



# Population Dynamics and Economic Development: Filling the Research Gaps

Center for Global Development and  
Population Reference Bureau

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Prepared by Shareen Joshi, Ph.D., with support from Rachel Nugent, Ph.D. and Meghan Cagley, for the William and Flora Hewlett Foundation and its partners. The paper summarizes progress-to-date on the research agenda on population, reproductive health, and economic development.

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# Executive Summary

**T**he relationship between reproductive health and economic growth has long been of interest to academics as well as policy-makers across the world. However, the empirical relationship between these variables has been difficult to establish. In 2005, a report by the Population and Development Working Group of the Center for Global Development outlined a research agenda to review the relationship between reproductive health and economic outcomes at both the macro and micro-levels. The report also established clear priorities for data collection. On the basis of this report, research funding was awarded to 38 investigators and dissertation funding was awarded to 18 Ph.D. candidates. This paper summarizes the key achievements of this research and also highlights new issues as well as unanswered questions.

Among the many achievements that will be summarized in this paper, three are particularly noteworthy. First, the new research has focused heavily on countries in Sub-Saharan Africa and collected micro-economic and demographic data in countries, districts, cities, and villages that have previously been at the margins of social science research. Second, the research has established a much needed evidence base for the relationship between reproductive health interventions and health and economic outcomes. While many of the results are preliminary, the evidence so far confirms that the benefits of reproductive health programs extend to a broad array of indicators that go well beyond the health of the women they target and include the health, income, savings, education, and well-being of other family members. This is a very important insight for ensuring continued support for reproductive health programs in the developing world. Third, the research promises to shed light on numerous “best practices”

for the design of reproductive health programs. It has provided insights into the most cost-effective family planning services and the benefits of bundling services such as immunization for infants and early-childhood nutrition programs with family planning. The research has also provided insights into the comparative benefits of providing women with conditional cash transfers and/or other services such as counseling, education and training.

The research has gaps and raises some new interesting questions. First, we need to continue to improve the metrics for measuring the impact of reproductive health programs on women’s empowerment, decision-making authority, and social networks. Second, some of the interventions studied during the process of research are expensive, require strong and reliable supply chains of equipment and testing supplies, and most importantly, a significant administrative infrastructure that can provide sophisticated training and oversight. This may make it difficult to “scale” up successful interventions. A final issue that requires further research is cost effectiveness of reproductive health programs. We currently lack a detailed understanding across settings of exactly how much each type of reproductive health intervention costs, how these costs compare with each other, and how they compare to the costs of other poverty alleviating programs.

The overall contributions of this new research are truly remarkable. It has yielded new models, new datasets and new approaches that provide a variety of new insights into the relationships between reproductive health, economic growth, and poverty reduction. These tools and perspectives will enrich policy-makers and academics for years to come.

# Population Dynamics and Economic Development: Filling the Research Gaps

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# 1. Introduction

It is now widely acknowledged that improvements in reproductive health can affect economic growth and poverty reduction through many pathways. At the macro-level, these changes can have an impact on GDP growth rates, population growth rates, age-distributions, poverty rates, the distribution of income and in some cases, the spatial distribution of populations. At the micro-level, health improvements can have a variety of indirect effects such as improvements in a woman's educational and employment opportunities, her household's savings and income, her investments in children's human capital and her status within as well as outside of her household.

The empirical relationship between reproductive health improvements and the variables that are directly or indirectly impacted by it however, has been difficult to establish at both the macro and micro-levels. The main reasons are that reproductive health and population dynamics impact economic growth and poverty reduction through a number of pathways, and empirical research has not always had an easy time establishing the causal relationships involved in the pop/reproductive health and economic development relationships, just as it has had a hard time establishing causality on economic development with nearly all the factors that influence its pace and trajectory.

## 1.1 Background to Research Studies

In 2005, a report by the Population and Development Working Group of the Center for Global Development outlined a research agenda to review the relationship between reproductive health and key economic outcomes. The group placed a special focus on the types of research that would be useful to economic and health sector policymaking by national governments and donor agencies working in Sub-Saharan Africa. The specific research questions reflected the combined wisdom of experts from economics, demography, sociology, epidemiology, public policy and related disciplines:

- Given the projected trends in fertility and mortality changes, what are the implications for economic growth and income distribution and the incidence of poverty?
- How do different types of investments in reproductive health affect the health of women and their children?
- How does investment in reproductive health affect economic conditions at the household level?

