for not having an explicit economic model that informs the contribution of demographic changes to economic growth, the “built-in” conclusions about the connection between reduced population growth and higher per capita GDP is consistent with the analyses by Ashraf et al. (2011) (Figure 3). If this were indeed the case, the benefit-cost ratios in terms of GDP per capita would be on the order of magnitude of 60:1 over a 50 year horizon—as we’ve calculated above for Zambia—if reducing the population growth by 1% during this period would have present per capita value costs of around 20–30% of per capita GDP—an assumption that seems quite plausible given the calculation of family planning program costs above.<sup>13</sup>

In addition to relying on results of simulation models such as in Ashraf et al. (2011), we can ask if our knowledge of the interactions between population growth and economic development, and in particular, our knowledge of the potential impacts of changing age structures, are consistent with the above interpretations (Bloom and Canning 2008; Bloom et al. 2007a,b, 1998; Kelley and Schmidt 1995, 2005) (see also Kohler 2013). Eastwood and Lipton (2011) provide a detailed discussion of the implications of this literature for understanding the potential of a demographic dividend in sub-Saharan Africa. In particular,

the recent literature on the demographic dividend has estimated versions of models of the form  $g(Y/N) = \phi + X\beta + \delta(Y/L) + \gamma g(WA/N)$ , where  $g(\cdot)$  denotes the growth rate,  $Y$  is output,  $N$  is the population size,  $L$  is the size of the labor force,  $Y/L$  is output per worker,  $(WA)$  is the population in working ages, and  $WA/N$  is the fraction of the population in working ages.  $\gamma$  indicates the effect of changes in age in the proportion of the population in working ages—which tends to increase as fertility declines—on per capita income. Estimates for  $\gamma$  range from 1.5 to 3.5, with the higher of these figures obtained for African countries (e.g., Bloom et al. 1998, Table 6). For Zambia, for example, the projected population growth rate during 2010–60 is 3.29% in the UN high fertility scenario, and 2.73% in the UN low fertility scenario; the low fertility scenario thus implies a .56 percentage point lower growth rate. In the high fertility scenario, the growth in the fraction of the population at working ages (16–65) is 0.121%, and in the low fertility scenario this growth rate increases to 0.292% (a difference of .171 percentage points). A parameter value of  $\gamma$  of close to 3, which has for instance been estimated for SSA by Bloom et al. (1998), would imply that the more rapid growth in the fraction of the population in the low fertility scenario results in a more rapid growth of GDP per capita of about .51%—a value that corresponds closely to the reduced population growth rate that is implied by the low fertility scenario as compared to the high fertility scenario. Very similar results also hold for other high fertility SSA countries (such as Nigeria).

There is considerable controversy about the validity of the country-level estimates of the demographic dividends, that is, the contribution of changing age structures to economic growth. Some of these concerns are of an econometric nature (Schultz 2010), while others question the applicability of the Asian experience—which is an important driver of the empirical results—to SSA. Notwithstanding these criticisms, however, if one takes the existing estimates of a demographic dividend ( $\gamma$  in the above notation) at their face value, they are consistent with our earlier discussions of Figure 3 and an approximate calculation that reductions in population growth translate one-to-one into increased rates of per capita GDP growth. If this is indeed the case, family planning programs are associated with significant benefit-cost ratios in terms of per capita income growth, possibly in the order of magnitude to 60:1 or higher. In interpreting this benefit-cost calculation, however, it is important to emphasize that the evidence underlying such benefit-cost calculations for the effect of family planning programs on increased growth of GDP per capita remains tenuous at best, and that there remains considerable uncertainty about the magnitude these effects that is very difficult to evaluate at this point.

### **Benefit-cost ratios for family planning programs**

The costs of family planning programs in the past have varied widely (Section A.2.1), and so do estimates of the costs of expanding family planning services in the current high fertility countries that have the largest unmet need for such programs. Given the need to expand health systems and related infrastructures, the costs of expanding access to family planning per additional user are thought to exceed—at least in the short- to medium term—the average costs per current user in SSA contexts. Recent estimates, for example, suggest that additional annual expenditure of \$3.6 billions would allow expansion of family planning services to all women who currently have an unmet need. Arguably most useful for the present benefit-cost calculations are estimates of the family planning costs related to

attaining the UN population forecasts (Moreland et al. 2010), which suggest that a reduction in the SSA population growth rate by 1 percentage point during 2005–50 would entail discounted family planning costs in the order of magnitude of about \$27 billion (or about 3% of current SSA GDP) (see Section A.2). These estimates do not consider potentially necessary expansions of health systems that might be necessary to increase the family planning provisions to the required levels and possible costs of generating the demand for family planning (Population Council 2012), and so actual program costs may be significantly higher—however, based on the literature, it is difficult to make precise conclusions about the costs of these additional investments, which almost certainly, are context specific and highly variable across countries.

In terms of benefits, our discussion has focused on four categories. First, benefits that result from the fact that family planning programs may reduce expenditures on social programs as a result of a less rapidly growing size of birth cohorts, with savings including a reduced need for expanding the school system, providing education, implementing immunization programs or providing health care for children. However, these savings may potentially be misleading as in terms of reductions in social costs if family planning programs also result—as is suggested by much of the recent literature—in shifts in the demand for child quality (including for instance child health and schooling) and increases in female education. Because the net effect is unclear, we do not consider these benefits in our benefit-cost calculations.

Second, benefits of family planning programs occur because reduced fertility, increased child spacing and possible reductions in unwanted fertility are likely to reduce both infant and maternal mortality. Some recent estimates of the reduction in child and maternal mortality that would result from expanding family planning programs to satisfy current unmet need suggest benefit-cost ratios in the order of magnitude of 30:1 to 50:1 resulting from the reduction in child and maternal mortality alone (Section A.2.3). Some caution, however, is necessary in interpreting these numbers since it is not clear to what extent these estimates reflect the causal impact of expanding family planning programs on child/maternal mortality.