The Working Group also recognized that causal relationships between reproductive health, fertility, and economic growth are difficult to identify empirically. The group thus identified four priorities for data collection, each of which would benefit from higher levels of investment:

- Collection of new cross-sectional data that have economic as well demographic characteristics of respondents and detailed information on reproductive health interventions received by them
- Development of panel datasets that track economic as well as reproductive health outcomes over time
- Collection of sub-national data for large countries with significant internal variation
- Use of random assignment evaluation methods that allow researchers to establish clear pathways of causality between reproductive health interventions and economic outcomes

On the basis of these recommendations, the William and Flora Hewlett Foundation formed partnerships with science funding agencies and program implementers to support new research on the links among population, reproductive health, and economic development. Partnering funders are: the Economic and Social Research Council in the UK, the Netherlands Organization for Scientific Research, the Agence Française de Développement, and the World Bank. Partnering implementers are: the Population Reference Bureau, the African Economic and Research Consortium, the World Bank, the Institute for International Education, the Center for Global Development, and numerous academic institutions. Additional partnerships are being created with other bilateral research funders.

The partnerships solicited research proposals beginning in 2006 and have conducted nine competitions for research funds to date. Approximately \$25 million has been allocated by the existing partners to the research program. Thirty-seven research grants have been awarded to senior investigators in Africa, Europe, and the United States. Dissertation funding has been awarded to 18 Ph.D. candidates at 16 institutions. All of the research projects funded through these partnerships are still underway, with several anticipating completion in 2009. Most projects are funded for two to three years. (See Table 1)

## 1.2 Summary of Research Progress

This paper summarizes the progress that has been subsequently made in these research agendas, describes the main

achievements so far, and also highlights topics/issues that are currently unexplored.<sup>1</sup>

Of the many achievements that will be discussed, three are particularly noteworthy. First, there has been remarkable progress in our understanding of reproductive health conditions in Sub-Saharan Africa. The new research has been located in countries such as Botswana, Burkina Faso, Cameroon, Congo, Cote d'Ivoire, Ghana, Malawi, Rwanda, Senegal, South Africa, Tanzania, Togo, Uganda, and Zambia. Moreover, many researchers have focused their research on the needs of sub-groups such as adolescents and older women. Insights from this new data will shape policy discussions about health and poverty-alleviation strategies in this region.

A second significant achievement has been the establishment of an evidence base for the relationship between reproductive health interventions and health and economic outcomes for women and their entire families. While it has been long-suspected that reproductive health interventions affect the well-being of entire families, empirical evidence was very limited. The new studies help close this gap. They are showing that reproductive health improvements have direct effects on the health of women, and also have indirect effects such as increased participation of women in the labor force, increases in family income, increases in household savings rates, and investments in the health and education of children. These tentative results have profound policy implications for they suggest that reproductive health programs have poverty-alleviating effects on households.

A final achievement of this research is yielding numerous insights into the design and implementation of reproductive health programs in a variety of contexts. Researchers are examining the cost-effectiveness of family planning services and the impact of cash incentives. What is most notable about this research is that it is based on a comparison of programs across countries (both within and across regions of the world), across districts, and even villages and clinics within a particular area of a country.

The research raises new questions and leaves some unanswered. These will be discussed extensively later in the paper, but three of the most salient of these questions/concerns deserve an early mention. First, we are still unable to clearly define and quantify concepts such as women's empowerment, decision-making authority, social networks, and economic productivity. While we expect improvements in reproductive health to positively impact these aspects of women's lives, we do not yet have clear metrics for measur-

ing success. Second, it is not clear whether the results of at least some of the small-scale randomized controlled trials or conclusions can be generalized and/or scaled for policy purposes. Some of the interventions that have been studied (for example, conditional cash transfers, counseling services, management of obstetric complications) are generally expensive, often require strong and reliable supply chains of equipment and testing supplies, and most importantly, a significant administrative infrastructure that can provide sophisticated training and oversight. It remains unclear whether these can be achieved on a large-scale. A final key issue that requires further research is cost effectiveness of reproductive health programs. We currently lack a detailed understanding of exactly how much each type of reproductive health intervention costs across settings, how these costs compare with each other, and how they compare to the costs of other poverty alleviating programs.

The remainder of the paper is organized as follows: Section 2 summarizes the research that is ongoing and that has been completed thus far. Section 3 describes the main realized and anticipated achievements of the research. Section 4 discusses the main unanswered questions and also proposes some new questions that could benefit from future research. Section 5 presents some recommendations and challenges for the funders.

**Table 1: Ongoing Research Programs**

| Categories of Supported Studies   | Number of Studies |
|---|-------------------|
| <b>Macro impacts of fertility decline and reproductive health improvements</b>  | <b>7</b>          |
| Micro-parameters and macro outcomes   | 4                 |
| Within-country and within-region studies  | 3                 |
| <b>Micro impacts of investments in reproductive health programs</b>             | <b>30</b>         |
| Female labor supply and skill formation   | 5                 |
| Household income  | 4                 |
| Household savings and long-term asset accumulation                              | 2                 |
| Investments in children   | 5                 |
| Further insights on program design  | 16                |
| The effectiveness of immunizations and other forms of antenatal care            | 6                 |
| Cost-effective delivery of malaria treatments                                   | 1                 |
| Cost-effective delivery of family planning services                             | 4                 |
| The value of "cash incentives" versus other types of interventions              | 2                 |
| Should other family members (husbands, for example) be involved?                | 1                 |
| How to best incorporate HIV related services into reproductive health programs? | 2                 |

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## 2. Summary of Progress

**A**s noted in the 2005 Working Group Report, reproductive health programs can affect three types of demographic variables: fertility, mortality, and migration. This paper will focus mainly on fertility and mortality. Fertility is likely to change through changes in sexual behavior and the use of contraception to delay pregnancies or limit family size. Mortality is likely to change, at least modestly, through declines in the risk associated with sexually transmitted diseases and diseases of the reproductive organs, as well as pregnancy and childbirth. These changes can have strong effects on “macro-level” variables such as the population size, population growth rate, age structure, and spatial distribution (urban vs. rural density, for example) which can then impact the rate of economic growth, the rate of poverty-alleviation and other macroeconomic variables like the distribution of income.

Changes in fertility and mortality can also have strong effects on “micro-level” variables, that is, the decisions made by women (and their partners) and families about childbearing, household structure, employment, savings, and other important life choices. Each of these decisions can be affected by the availability of reproductive health services in numerous ways. Below we separately summarize new insights on both sets of variables.

### 2.1 Macro Impacts of Fertility Decline and Reproductive Health Improvements

The 2005 Population and Development Working Group identified two approaches to identify the effects of reproductive health programs on aggregate economic outcomes. The first was to relate micro-level phenomena to macro-level outcomes. The second approach was to perform within-country or within-region analyses of a single policy or set of policies to analyze the key drivers of success. Four teams of researchers have used the first approach, and three teams have used the second approach. Their work is summarized in the subsections below and in Table 2.

#### 2.1.1 Micro-Parameters and Macro Outcomes

The main idea behind this approach is to use micro-level data from well-designed studies to estimate the direction and magnitude of key relationships (for example, the relationship between the prevalence of diseases such as HIV and life-expectancy), then apply these parameters to an observed situation (e.g., the extent of HIV infections) and then model the outcome (e.g., aggregate life expectancy).

Bussolo, van der Mensbrugge, Madvedev, Hoyos, and Horowitz (World Bank) are using a combination of macro models (economy-wide general equilibrium models) and micro models (based on household survey data) to analyze the economic impacts of a delayed or a quickened decline in fertility rates in developing countries. Specifically, their hypotheses are that a delay of the decline in fertility rates might cause the following effects:

- An increase in income inequality and hence a slowdown in the poverty reduction.
- An enlargement in the proportion of the population living in rural areas, and, thus a slower increase of the future urbanization rate (and possibly a slower increase in the proportion of people efficiently employed in non-farm activities).
- A strain in the education systems, making Millennium Development Goals (MDG) more difficult to achieve.

The research will be based on the Global Trade Analysis Program (GTAP)<sup>2</sup> global macroeconomic data, used in a global general equilibrium model (distinguishing 80 countries or regions and 40 sectors), and a global database with household surveys of 95 developing countries. Results from this study are expected in the next several months.

New research by Foster, Weil, and Ashraf (2007) has also been based on this approach. In a paper entitled, “When Does Improving Health Raise GDP?” the authors develop a simulation model of the different channels by which a change in population health could affect the economy. They parameterize their model using microeconomic historical estimates of demographic characteristics, disease burdens (in particular, malaria and tuberculosis), and natural resource income in developing countries, and standard components of quantitative macroeconomic theory. They find that health improvements have at best only modest positive effects on economic growth, and that these improvements take several decades to materialize. The relationship between health improvements and economic growth is complicated by a key variable: fertility. If fertility falls, health improvements do raise economic growth rates (as seen in East Asia). But the authors argue that fertility will typically not fall in the aftermath of health improvements for two reasons: more children survive (an immediate effect), and more women reach child-bearing age (a delayed effect). This will diminish the effect of health improvements on economic growth.

The results of this research have been seen as quite startling relative to the conventional wisdom in this area. In the 1990s, much macroeconomic research using cross-country regression models argued that there are strong relationships between the health status of a population and economic growth.<sup>3</sup> These estimates have been widely accepted and have formed the basis for reformulating health policies in many parts of the world. Ashraf, Foster, and Weil’s research argues that these relationships may in fact be more complicated than this early work suggests.<sup>4</sup>

In related work, Rubinstein and Weil are studying the sources of bias in traditional cross-country regression models in which GDP per capita or per worker is regressed on measures of demographic status (among other controls). They argue that one important source of bias is that reductions in fertility do not affect all parts of the income distribution equally. Typically, poorer parts of a society lag in reducing their fertility. There can be similar effects among different regions, different ethnicities or castes, different education groups, and so on. These compositional changes can mean that increases in within-group income will not be fully reflected in aggregate income. The researchers propose that growth rates of income per capita in a country should be adjusted to reflect composition changes within that country.