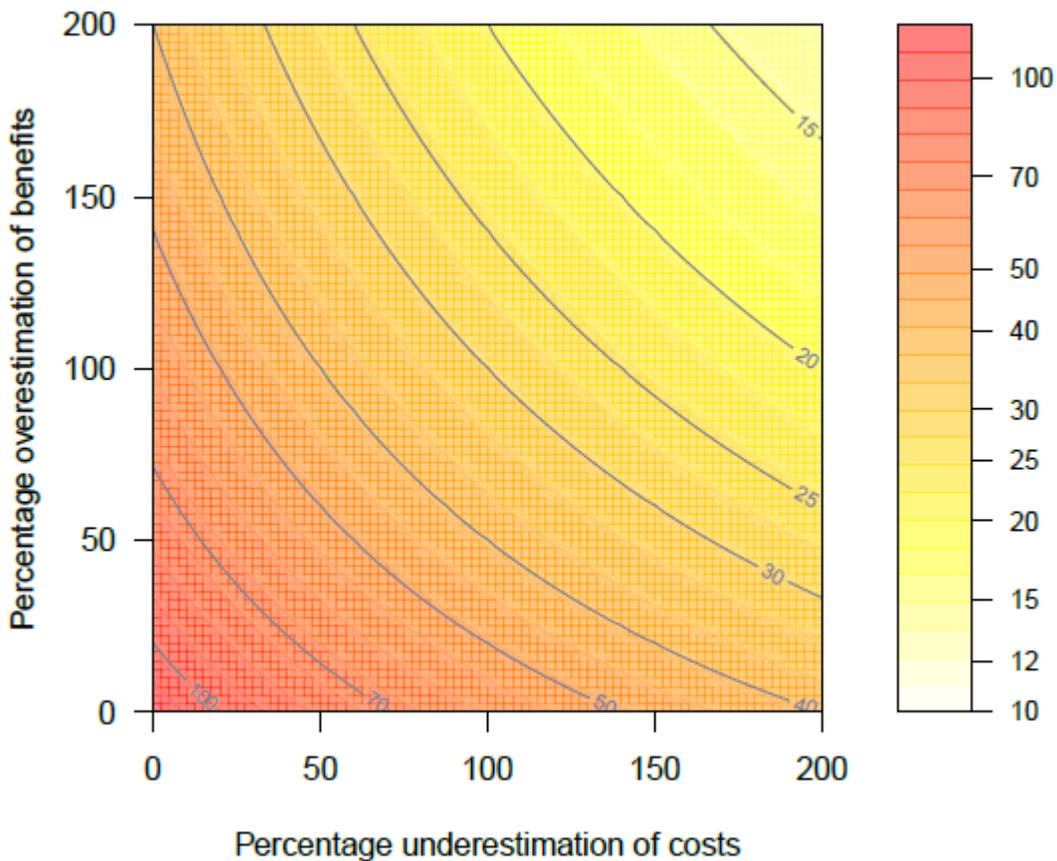
Third, our analyses have emphasized that family planning programs—in addition to reducing fertility and, related, maternal and child mortality—are likely to result in higher levels of female education, improvements in women’s general health, increases in female labor force participation and earnings, increased child health (up and beyond the effect on reducing child mortality) and increased child human capital. Several of these factors will affect economic growth, and will therefore be considered as part of the benefits considered below. And while these consequences are likely to be desirable from a policy perspective up and beyond their contributions to economic growth, we will not consider these additional life cycle, distributional and intergenerational benefits of family planning program due to the difficulties in evaluating them within the framework of this paper.

Fourth, and finally, benefits of large-scale family planning programs may result from changes in population dynamics, and in particular, from reductions in population growth rates, increases in the proportion of the population at working ages, and increases in levels

of human capital and female labor force participation that result from reduced fertility over the next decades. It is important to emphasize that these aggregate effects of family planning programs—as of many other health interventions (Bleakley 2010)—are likely to be small in light of the vast differences in income levels among less developed countries, or between the least developed and more developed countries. Some recent discussions of the contribution of demographic change—and specifically declining fertility, age-structure changes and demographic dividends—to economic development in SSA seem rather optimistic in that regard (Sippel et al. 2011). Nevertheless, a review of the literature suggests that reductions in population growth rates by 1 percentage point in current high fertility countries may result in increases of the growth rate of per capita GDP by approximately 1 percentage point. This effect of reduced population growth on economic development is about twice as large as the effect that was suggested in the National Research Council (1986) report on Population Growth and Economic Development.<sup>14</sup> Given the uncertainty in the underlying models, the still limited knowledge about population–development interactions, and the limitations of existing empirical estimates, all of which have been subject to a long and at times heated discussion, this finding is hardly more than a rule of thumb or back-of-the-envelope calculation. Nevertheless, if this estimate that reductions in population growth rates by 1 percentage point in current high fertility countries may result in increases of the growth rate of per capita GDP by approximately 1 percentage point is broadly accurate, it would suggest substantial benefit-cost ratios for family planning programs, possibly in the magnitude of 60:1 to 100:1 (or even higher) if the discounted costs of reducing population growth by 1 percentage in SSA are indeed in the order of magnitude of less than 10% of current SSA GDP during the next five decades (as is suggested by our discussion of the program costs above). The sizable benefit-cost ratios essentially result from the fact that reductions in fertility and population growth rates will result in sustained increases in GDP per capita over several decades in these calculations, and the costs of achieving these reductions in fertility and population growth are relatively modest when compared to current GDP levels in SSA and other least developed countries. However, one should not be mistaken about the magnitude of these aggregate economic effects in terms of closing substantial the income gap between the least developed countries and other developing or even developed countries. While these aggregate effects of family planning programs are likely to contribute substantially and favorably to the benefit-cost ratio of family planning programs, the aggregate effects are too small for these programs to significantly reduce global income inequalities or to provide a substitute for other development policies. More likely, a convincing case can be made for integrating family planning programs with other development policies (APPG 2007; Canning 2012; Cleland et al. 2006; Eastwood and Lipton 2011; Global Agenda Council on Population Growth 2012; Sippel et al. 2011; Teller and Hailemariam 2011; Wilcher et al. 2009), including those that target reproductive-health concerns such as HIV/AIDS or other infectious diseases (including specifically also those reducing infant/child mortality) and/or development policies that would help create the institutional environment to capture the demographic dividend from reduced population growth and changes in the population age structure that are likely to occur in the next decades.

Combining the above estimates of the benefit-cost ratios for family planning programs in the area of reducing maternal/child mortality and increasing income per capita suggest benefit-cost ratios for investments in family planning programs of 90:1 to 150:1. Table 1 summarizes how these benefit-cost ratios arise from benefits in terms of reduced infant and maternal mortality and income growth. High and low estimates for the former are due to different evaluations of life, and in the latter, due to different costs of achieving a specific reduction in fertility and population growth rates. The table also reports the estimated costs of satisfying the total current unmet need for family planning in developing countries, obtained from Singh et al. (2010) (see also Section A.2.1), as well as the total benefits resulting from this investment in family planning based on the benefit-cost ratios obtained reported in this table.

**Figure 4:** Robustness of benefit-cost calculations: benefit-Cost Ratio for family planning programs if costs are underestimated and/or benefits are overestimated by a factor of up to 200%



Several caveats need to be emphasized when interpreting these favorable benefit-cost ratios for family planning programs. On the one hand, since there is evidence that family planning programs result in benefits that are not considered here, such as climate change, environmental sustainability and political stability (Goldstone et al. 2012; O’Neill et al. 2010; Speidel et al. 2009; Sulston et al. 2012), one could argue that the actual benefit-cost ratios are likely to be higher. On the other hand, we have emphasized throughout this

paper that, despite the progress in the literature during the last two decades, the empirical basis for conducting these benefit-cost calculations remains somewhat weak, and significant uncertainty prevails in both the assessments of the costs of these programs and their expansion, as well as in terms of the causal effects in terms a range of benefits that these programs will produce. It is easy to argue that many biases in the existing literature will tend to over-state the benefits resulting from family planning programs and under-state the costs of these programs and their expansion (Sections A.2.1–A.2.5). Thus, the above benefit-cost ratios would tend to be over-estimates. Based on the current literature, it is impossible to establish with confidence how large these biases might be. However, the magnitude of the benefit-cost ratios for family planning programs that emerge from our analyses, and the relatively convincing recent empirical micro- and macro-evidence about the benefits resulting from family planning programs and reductions in fertility, a fairly favorable assessment of family planning programs in terms of their benefit-cost ratios and cost-effectiveness seems to be justified and relatively robust with respect to measurement errors. For example, Figure 4 illustrates how a benefit-cost ratio of 120, which is the average of the high and low overall benefit-cost ratios reported in Table 1, would change if the costs of family planning programs were underestimated, and/or the benefits of these programs were overestimated, by a factor of up to 200% (i.e., if the costs were up to 3-times as high, and/or the benefits were only 1/3 as high as is assumed in the current calculation of the benefit-cost ratios in Table 1). Even in the most pessimistic assumption in Figure 4 when the costs are 3-times as high and the benefits are only 1/3 as high as is currently assumed in Table 1, the benefit-cost ratio are fairly favorable and in excess of 13:1; and, of course, the benefit-cost ratios are higher if the underestimation of the costs and/or the overestimation of the benefits is less pronounced.

## Notes

\*Kohler is Frederick J. Warren Professor of Demography, Department of Sociology and Population Studies Center, 3718 Locust Walk, University of Pennsylvania, Philadelphia, PA 19104-6299, USA; Email: [hpkohler@pop.upenn.edu](mailto:hpkohler@pop.upenn.edu), Homepage: <http://www.ssc.upenn.edu/~hpkohler>. Behrman is William R. Kenan Jr. Professor of Economics and Sociology, Department of Economics and Population Studies Center, University of Pennsylvania, 3718 Locust Walk, Philadelphia, PA 19104, USA; Email: [jbehrman@econ.upenn.edu](mailto:jbehrman@econ.upenn.edu).

1. For a related discussion of future policy priorities in the area of population quantity, quality and mobility, see Behrman and Kohler (2014).
2. The other priority areas emphasized in the GTC-PD Report are Economic development and income security, Population data and projections, and Development cooperation and partnerships.
3. A net reproduction rates (NRR) of more than 1.5 means that more than 1.5 daughters are born to women given 2010 fertility and mortality levels. This implies that the next generation is 50% larger than the current generation, and at constant fertility and mortality levels, a NRR of 1.5 implies a long-term annual population growth rate of about 1.4%. The intrinsic growth rate is the population growth rate that would prevail in the long term if current patterns of fertility and mortality were to prevail in a population and the population is closed to migration.
4. However, it is important to note that the average remaining life expectancy can increase in aging populations, and old-age dependency ratios that are adjusted for gains in life expectancy increase considerably less than old-age dependency measures calculated based on fixed ages (conventionally age 65) (Sanderson and Scherbov 2008).
5. Actuarial neutrality is a marginal concept, relating to the effect of working an additional year. It implies that the present value of accrued pension benefits for working an additional year is the same as in the year before (meaning that benefits increase only by the additional entitlement earned in that year). Conversely, retiring a year earlier should reduce the pension benefit both by the entitlement that would have been earned during the year and by an amount to reflect the longer duration for which the pension must be paid. In contrast, actuarial fairness of a pension system requires that the present value of lifetime contributions equals the present value of lifetime benefits (Queisser and Whitehouse 2006). Actuarial fairness thus relates to the entire lifetime of contributions and benefits. A pension system can be actuarially fair but not neutral, and vice versa. For a detailed discussion of actuarial neutrality and fairness see Queisser and Whitehouse (2006).
6. The implicit social security tax reflects the fact that the wage compensation for working an additional year consists of two components: the first is wage earnings,

and the second is the “increase” in the expected present discounted value of promised future social security benefits. If the difference between these two components is positive, then the benefits of a person who works for an additional year, and thus forgoes one year of benefits, would be increased to offset the fact that they are received for one fewer year. This is true, for example, for the typical worker in the United States: if a worker forgoes claiming benefits at the earliest possible age (62) and works another year, benefits in subsequent years are increased by 6.67% to account for the fact that benefits will be received for one fewer year. In many other countries, however, the accrual is significantly negative. This is largely a consequence of not increasing benefits enough if the age of benefit receipt is delayed. In this case, benefits are not actuarially neutral, and the gain in wage earnings is partially, or even mostly, offset by a loss in future social security benefits. The ratio of this loss to wage earnings (after tax) is called the social security implicit tax on earnings. In many countries, this tax can be 80% or more at certain ages. To provide a simple summary of the country-specific incentives for early retirement, Wise (2010) sums the implicit tax rates on continued work beginning at age 55 or at an early retirement age—when a person is first eligible for social security benefits—and running through age 69. This measure, which Wise (2010) calls the “tax force to retire” or “implicit social security tax” varies from 1.6 in the United States to 9.2 in Italy.

7. United Nations Framework Convention on Climate Change
8. The post-Hyogo framework is the current UN Post-2015 Framework for Disaster Risk Reduction
9. In addition to the large uncertainties regarding the costs of migration reform, commentaries written as part of the Copenhagen Consensus Project on the benefit-cost assessments for reducing the barriers to migration also highlight that the empirical estimates of the gains of migration might be overestimated in these analyses; see for instance Rosenzweig (2004) and Deardorff (2009).
10. It is difficult to assess based on Singh et al. (2010) and related reports how quickly, if at all, programs could be family planning programs could be expanded to reach the unmet need of all women in the developing world or sub-Saharan Africa, even if the additional funds were provided.
11. Moreland et al. (2010) base their calculations on the 2008 version of the UN World Population Prospects, rather than the most recent 2012 version. The differences of assessing the costs of family planning programs between these versions are likely to be minor.
12. We emphasize that these calculations are “approximate” in the sense that there is considerable uncertainty about this conclusion. In a subsequent version of the paper that uses the 2010 UN Population Prospects, Ashraf et al. (2013) estimates that a 1 percentage point reduction in the annual population growth rate over a 50-year

horizon is associated with a .84 percentage point increase in the annual rate of per capital GDP growth over this period. Because Moreland et al. (2010) provides estimates of the family planning costs associated with attaining the 2008 UN World Population Prospect scenarios, we continue to use the results from Ashraf et al. (2011). It is also important to mention that, while the model Ashraf et al. (2011) is based on the most recent developments in growth theory (e.g., Galor 2011) that is calibrated to a SSA context, an assessment of the aggregate consequences of fertility declines based on remains subject to important uncertainties about the parameter values used in the simulation as well as about the mechanisms for the interactions between population change and economic development that are postulated as part of the model.

13. The calculation assumes that GDP per capita grows at 3–4% p.a., and that a reduction in population growth would increase the rate of GDP per capita growth by 1 percentage point. The gain in GDP per capita is discounted at 3%. Even if GDP per capita were constant in the presence of more rapid population growth, the benefit-cost ratio would be 60:1 if population growth could be reduced over the 50 year horizon at a cost of about 10% of GDP per capita.
14. The conclusions in National Research Council (1986) state: “A simple model suggests that the effect is comparatively modest. Using a typical labor coefficient of 0.5 in estimated production functions, a 1 percent reduction in the rate of labor force growth would boost the growth of per capita income by 0.5 percent per year.” Since the report did not consider age structure effects, a the growth rate of the labor force is equal to that of the population. The reports conclusions therefore continue: “Thus, after 30 years, a 1 percent reduction in the annual rate of population growth (produced, say, by a decline in the crude birth rate from 37 to 27 per 1,000) will have raised production and income per capita to a level 16 percent [=  $\exp(.005 * 30) - 1$ ] above what it would otherwise have been.”