Alternately, they suggest that the coefficients that are derived from cross country estimates must be adjusted for the effect of fertility reduction on income. In this case, the adjustment would reflect the average change in composition that resulted from fertility reduction.

Andrew Foster is studying the relationship between population growth and the quality and level of environmental resources. He argues that this issue is central to the relationship between fertility change and economic growth because Malthusian constraints may prevent the production and availability of environmental resources from keeping up with increases in the size of the workforce. Malthusian pressures may be further complicated by the fact that the extraction and use of environmental resources is often difficult to monitor and may cause them to be inefficiently allocated and/or mispriced.<sup>5</sup> To better understand this issue, Foster uses a panel dataset from India to provide a clear assessment of how population growth and the consequent land fragmentation have impacted farm profitability through their effect on groundwater resources. The panel survey—known as the ARIS-REDS survey—is a multi-purpose dataset that constitutes a representative sample of rural India and spans a period of almost 40 years.<sup>6</sup> The most recent rounds of this survey include data on location, usage and costs of water sources.

**Table 2: Summarized Studies Pertaining to Macro Impacts of Fertility Decline and Improvements in Women’s Reproductive Health**

| Project Title   | Funding Program    | Country           | Dataset  | Household Income and Savings                                 | Investments in Children                                       | Macro Policy   | Investigators and Institutions                               |
|---|--------------------|-------------------|--|--|---|--|--|
| A Dynamic Analysis of the Role of Growth and Reproductive Health in Poverty: The Case of Zambia   | AERC               | Zambia            | Living Condition and Monitoring Survey                           |  |   | Impact of fertility on poverty   | Noah Mutoti and Nchimunya Nkombo, Central Statistical Office |
| The Effects of Health and Demographic Change on Economic Growth: Integrating Micro and Macro Perspectives                                       | PRB Domestic Teams | India, Bangladesh | ARIS-REDS surveys; Nutrition Survey of Bangladesh                |  | Contributions of early health interventions on adult outcomes | Micro and macroeconomic linkages as countries move from youth-dependency and the ‘demographic dividend’<br><br>Long-term aggregate economic effects of interventions that affect population and fertility<br><br>Relationship between population growth and the quality and level of environmental resources | Andrew Foster and David Weil, Brown University               |
| Demographic Trends, Economic Growth, and Distribution Dynamics  | World Bank         | Global            | GTAP global macro-economic data                                  |  |   | Effect of variations in the fertility rates on both macro and micro-level economic indicators  | Maurizio Bussolo and Rafael De Hoyos Navarro, World Bank     |
| Impact of Reproductive Health Services on Socio-Economic Development in Sub-Saharan Africa: Connecting Evidence at Macro, Meso, and Micro-Level | WOTRO              | Tanzania          | Living Standards Measurement Survey; Prospective data collection | Shocks due to household reproductive morbidity and mortality |   | Effect of variations in the fertility rates on both macro and micro-level economic indicator   | Ruud Ruben, Radboud Universiteit Nijmegen                    |

es such as wells. This dataset is one of very few that allow researchers to simultaneously explore the relationship between economic, demographic, and natural resource variables and is likely to be used for much future research on these issues.

In summary, this subset of research has resulted in new models and new datasets that are providing us with a more nuanced understanding of the relationships between reproductive health, economic growth, and poverty reduction. We have learned, for example, that fertility transitions may be the most important pathway through which improvements in health ultimately affect economic growth. Fertility transitions, however, can be complicated by compositional effects and/or constraints such as the availability and pricing of natural resources. These perspectives will likely shape a great deal of future research.

### **2.1.2 Within-Country and Within-Region Studies**

An alternative approach to studying the macro-effects of reproductive health is to look at within-country (or within-region) variations in the impacts of health programs or policies that provide such services. Mark Pitt (Brown University) is using this approach to analyze longitudinal data from the Nutrition Survey of Bangladesh to assess the contribution of early health interventions on adult outcomes.<sup>7</sup> Three rounds of longitudinal data spanning a time-frame of 26 years are providing him with an unusually rich opportunity for quantifying the relationship between early nutritional intake and health interventions on outcomes later in life, including economic productivity, as well as the health and general human capital of the children of these respondents. When completed, this study is likely to provide insights into the benefits of early childhood nutritional interventions and the ultimate impact of such programs on macro-variables.

Ruben and Kamazima (Radboud University) are using the variation in population and reproductive health investments among districts in 32 Sub-Saharan African countries to find out whether investments in such services generate wealth and economic growth at the household and district level. They begin their analysis by drawing on a variety of databases and policy descriptions to classify the available reproductive health services in each district in terms of type of service provided (family planning, safe motherhood, or HIV), service characteristics (availability, accessibility, quality, acceptability, etc.) and type of institutional provider (public, private or NGO). They then analyze cross-sectional data from Demographic Health Surveys (DHS) and Living Standards Measurement Surveys (LSMS) on 1.5 million persons living in 300,000 households in 420 districts of this region to examine the effect of the reproductive health programs on

household-level wealth and growth. This enables them to identify the reproductive health programs that are most effective in reducing regional poverty and generating growth.

The authors pay close attention to issues such as spatial externalities of reproductive health services at the community and district level, complementarities between different types of reproductive health services that could generate additional benefits, and spill-over effects of reproductive health services to other socio-economic parameters (e.g. subsistence food production, non-farm activities). These authors are also conducting a micro and macro-level analysis in a single country—Tanzania—to explore the relationships between reproductive health services and poverty reduction programs. They argue that the unique panel database enables cross-sectional and longitudinal analysis on changes over time, and contributes to the likelihood of identifying causal linkages between reproductive health services and social and economic variables.<sup>8</sup> This research will be completed within the next year.

Similarly, Mutoti and Nkombo are using cross-sectional data from Zambia to analyze the general relationships and interactions between reproductive health improvements, poverty reduction, and economic growth. This study is likely to provide detailed insights into the institutions and other contextual factors that have affected these relationships.

In summary, this research has resulted in new models, new datasets and new approaches that will together provide a variety of new insights into the relationships between reproductive health, economic growth, and poverty reduction. Many of the results are either preliminary or not yet available, but even thus far, the researchers have developed tools and datasets that will likely be used by other researchers in the years ahead. The salient achievements of this research and additional questions it raises will be further analyzed in Sections 3 and 4.

## **2.2 Micro Impacts of Investments in Reproductive Health Programs**

The set of micro-level behaviors that are directly and indirectly related to reproductive health service availability is very broad. The availability of modern contraception can have direct effects such as a later age at first birth, longer birth intervals, and/or a lower number of births during a woman's reproductive years. This can also be accompanied by higher levels of nutrition, lower levels of morbidity, and reduced mortality levels. Indirect effects include longer-term economic impacts such as greater access to productive opportunities (employment and education), greater household income, savings and long-term asset accumulations, and greater opportu-

nities to invest in the health and education of children. The 2005 Working Group prioritized the study of these direct as well as indirect micro-level effects of reproductive health programs. Additionally, it prioritized the identification of “best practices” for reproductive health programs.

The new research has heavily relied on innovative data-gathering mechanisms to create exogenous forms of variation in reproductive health conditions and study the associated effects. Many of the new studies have relied on randomized trials—long favored in the medical profession—to compare similar individuals who did and did not receive a “treatment” (such as a particular medication or access to a particular type of physical or mental health service). Some additional studies have also focused on collecting longitudinal datasets that enable researchers to study the well-being of families over a period of several years. The studies have broad coverage of Sub-Saharan Africa, but also cover parts of Asia and Latin America. Below is a summary of what has so far been learned. See Table 3 for a summary of the projects that have contributed on these points. The studies are loosely grouped based on the key economic variables that were listed in the 2005 Working Group Report.

### 2.2.1 Female Labor Supply and Skill Formation

Numerous researchers have focused on studying the relationship between reproductive health services and female access to productive employment and educational opportunities. The main pathway of influence between these variables has been believed to be a reduction in the number of births per woman and a reduction in mortality and morbidity risks faced by women in their reproductive years. This is believed to reduce the demands on a woman’s time and open up new opportunities and incentives to expand her skills and participate in the labor force.

Filmer, Friedman, and Schady (World Bank) are using the combination of 120 Demographic and Health Surveys (ORC, Macro International) to conduct cross-country analyses of the relationship between lower levels of fertility (presumably through contraceptive use), female labor supply decisions, and investments in children. Specifically, they use the approach of Angrist and Evans (1998) to estimate impact of fertility on labor-supply.<sup>9</sup> They find that an exogenous shock to fertility (as measured by gender at first birth) lowers women’s labor force participation. Women ages 25 and over whose first child is a boy are 4 percent less likely to participate in the labor force, and women ages 35 and over whose second child is a boy are equally less likely to participate in the labor force than their counterparts whose second child was a girl. Interestingly, while the effect on fertility of having children of the same sex in the first two births is similar in

magnitude to the effect of having a son in the first birth, same sex births do not significantly impact labor supply. In a similar study, King and Porter (World Bank) confirm that the relationship between fertility and labor-force participation may depend on the mother’s age. Focusing on the exogenous shock of the birth of twins, they find that women under age 25 are 17 percent less likely to work all year round if the first birth is a twin, while women ages 25 to 34 are 17 percent more likely to work all year round when the first birth is a twin. The implications of these initial results and the economic behavior they highlight are currently unclear, but the researchers expect to unpack these results further in later stages of this project.