## References

- Abel, G. J. and Sander, N. (2014). Quantifying global international migration flows. *Science* 343(6178): 1520–1522. doi:10.1126/science.1248676.
- Adair, L. S., Martorell, R., Stein, A. D., Hallal, P. C., Sachdev, H. S. et al. (2009). Size at birth, weight gain in infancy and childhood, and adult blood pressure in 5 low-and middle-income-country cohorts: when does weight gain matter? *American Journal of Clinical Nutrition* 89(5): 1383–1392. doi:10.3945/ajcn.2008.27139.
- Ahmed, S., Li, Q. F., Liu, L. and Tsui, A. (2012). Maternal deaths averted by contraceptive use: An analysis of 172 countries. *Lancet* forthcoming. Preliminary version is available at <http://paa2012.princeton.edu/download.aspx?submissionId=122679>.
- Aldy, J. E. and Viscusi, W. K. (2007). Age differences in the value of statistical life: Revealed preference evidence. *Review of Environmental Economics and Policy* 1: 241–260. doi:10.1093/reep/rem014.
- Anderson, K. and Winters, A. L. (2009). The challenge of reducing international trade and migration barriers. In: Lomborg, B. (ed.), *Global Crises, Global Solutions: Second Edition*, Cambridge, MA: Cambridge University Press, 451–503.
- APPG (2007). Return of the population growth factor: Its impact on the Millennium Development Goals. All Party Parliamentary Group on Population Development and Reproductive Health (APPG), UK Parliament, London, URL [www.appg-popdevrh.org.uk](http://www.appg-popdevrh.org.uk).
- Arends-Kuenning, M. (2001). How do family planning worker visits affect women's behavior in Bangladesh? *Demography* 38(4): 481–496.
- Ashraf, N., Field, E. and Lee, J. (2010). Household bargaining and excess fertility: A study in Zambia. Harvard Business School: Unpublished Manuscript, URL [http://people.hbs.edu/nashraf/papers/Ashraf\\_Field\\_Lee\\_December2010.pdf](http://people.hbs.edu/nashraf/papers/Ashraf_Field_Lee_December2010.pdf).
- Ashraf, Q. H., Weil, D. N. and Wilde, J. (2011). The effect of interventions to reduce fertility on economic growth. NBER Working Paper #17377, URL <http://www.nber.org/papers/w17377>.
- Ashraf, Q. H., Weil, D. N. and Wilde, J. (2013). The effect of fertility reduction on economic growth. *Population and Development Review* 39(1): 97–130. doi:10.1111/j. 1728-4457.2013.00575.x.
- Ballard, C., Shoven, J. and Whalley, J. (1985). General equilibrium computations of the marginal welfare costs of taxes in the United States. *American Economic Review* 75(1): 128–138.

- Bartick, M. and Reinhold, A. (2010). The burden of suboptimal breastfeeding in the United States: A pediatric cost analysis. *Pediatrics* 125(5): 1048–1058.
- Bauernschuster, S., Hener, T. and Rainer, H. (2014). Children of a (policy) revolution: The introduction of universal child care and its effect on fertility. CESifo Working Paper Series No. 4776, URL <http://ssrn.com/abstract=2439616>.
- Beard, J., Biggs, S., Bloom, D., Fried, L., Hogan, P. et al. (2012). Global population ageing: Peril or promise? PGDA Working Paper No. 89 (Global Agenda Council on Ageing Society), URL <http://www.hsph.harvard.edu/pgda/working.htm>.
- Behrman, J. R., Alderman, H. and Hoddinott, J. (2004). Hunger and malnutrition. In: Lomborg, B. (ed.), *Global Crises, Global Solutions*, Cambridge: Cambridge University Press, 363–420. (see also <http://www.copenhagenconsensus.com>), URL (seealso<http://www.copenhagenconsensus.com>).
- Behrman, J. R., Calderon, M. C., Preston, S., Hoddinott, J., Martorell, R. et al. (2009). Nutritional supplementation of girls influences the growth of their children: Prospective study in Guatemala. *American Journal of Clinical Nutrition* 90: 1372–1379.
- Behrman, J. R. and Kohler, H.-P. (2012). Sexual transmission of HIV. In: Lomborg, B. (ed.), *Rethink HIV: Smarter Ways to Invest in Ending HIV in Sub-Saharan Africa*, Cambridge, MA: Cambridge University Press, chap. 1, 11–60. Working paper version available at <http://www.rethinkHIV.com>.
- Behrman, J. R. and Kohler, H.-P. (2014). Population quantity, quality, and mobility. In: Fardoust, S. and Behrman, J. R. (eds.), *Towards a Better Global Economy: Policy Implications for Global Citizens in the 21st Century*, Oxford, UK: Oxford University Press, forthcoming. Working paper version is available at [http://www.gcf.ch/?page\\_id=5811](http://www.gcf.ch/?page_id=5811).
- Behrman, J. R., Parker, S. W., Todd, P. E. and Wolpin, K. I. (forthcoming). Aligning learning incentives of students and teachers: Results from a social experiment in mexican high schools. *Journal of Political Economy*.
- Belfield, C. and Levin, H. (2010). Cost–benefit analysis and cost–effectiveness analysis. In: Peterson, P., Baker, E. and McGaw, B. (eds.), *International Encyclopedia of Education* (Third Edition), Oxford: Elsevier, 199–203. doi:10.1016/B978-0-08-044894-7.01245-8.
- Bernstein, S. (2006). Public choices, private decisions: Sexual and reproductive health and the Millennium Development Goals. UN Millnium Project, URL [http://www.unmillenniumproject.org/documents/MP\\_Sexual\\_Health\\_screen-final.pdf](http://www.unmillenniumproject.org/documents/MP_Sexual_Health_screen-final.pdf).
- Blau, F. D. and Kahn, L. M. (2012). Immigration and the distribution of incomes. NBER Working Paper #18515, URL <http://www.nber.org/papers/w18515>.