King, Lundberg, and Sinha (World Bank) however, caution that the relationship between fertility decline, stronger reproductive health, and fertility may be more complicated in some contexts. They hypothesize that the type of fertility change—whether delayed age at first birth, earlier cessation of births, or increased spacing—affects the time-allocation decisions made by mothers. Women who choose to delay fertility can obtain more education or work experience early; those who stop bearing children earlier can then benefit from the higher wages accruing to uninterrupted labor force participation later on. Their early results, using the 1996 Matlab Health and Socio-Economic Survey of Bangladesh, show that high fertility may not always be a deterrent to female labor-supply decisions. They find that women with exposure to a 20-year long reproductive health program favoring birth-spacing had a 15 percent decline in fertility and did not display higher labor force participation rates than their counterparts who had not been exposed to the program or achieved the extra fertility reduction.

It is important to note here that the contrast between the two sets of results discussed thus far—between Filmer, Friedman, and Schady on the one hand and King, Lundberg, and Sinha on the other hand—illustrate the value of several different approaches toward similar questions.

Closely related to the issue of female labor supply is the issue of female education, skill acquisition, and access to productive employment opportunities. Dow (Berkeley) is conducting a randomized controlled trial among young people ages 15 to 30 in southern Tanzania. Individuals in the treatment as well as control groups receive education and training to increase basic financial literacy, address gender/power inequities, and encourage deliberate decision-making in sexual and reproductive health decisions (the prevention of HIV, other sexually transmitted infections (STIs), and unintended pregnancy will feature prominently). Individuals in the treatment group also receive an additional “conditional cash

transfer” as long they receive negative laboratory tests for STIs, and unintended pregnancy.<sup>10</sup> The tests are conducted quarterly. The treatment arm will further allow sub-study of the effect of varying sizes of cash transfers. The control arm will allow the team to study the effects of the counseling and life skills training in the absence of cash. This study will provide insights into the differential impact of programs that provide cash incentives for reproductive health outcomes versus those that focus on education and awareness alone. At this time, most of the data have been collected and are being prepared for analysis.

Since decisions regarding education and labor force participation may be most important at younger ages, some researchers have focused exclusively on adolescents and younger women. Lam and Leibbrandt (Universities of Michigan and Cape Town) are developing the Cape Area Panel Study (CAPS), a longitudinal survey of young people

and their families in Cape Town. Their survey collects detailed sex/pregnancy histories and contains information on many outcomes that include a variety of measures of education and access to employment. The dataset is being used to assess the consequences of teen childbearing on longer-term economic outcomes for the teens (schooling and earnings) and their children (schooling, birth-weight, health), and the role played by both private and public support systems in mediating these effects.<sup>11</sup>

Hallman (Population Council) is also examining adolescents in South Africa. She argues that programs for this particular group must be based on a careful understanding of their heterogeneity due to factors such as age, poverty, social connectedness, and orphanhood status. An initial set of results (based on a cross-sectional dataset) illustrated that there are statistically significant associations between economic status/behaviors and adolescent sexual and reproductive health/

**Table 3: Summarized Studies that Pertain to Mirco-Impacts of Investments in Reproductive Health Programs**

| Project Title  | Funding Program    | Country   | Dataset  | Household Income and Savings  |
|--|--------------------|---|--|---|
| Economic Evaluation of the Projects Aiming at the Reduction of Maternal Morbidity and Mortality in Congo Brazzaville                               | AERC               | Congo Brazzaville                               | Prospective data collection  |   |
| Enhancing the Economic, Health, and Social Capabilities of Highly Vulnerable Groups  | Hewlett/ESRC Teams | South Africa                                    | Prospective data collection  |   |
| The Effects of Obstetric Complications and Their Costs on the Long-Term Economic and Social Well Being of Women and Their Families in Burkina Faso | Hewlett/ESRC Teams | Burkina Faso                                    | Prospective data collection  | Shocks due to household reproductive morbidity and mortality  |
| Reproductive Health, Empowerment of Women, and Economic Prosperity   | PRB Domestic Teams | Bangladesh, Indonesia, Mexico, and South Africa | Matlab Health and Socioeconomic Survey; Indonesia Family Life Survey; Mexican Family Life Survey   | Shocks due to household reproductive morbidity and mortality  |
| Fertility, Intergenerational Transfers, and Economic Development in South Africa   | PRB Global Teams   | South Africa                                    | Cape Area Panel Study (ongoing collection); National Income Dynamics Study (ongoing collection)  | Income effects due to unexpected or unwanted fertility; Time-series evaluation of demographic change at the household-level |
| Reproductive and Overall Health Outcomes and Their Economic Consequences for Households in Accra, Ghana  | PRB Global Teams   | Ghana   | Women’s Health Study (ongoing collection)  | Shocks due to household reproductive morbidity and mortality  |
| Determining the Impact of Family Size on Child Welfare Across the Developing World   | World Bank         | Global  | Demographic and Health Survey  |   |
| Fertility and Women’s Labor Force Participation  | World Bank         | Global  | Demographic and Health Survey  |   |
| The Decision to Invest in Child Quality Over Quantity: Declining Fertility and Rising Investment in Private Tutoring                               | World Bank         | Global  | Living Standards Measurement Survey  |   |
| Financial Incentives for Female Births and Parental Investments in Daughters: Evidence From a Program in North India                               | World Bank         | India   | Demographic and Health Survey; Apni Beti Apna Dhan program (retrospective analysis)  |   |
| Family Size and Investments in Early Childhood Development in Ecuador  | World Bank         | Ecuador   | Prospective data collection  |   |
| Breaking the Cycle: Reproductive Health and Poverty Decline in Rwanda  | WOTRO              | Rwanda  | Demographic and Health Survey; Surveys on Living Conditions (EICV); Ministry of Finance and Economic Planning’s Social Accounting Matrix |   |