- Bleakley, H. (2010). Health, human capital, and development. *Annual Review of Economics* 2(1): 283–310. doi:10.1146/annurev.economics.102308.124436.
- Bloom, D. E. and Canning, D. (2008). Global demographic change: Dimensions and economic significance. *Population and Development Review* 34(Supplement): 17–51.
- Bloom, D. E., Canning, D., Fink, G. and Finlay, J. (2007a). Does age structure forecast economic growth? NBER Working Paper No. 13221, URL <http://www.nber.org/papers/w13221>.
- Bloom, D. E., Canning, D., Fink, G. and Finlay, J. (2007b). Realizing the demographic dividend: Is Africa any different? Program on the Global Demography of Aging, Harvard University, PGDA Working Paper No. 23, URL <http://www.hsph.harvard.edu/pgda/working.htm>.
- Bloom, D. E., Canning, D. and Sevilla, J. (2002). *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*. Santa Monica, CA: RAND Corporation.
- Bloom, D. E., Sachs, J. D., Collier, P. and Udry, C. (1998). Geography, demography, and economic growth in Africa. *Brookings Papers on Economic Activity* 1998(2): 207–295.
- Bongaarts, J. and Bruce, J. (1995). The causes of unmet need for contraception and the social content of services. *Studies in Family Planning* 26(2): 57–75.
- Bongaarts, J. and Sinding, S. (2011). Population policy in transition in the developing world. *Science* 333(6042): 574–576. doi:10.1126/science.1207558.
- Bongaarts, J. and Watkins, S. C. (1996). Social interactions and contemporary fertility transitions. *Population and Development Review* 22(4): 639–682.
- Canning, D. (2012). Copenhagen consensus perspective paper on “Infectious Disease”. Copenhagen Consensus Project 2012, URL <http://www.copenhagenconsensus.com>.
- Chao, D. N. W. and Allen, K. B. (1984). A cost-benefit analysis of Thailand’s family planning program. *International Family Planning Perspectives* 10(3): 75–81.
- Cleland, J., Bernstein, S., Ezeh, A., Faundes, A., Glasier, A. et al. (2006). Family planning: The unfinished agenda. *Lancet* 368(9549): 1810–1827. doi:10.1016/S0140-6736(06)69480-4.
- Cleland, J., Conde-Agudelo, A., Peterson, H., Ross, J. and Tsui, A. (2012). Contraception and health. *Lancet* 380(9837): 149–156. doi:10.1016/S0140-6736(12)60609-6.

- Cleland, J. and Wilson, C. (1987). Demand theories of the fertility transition: An iconoclastic view. *Population Studies* 41(1): 5–30.
- Clements, B. J., Coady, D., Eich, F., Gupta, S., Kangur, A. et al. (2013). The challenge of public pension reform in advanced and emerging economies. International Monetary Fund, IMF Occasional Papers #275, URL <http://econpapers.repec.org/repec:imf:imfocp:275>.
- Collumbien, M., Gerressu, M. and Cleland, J. (2004). Non-use and use of ineffective methods of contraception. In: Ezzati, M., Lopez, A. D., A., R. and Murray, C. J. L. (eds.), *Comparative quantification of health risks, global and regional burden of disease attributable to selected major risk factors*, Geneva: World Health Organization, 1255–1320.
- Dahl, G. B., Løken, K. V., Mogstad, M. and Salvanes, K. V. (2013). What is the case for paid maternity leave? NBER Working Paper #19595, URL <http://www.nber.org/papers/w19595>.
- D'Amuri, F. and Peri, G. (2014). Immigration, jobs, and employment protection: Evidence from Europe before and during the great recession. *Journal of the European Economic Association* doi:10.1111/jeea.12040.
- Darroch, J. E. and Singh, S. (2013). Trends in contraceptive need and use in developing countries in 2003, 2008, and 2012: an analysis of national surveys. *Lancet* 381(9879): 1756–1762. doi:10.1016/S0140-6736(13)60597-8.
- Deardorff, A. V. (2009). Alternative perspective: The challenge of reducing international trade and migration barriers. In: Lomborg, B. (ed.), *Global Crises, Global Solutions: Second Edition*, Cambridge, MA: Cambridge University Press, 504–510.
- Devarajan, S., Squire, L. and Suthiwart-Narueput, S. (1997). Beyond rate of return: Reorienting project appraisal. *World Bank Research Observer* 12(1): 35–46.
- Dewey, K. G. and Cohen, R. J. (2007). Does birth spacing affect maternal or child nutritional status? A systematic literature review. *Maternal & Child Nutrition* 3(3): 151–173.
- Easterlin, R. A. and Crimmins, E. (1985). *The Fertility Revolution*. Chicago: University of Chicago Press.
- Eastwood, R. and Lipton, M. (2011). Demographic transition in sub-Saharan Africa: How big will the economic dividend be? *Population Studies* 65(1): 9–35. doi:10.1080/00324728.2010.547946.
- Engle, P. L., Black, M. M., Behrman, J. R., de Mello, M. C., Gertler et al. (2007). Strategies to avoid the loss of developmental potential in more than 200 million children in the developing world. *Lancet* 369(9557): 229–242. doi:10.1016/S0140-6736(07)60112-3.

- Engle, P. L., Fernald, L. C. H., Alderman, H., Behrman, J., O’Gara, C. et al. (2011). Strategies for reducing inequalities and improving developmental outcomes for young children in low-income and middle-income countries. *Lancet* 378(9799): 1339–1353. doi:10.1016/S0140-6736(11)60889-1.
- Feldstein, M. (1995). Tax avoidance and the deadweight loss of the income tax. NBER Working Paper No. 5055, URL <http://www.nber.org>.
- Freedman, R. (1997). Do family planning programs affect fertility preferences? A literature review. *Studies in Family Planning* 28(1): 1–13.
- Freedman, R. and Takeshita, J. Y. (1969). *Family Planning in Taiwan: An Experiment in Social Change*. Princeton: Princeton University Press.
- Galor, O. (2011). *Unified Growth Theory*. Princeton, NJ: Princeton University Press.
- Global Agenda Council on Population Growth (2012). *Seven billion and growing: A 21st century perspective on population*. World Economic Forum.
- Goldstone, J. A., Kaufmann, E. P. and Toft, M. D. (eds.) (2012). *Political Demography: How Population Changes Are Reshaping International Security and National Politics*. Paradigm Publisher.
- Government of Kenya (2010). *Kenya: Population and Development (RAPID Booklet)*. Washington, DC: USAID Health Policy Initiative. URL [http://www.healthpolicyinitiative.com/Publications/Documents/1095\\_1\\_Kenya\\_booklet\\_3\\_31\\_10\\_sgilepg\\_LOW\\_RES\\_PDF\\_for\\_INTERNET\\_acc.pdf](http://www.healthpolicyinitiative.com/Publications/Documents/1095_1_Kenya_booklet_3_31_10_sgilepg_LOW_RES_PDF_for_INTERNET_acc.pdf).
- Government of Malawi (2010). *Malawi: Population and Development (RAPID Booklet)*. Washington, DC: USAID Health Policy Initiative. URL [http://www.healthpolicyinitiative.com/Publications/Documents/1065\\_1\\_Malawi\\_booklet\\_2\\_23\\_10\\_singlepg\\_acc.pdf](http://www.healthpolicyinitiative.com/Publications/Documents/1065_1_Malawi_booklet_2_23_10_singlepg_acc.pdf).
- Grant, M. J. and Behrman, J. R. (2010). Gender gaps in educational attainment in less developed countries. *Population and Development Review* 36(1): 71–89. doi:10.1111/j.1728-4457.2010.00318.x.
- Hammitt, J. K. (2007). Valuing changes in mortality risk: Lives saved versus life years saved. *Review of Environmental Economics and Policy* 1: 228–240. doi:10.1093/reep/rem015.
- Harberger, A. (1997). New frontiers in project evaluation? A comment on Devarajan, Squire and Suthiwart-Narueput. *World Bank Research Observer* 12(1): 73–79.

- Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children. *Science* 312(5782): 1900–1902.
- Heckman, J. J., Moon, S. H., Pinto, R., Savelyev, P. A. and Yavitz, A. (2010). The rate of return to the highscope perry preschool program. *Journal of Public Economics* 94(1–2): 114–128. doi:10.1016/j.jpubeco.2009.11.001.
- Hobcraft, J. N., McDonald, J. W. and Rutstein, S. O. (1984). Socio-economic factors in infant and child mortality: A cross-national comparison. *Population Studies* 38(2): 193–223.
- Hoddinott, J., Alderman, H., Behrman, J. R., Haddad, L. and Horton, S. (2013a). The economic rationale for investing in stunting reduction. *Maternal and Child Nutrition* 9(Suppl. 2): 69–82. doi:10.1111/mcn.12080.
- Hoddinott, J., Behrman, J. R., Maluccio, J. A., Melgar, P., Quisumbing, A. R. et al. (2013b). Adult consequences of growth failure in early childhood. *American Journal of Clinical Nutrition* 98(5): 1170–1178. doi:10.3945/ajcn.113.064584.
- Hoddinott, J., Maluccio, J. A., Behrman, J. R., Flores, R. and Martorell, R. (2008). Effect of a nutrition intervention during early childhood on economic productivity in guatemalan adults. *Lancet* 371(9610): 411–416. doi:10.1016/S0140-6736(08)60205-6.
- Jamison, D. T. et al. (2014). Post-2015 copenhagen consensus: Health. Copenhagen Consensus Project, Post-2015 Development Goals.
- Jensen, R. and Oster, E. (2009). The power of TV: Cable television and women’s status in India. *Quarterly Journal of Economics* .
- Joshi, S. and Schultz, T. P. (2013). Family planning and women’s and children’s health: Long-term consequences of an outreach program in Matlab, Bangladesh. *Demography* 50(1): 149–180. doi:10.1007/s13524-012-0172-2. *Demography*.
- Kapur, D. and McHale, J. (2012). Economic effects of emigration on sending countries. In: Rosenblum, M. R. and Tichenor, D. J. (eds.), *Oxford Handbook of the Politics of International Migration*, Oxford, UK: Oxford University Press, chap. 6, 131–152.
- Kelley, A. C. and Schmidt, R. M. (1995). Aggregate population and economic growth correlations: The role of the components of demographic change. *Demography* 32(4): 543–555. doi:10.2307/2061674.
- Kelley, A. C. and Schmidt, R. M. (2005). Evolution of recent economic-demographic modeling: A synthesis. *Journal of Population Economics* 18(2): 275–300. doi:10.1007/s00148-005-0222-9.
- Kennan, J. (2012). Open borders. NBER Working Paper #18307, URL <http://www.nber.org/papers/w18307>.

- Knowles, J. C. and Behrman, J. R. (2003). Assessing the economic returns to investing in youth in developing countries. The World Bank, Health, Nutrition and Population (HNP) Discussion Paper 2888, URL <http://www.worldbank.org>.
- Knowles, J. C. and Behrman, J. R. (2005). Economic returns to investing in youth. In: *The Transition to Adulthood in Developing Countries: Selected Studies*, Washington, DC: National Academy of Science-National Research Council, 424–490.
- Kohler, H.-P. (2001). *Fertility and Social Interactions: An Economic Perspective*. Oxford: Oxford University Press. URL <http://books.google.com/books?id=03WVNSjf1KkC>.
- Kohler, H.-P. (2013). Population growth. In: Lomborg, B. (ed.), *Global Problems, Smart Solutions*, Cambridge, MA: Cambridge University Press. Working paper version available at [http://repository.upenn.edu/psc\\_working\\_papers/34](http://repository.upenn.edu/psc_working_papers/34).
- Kohler, H.-P., Behrman, J. R. and Watkins, S. C. (2001). The density of social networks and fertility decisions: Evidence from South Nyanza District, Kenya. *Demography* 38(1): 43–58. doi:10.1353/dem.2001.0005.
- Kohler, H.-P., Billari, F. C. and Ortega, J. A. (2006). Low fertility in Europe: Causes, implications and policy options. In: Harris, F. R. (ed.), *The Baby Bust: Who will do the Work? Who Will Pay the Taxes?*, Lanham, MD: Rowman & Littlefield Publishers, 48–109. URL <http://books.google.com/books?id=75alsu8U9QAC&pg=PA48>.
- La Ferrara, E., Chong, A. and Duryea, S. (2008). Soap operas and fertility: Evidence from Brazil. Inter-American Development Bank, Research Department, RES Working Paper #4573, URL <http://ideas.repec.org/p/idb/wpaper/4573.html>.
- Lam, D. (2012). Perspective paper on “Population Growth” for Copenhagen Consensus 2012. Copenhagen Consensus Project 2012, URL [www.copenhagenconsensus.com](http://www.copenhagenconsensus.com).
- Lee, R. D. and Mason, A. (2011). Generational economics in a changing world. *Population and Development Review* 37: 115–142. doi:10.1111/j.1728-4457.2011.00380.x.
- Levine, R., Birdsall, N., Matheny, G., Wright, M. and Bayer, A. (2006). Contraception. In: Jamison, D. T., Breman, J. G., Measham, A. R., Alleyne, G., Claeson, M. et al. (eds.), *Disease Control Priorities in Developing Countries*, Oxford University Press, 35–86. 2nd edn. URL <http://www.dcp2.org/pubs/DCP>.
- Luci-Greulich, A. and Thévenon, O. (2013). The impact of family policies on fertility trends in developed countries. *European Journal of Population* doi:10.1007/s10680-013-9295-4.
- Lyngstad, T. H. and Prskawetz, A. (2010). Do siblings’ fertility decisions influence each other. *Demography* 47(4): 923–934. doi:10.1007/BF03213733.

- Malhotra, A., Warner, A., McGonagle, A. and Lee-Rife, S. (2011). Solutions to end child marriage: What the evidence shows. International Center For Research On Women (ICRW), Washington, DC, URL <http://www.icrw.org/files/publications/Solutions-to-End-Child-Marriage.pdf>.
- Martin, P. (2004). Migration. In: Lomborg, B. (ed.), *Global Crises, Global Solutions*, Cambridge: Cambridge University Press, 443–473.
- Miller, G. (2010). Contraception as development? new evidence from family planning in colombia\*. *Economic Journal* 120(545): 709–736. doi:10.1111/j.1468-0297.2009.02306.x.
- Montgomery, M. R. and Casterline, J. B. (1996). Social learning, social influence, and new models of fertility. *Population and Development Review* 22(Supplement): 151–175.
- Moreland, S., Smith, E. and Sharma, S. (2010). World population prospects and unmet need for family planning. The Futures Group, Washington, DC, URL <http://pubs.futuresgroup.com/3571WPP.pdf>.
- Mukand, S. (2012). International migration, politics and culture: The case for greater labour mobility. Chatham House Policy Paper, URL <http://www.chathamhouse.org/publications/papers/view/186357>.
- Munshi, K. D. and Myaux, J. (2006). Social norms and the fertility transition. *Journal of Development Economics* 80(1): 1–38.
- Muralidharan, K. and Sundararaman, V. (2011). Teacher opinions on performance pay: Evidence from india. *Economics of Education Review* 30(3): 394–403. doi:10.1016/j.econedurev.2011.02.001.
- Myrskylä, M., Kohler, H.-P. and Billari, F. C. (2009). Advances in development reverse fertility declines. *Nature* 460(7256): 741–743. doi:10.1038/nature08230.
- National Research Council (1986). *Population Growth and Economic Development: Policy Questions*. Washington, D.C.: National Academy Press.
- National Research Council (2012). *Aging and the Macroeconomy. Long-Term Implications of an Older Population*. Washington, D.C.: National Academy Press. National Research Council (NRC) :Committee on the Long-Run Macroeconomic Effects of the Aging U.S. Population, Board on Mathematical Sciences and their Applications, Division on Engineering and Physical Sciences, Committee on Population, Division of Behavioral and Social Sciences and Education.