HIV risk behaviors among this population. Females and males with more personal assets have more sexual partners.<sup>12</sup> Females with more personal assets and more knowledge and exposure to reproductive health services however, are better equipped to protect themselves from the risks of HIV and unwanted pregnancies. Females in poorer households appear more vulnerable—they have older sexual partners and are the most likely to have been pregnant; they also report having the fewest friends. Hallman’s subsequent data collection effort is focused on tracking 1,300 students in seven schools outside of Durban. The intervention aims to increase financial literacy, social skills, information about jobs and job training possibilities, HIV/AIDS information, knowledge of contraceptives, pregnancy, etc., and especially interpersonal skills to assist young people to continually acquire such information and learn how to use it in their daily lives.<sup>13</sup> This project provides quantifiable evidence about a program that could be adopted into a school or community-project

setting and thus reach large numbers of youth making the transition from school.

In summary, this research suggests that reproductive health improvements are likely to impact female labor supply decisions as well as decisions related to education and training. The precise effects however, depend on the services provided and the age and in some cases socio-economic status of the women targeted. In general, adolescents appear to be an important sub-group. Reductions in unwanted fertility in this age group may be associated with strong incentives to invest in their education, skills, and training.

### 2.2.2 Household Income

The relationship between reproductive health improvements and household income is complex. As women improve their health and their access to employment and education increases, we would expect household income to increase.

| Female Labor Supply and Skill Formation  | Fertility Decision-Making   | Investments in Children   | Investigators and Institutions   |
|--|---|---|--|
| Maternal mortality and morbidity associated with malaria                                 |   |   | Martine Beatrice Pongui and Bethuel Makosso, Centre for Study and Research on Economic Analyses and Policies |
| Provision of economic literacy, skills, reproductive health, and AIDS education to youth |   |   | Kelly Hallman, Population Council  |
|  | Long-term effects of morbidity/mortality on family composition                                    |   | Veronique Filippi, London School of Hygiene and Tropical Medicine  |
|  | Family planning decisions and their effect on household savings                                   | Assess resource allocation and child educational attainment if female is head of the household                | Duncan Thomas and Elizabeth Frankenberg, Duke University   |
| Consequences of teen childbearing on education outcomes                                  |   | Evaluation of secondary caregiver grants on child quality   | David Lam, University of Michigan; and Murray Leibbrandt, University of Capetown                             |
|  | Incentivizing contraceptive usage; Long-term effects of morbidity/mortality on family composition |   | Ernest Aryeety, University of Ghana; and Allan Hill, Harvard University                                      |
| Fertility / child-rearing practices and its effect on female labor force participation   |   |   | Deon Filmer and Jed Friedman, World Bank   |
| Fertility / child-rearing practices and its effect on female labor force participation   |   |   | Maria Porter and Elizabeth King, World Bank  |
|  |   | Impact of fertility decisions on human capital investment in children   | Hai-Anh Dang and Halsey Rogers, World Bank   |
|  |   | Impact of fertility decisions on human capital investment in children   | Nistha Sinha, World Bank; and Rekha Varghese, University of Chicago  |
|  |   | Effect of early childhood development interventions interacted with family size on child development outcomes | Christina Paxson and Norbert Schady, World Bank  |
|  | Family planning decisions and their effect on household savings                                   | Family planning decisions and their effect on income surplus to be invested in children                       | Pieter Hooimeijer, Universiteit Utrecht; and Herman Musahara, National University of Rwanda                  |

This is further bolstered by the fact that households must invest in the health and education of fewer children. In situations where women and their families rely on their children for income however, we can also expect a negative relationship. Most of the Hewlett-supported studies are focusing on the first pathway of influence.