- O'Neill, B. C., Dalton, M., Fuchs, R., Jiang, L., Pachauri, S. et al. (2010). Global demographic trends and future carbon emissions. *Proceedings of the National Academy of Sciences* 107(41): 17521–17526. doi:10.1073/pnas.1004581107.
- Phillips, J. F., Bawah, A. A. and Binka, F. N. (2006). Accelerating reproductive and child health programme impact with community-based services: the Navrongo experiment in Ghana. *Bulletin of the World Health Organization* 84: 949–955. doi:10.1590/S0042-96862006001200010.
- Population Council (2012). *Family Planning Programs for the 21st Century: Rationale and Design*. New York: The Population Council.
- Pritchett, L. (2007). *Let Their People Come: Breaking the Deadlock in International Labor Mobility*. Washington, DC: Center for Global Development, Brookings Institution Press.
- Pritchett, L. H. (1994). Desired fertility and the impact of population policy. *Population and Development Review* 20(1): 1–55.
- Psacharopoulos, G. (2014). Education assessment paper: Benefits and costs of the education targets for the post-2015 development agenda. Copenhagen Consensus Project, Post-2015 Development Goals, URL <http://www.copenhagenconsensus.com//publication/post-2015-consensus-education-assessment-psacharopoulos>.
- Queisser, M. and Whitehouse, E. R. (2006). Neutral or Fair? Actuarial Concepts and Pension-System Design. OECD Social, Employment and Migration Working Papers #40. doi:10.1787/1815199x. URL [http://www.oecd-ilibrary.org/social-issues-migration-health/neutral-or-fair\\_351382456457](http://www.oecd-ilibrary.org/social-issues-migration-health/neutral-or-fair_351382456457).
- Rindfuss, R. R., Guilkey, D., Morgan, P. S., Kravdal, Ø. and Guzzo, K. B. (2004). Child care availability and fertility in Norway: Pro-natalist effects. Paper presented at the annual meeting of the Population Association of America, Boston, M.A., April 1–3, 2004 URL: <http://paa2004.princeton.edu>, URL URL:<http://paa2004.princeton.edu>.
- Robinson, L. A. (2007). Policy monitor: How US government agencies value mortality risk reductions. *Review of Environmental Economics and Policy* 1: 283–299. doi:10.1093/reep/rem018.
- Rohwedder, S. and Willis, R. J. (2010). Mental retirement. *Journal of Economic Perspectives* 24(1): 119–138. doi:10.1257/jep.24.1.119.
- Rosenzweig, M. (2004). Migration: Alternative perspectives. In: Lomborg, B. (ed.), *Global Crises, Global Solutions*, Cambridge: Cambridge University Press, 478–488.

- Ross, J. and Blanc, A. (2012). Why aren't there more maternal deaths? A decomposition analysis. *Maternal and Child Health Journal* 16(2): 456–463. doi:10.1007/s10995-011-0777-x.
- Rutstein, S. (2005). Effects of preceding birth intervals on neonatal, infant and under-five years mortality and nutritional status in developing countries: Evidence from the demographic and health surveys. *International Journal of Gynecology & Obstetrics* 89(Supplement 1): S7–S24. doi:10.1016/j.ijgo.2004.11.012.
- Sahlgren, G. H. (2013). Work longer, live healthier: The relationship between economic activity, health and government policy. doi:10.2139/ssrn.2267408. Institute of Economic Affairs (IEA) Discussion Paper No. 46.
- Salles, A., Rossier, C. and Brachet, S. (2010). Understanding the long term effects of family policies on fertility: The diffusion of different family models in France and Germany. *Demographic Research* 22: 1057–1096. doi:10.4054/DemRes.2010.22.34.
- Sanderson, W. and Scherbov, S. (2008). Rethinking age and aging. *Population Bulletin* 63(4): 1–16.
- Schultz, T. P. (2007). Population policies, fertility, women's human capital, and child quality. In: Schultz, T. P. and Strauss, J. A. (eds.), *Handbook of Development Economics*, Elsevier, vol. Volume 4, 3249–3303. doi:10.1016/S1573-4471(07)04052-1.
- Schultz, T. P. (2009). How does family planning promote development? evidence from a social experiment in Matlab, Bangladesh: 1977–1996. Yale University, Economic Growth Center, New Haven, Conn.
- Schultz, T. P. (2010). Population and health policies. In: Rodrik, D. and Rosenzweig, M. (eds.), *Handbooks in Economics*, Elsevier, vol. 5, 4785–4881. doi:10.1016/B978-0-444-52944-2.00010-0.
- Sedgh, G., Hussain, R., Bankole, A. and Singh, S. (2007). Women with an unmet need for contraception in developing countries and their reasons for not using a method. Guttmacher Institute, Occasional Report No. 37, URL <http://www.guttmacher.org/pubs/2007/07/09/or37.pdf>.
- Singh, S., Darroch, J., Ashford, L. and Vlassoff, M. (2010). Adding it up: The costs and benefits of investing in family planning and maternal and newborn health. Guttmacher Institute Report, URL <http://hdl.handle.net/123456789/28189>.
- Sippel, L., Kiziak, T., Woellert, F. and Klingholz, R. (2011). Africa's demographic challenges: How a young population can make development possible. Berlin Institut für Bevölkerung und Entwicklung, URL <http://www.berlin-institut.org/selected-studies/africas-demographic-challenges.html>.

- Speidel, J. J., Weiss, D. C., Ethelston, S. A. and Gilbert, S. M. (2009). Population policies, programmes and the environment. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364(1532): 3031–3047. doi:10.1098/rstb.2009.0156.
- Sulston, J. et al. (2012). People and the planet. Royal Society Science Policy Centre Report 01/12, URL <http://royalsociety.org/policy/projects/people-planet/report>.
- Summers, L. H. (1992). Investing in all the people. *Pakistan Development Review* 31(4): 367–406.
- Summers, L. H. (1994). Investing in all the people: Educating women in developing countries. World Bank, Economic Development Institute Seminar Paper No. 45, Washington, DC.
- Sunil, T. S., Pillai, V. K. and Pandey, A. (1999). Do incentives matter? Evaluation of a family planning program in India. *Population Research and Policy Review* 18(6): 563–577. doi:10.1023/A:1006386010561.
- Teller, C. and Hailemariam, A. (eds.) (2011). *The Demographic Transition and Development in Africa: The Unique Case of Ethiopia*. New York: Springer.
- Thorne-Lyman, A. L., Valpiani, N., Sun, K., Semba, R. D., Klotz, C. L. et al. (2010). Household dietary diversity and food expenditures are closely linked in rural bangladesh, increasing the risk of malnutrition due to the financial crisis. *Journal of Nutrition* 140(1): 182S–188S. doi:10.3945/jn.109.110809.
- Uganda Ministry of Finance, Planning and Economic Development (2010). Uganda: Population factors and national development (rapid brief). USAID Health Policy Initiative, URL <http://www.healthpolicyinitiative.com/index.cfm?ID=publications&get=pubID&pubID=1068>.
- UN Population Division (2000). *Replacement Migration: Is It a Solution to Declining and Ageing Populations?* New York: Population Division, Department of Economic and Social Affairs, United Nations.
- UN Population Division (2009). What would it take to accelerate fertility decline in the least developed countries? UN Population Division Policy Brief No. 2009/1, URL [http://www.un.org/esa/population/publications/UNPD\\_policybriefs/UNPD\\_policy\\_brief1.pdf](http://www.un.org/esa/population/publications/UNPD_policybriefs/UNPD_policy_brief1.pdf).
- UN Population Division (2010). *World Population Prospects, the 2010 revision: Standard (median) forecasts*. United Nations, Department of Economic and Social Affairs, Population Division, URL <http://esa.un.org/unpd/wpp/>.

- UN Population Division (2012). World urbanization prospects: The 2011 revision. Population Division, Department of Economic and Social Affairs, United Nations, New York.
- UNFPA (2014). ICPD Beyond 2014 Global Report. New York, NY: United Nations. URL <http://www.unfpa.org/public/home/sitemap/ICPDRreport>.
- UNFPA, UNDESA, UN-HABITAT, IOM (2013). Population Dynamics in the Post-2015 Development Agenda: Report of the Global Thematic Consultation on Population Dynamics. United Nations. URL <http://www.worldwewant2015.org/file/313464/download/340868>.
- United Nations (1996). Programme of Action Adopted at the International Conference on Population and Development, Cairo. New York, NY: United Nations.
- USAID Health Policy Initiative (2009). Family planning and the MDGs: Saving lives, saving resources. USAID Health Policy Initiative, URL <http://www.healthpolicyinitiative.com/index.cfm?ID=publications&get=pubID&pubID=788>.
- USAID Health Policy Initiative (2010). The cost of family planning in Kenya. USAID Health Policy Initiative, URL <http://www.healthpolicyinitiative.com/index.cfm?ID=publications&get=pubID&pubID=1189>.
- Valente, T. W. and Saba, W. (1998). Mass media and interpersonal influence in a reproductive health communication campaign in Bolivia. *Communications Research* 25: 96–124.
- Valente, T. W. and Saba, W. (2001). Campaign recognition and interpersonal communication as factors in contraceptive use in Bolivia. *Journal of Health Communication* 6(4): 1–20.
- Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R. et al. (2008). Maternal and child undernutrition: consequences for adult health and human capital. *Lancet* 371(9609): 340–357. doi:10.1016/S0140-6736(07)61692-4.
- Victora, C. G., de Onis, M., Hallal, P. C., Blössner, M. and Shrimpton, R. (2010). Worldwide timing of growth faltering: revisiting implications for interventions. *Pediatrics* 125(3): e473–e480. doi:10.1542/peds.2009-1519.
- Viscusi, W. K. (1993). The value of risks to life and health. *Journal of Economic Literature* 31: 1912–1946.
- Viscusi, W. K. (2010). The heterogeneity of the value of statistical life: Introduction and overview. *Journal of Risk and Uncertainty* 40(1): 1–13.

- Walker, J.-A. (2013). Why ending child marriage needs to be an education goal: The case for improved coordination between ending child marriage and girls' education movements in west africa. Center for Universal Education, URL [http://www.brookings.edu/~media/Research/Files/Reports/2013/12/improving%20learning%20outcomes%20girls%20africa/walker\\_girls\\_education.pdf](http://www.brookings.edu/~media/Research/Files/Reports/2013/12/improving%20learning%20outcomes%20girls%20africa/walker_girls_education.pdf).
- WHO (2013). Health in the post-2015 development agenda: Report of the global thematic consultation on population dynamics. WHO and United Nations, URL <http://www.worldwewant2015.org/health>.
- Wilcher, R., Cates, W. and Gregson, S. (2009). Family planning and HIV: Strange bedfellows no longer. *AIDS* 23: S1–S6. doi:10.1097/01.aids.0000363772.45635.35.
- Wise, D. A. (2010). Facilitating longer working lives: International evidence on why and how. *Demography* 47(1): S131–S149. doi:10.1353/dem.2010.0000.
- Zambia Ministry of Finance and National Planning (2010). Zambia: Population and National Development (RAPID Booklet). Washington, DC: USAID Health Policy Initiative. URL <http://www.healthpolicyinitiative.com/index.cfm?ID=publications&get=pubID&pubID=1179>.

## List of Figures

1. Percentage of women with an unmet need for family planning (any method) among those aged 15–49 who are married or in a union: most recent data available
2. Migration stock and flow across regions defined by economic development, late 2000s
3. The effect of reduced fertility on economic growth in a unified growth model calibrated to Nigeria.
4. Robustness of benefit-cost calculations: benefit-Cost Ratio for family planning programs if costs are underestimated and/or benefits are overestimated by a factor of up to 200%

## List of Tables

1. Summary of costs, benefits and benefit-cost ratios for voluntary family planning programs
2. International migrant stock as percentage of total population, by age range, 2010
3. Approximate benefit-cost ratios for key policy priorities in the area of population and demography (not including priorities in the area of population quality, many of which have high benefit-cost ratios and are discussed as part of other papers)

4. Benefits resulting from modern contraceptive use among women who want to avoid a pregnancy, according to contraceptive use scenario, 2008

This paper was written by Hans-Peter Kohler, Frederick J. Warren Professor of Demography at University of Pennsylvania and by Jere R. Behrman, William R. Kenan Jr. Professor of Economics at University of Pennsylvania. The project brings together more than 50 top economists, NGOs, international agencies and businesses to identify the goals with the greatest benefit-to-cost ratio for the next set of UN development goals.

For more information visit [post2015consensus.com](http://post2015consensus.com)

## COPENHAGEN CONSENSUS CENTER

Copenhagen Consensus Center is a think tank that investigates and publishes the best policies and investment opportunities based on how much social good (measured in dollars, but also incorporating e.g. welfare, health and environmental protection) for every dollar spent. The Copenhagen Consensus was conceived to address a fundamental, but overlooked topic in international development: In a world with limited budgets and attention spans, we need to find effective ways to do the most good for the most people. The Copenhagen Consensus works with 100+ of the world's top economists including 7 Nobel Laureates to prioritize solutions to the world's biggest problems, on the basis of data and cost-benefit analysis.