Hill and Aryeetey (Harvard University) are constructing a panel dataset of 400 households in Accra, Ghana. An initial round of data collection in 2003 asked women about self-reported morbidity as well as medically ascertained diagnoses (i.e., backed up with biological tests). In 2008, women were re-interviewed and were asked retrospective information on health and economic activity over the five years between the surveys. They were also closely monitored over a three-month period. This allowed the authors to construct a picture of the consequences of individual health shocks and isolate the impact of reproductive health shocks in particular. The authors intend to examine whether the effects of such shocks are mitigated by factors such as their socioeconomic status, their access to health facilities, and their utilization of health care services. The impact of the shocks on household saving and investment decisions is being carefully analyzed. When completed (within the next year), this research will shed light on two key issues: first, what is the general impact of health shocks on the economic status of families; and second, to what extent can reproductive health policy mitigate the negative impacts of these shocks?

In a similar study, Filippé (London School of Hygiene and Tropical Medicine) is examining the impact of maternity, and its complications on economic, social, and physical well-being, to ascertain whether such events lead to sustained impoverishment in the longer term (three to four years). It builds on a recently completed longitudinal study of 1,014 women in Burkina Faso which investigated the health, economic, and social consequences of severe (“near miss”) complications and normal facility-based births up to one year postpartum. Filippé’s team is contacting the participants again in their third and fourth years postpartum, and is including an additional contrasting group of women who delivered around the same time and live in the same community as the near-misses. This study is examining the impact on household income, belongings, debts, and consumption; on women’s physical health and social situation; on their ability to earn money, work in production and in the home, the survival and development of the children, and on decisions about future pregnancies. Any effect of ongoing ill-health on the rest of the family, especially older children’s schooling and work responsibilities, is also being determined.

Thomas and Frankenburg use the exogenous variation in access to contraception and reproductive health services during the exchange rate crisis of 1998 to examine the impact of health care delivery on the health of families in Indonesia. Longitudinal data from Indonesia with detailed information about the usage of the Indonesian government’s midwife program allows them to specifically examine how exogenous changes in access to health care services impact health outcomes.<sup>14</sup> In a previous paper, the authors found that exposure to the program was associated with strong improvements in women’s body-mass indices, the birth-weights of their children and child height-for-age (Frankenberg and Thomas, 2001; Frankenberg, Suriastini, and Thomas, 2005). The current project expects to show that disruptions of the program are associated with negative impacts on short-term measures of health and may make people vulnerable to falling into poverty or other forms of economic insecurity.

Another strand of research is looking at income effects due to unexpected or unwanted fertility. Here the effects of teen fertility are being examined by Lam and Leibbrandt (Universities of Michigan and Cape Town). They are developing the Cape Area Panel Study (CAPS), a longitudinal survey of young people and their families in Cape Town. CAPS began following 4,800 14-to-22-year-olds in 2002, with annual follow-up surveys, the last of which was completed in 2006/07. The researchers hope to use these data to gain an insight into the economic and social heterogeneity of this group of individuals and their interactions with the health care system. This research will provide valuable insights into whether the economic impacts of unwanted fertility vary according to socio-economic background, and whether reliance on reproductive health services can mitigate the vulnerabilities of sub-populations.

Overall, this research suggests that improvements in reproductive health may be a key driver of poverty reduction for some women and their families. By reducing mortality and morbidity due to childbearing, it can eliminate or reduce the impact of an important source of economic shocks for families. These effects can be even stronger for certain sub-groups who are particularly vulnerable to falling into poverty.

### **2.2.3 Household Savings and Long-Term Asset Accumulation**

Improvements in household income and poverty reduction can also be manifested in improvements in household savings and asset accumulations. In situations where children are a form of social security and insurance, declining fertility would also induce women and their families to invest in asset “substitutes” that could presumably be liquidated in old age or during shocks.

Makosso (Centre for Study and Research on Economic Analyses and Policies, Congo) is using the 2005 DHS data to understand the determinants of maternal morbidity and mortality (and the role of reproductive health inputs) and also the impact of these factors on the incidence of poverty. This is one of the first studies on this issue in the Congo and their results are likely to be of considerable interest in the region.

Thomas and Frakenburg are using data from the Matlab Health and Socioeconomic survey to explore the effects of fertility decline on household asset accumulations. Following the approach of Joshi and Shultz (2006), they use the randomized design of a family planning program implemented in Matlab, Bangladesh, in 1977 to explore the long-term effects of fertility decline on savings and asset accumulations by men and women in “treated” households. Their initial evidence shows that women who were exposed to the family planning program were more likely to accumulate assets than their counterparts who were in the “control” households. In particular, treated women own 37 percent more assets, primarily gold. The authors do not find any statistically significant differences for the asset holdings of men. They believe that the result is driven by the tendency of women who have fewer children to save more for their old age. This is a very important result (similar to the results of Joshi and Shultz, 2006) for it suggests that in the long term, fertility decline may be associated with shifts in patterns of savings and asset accumulation and these may ultimately reduce a family’s propensity for falling into poverty at later stages of their lives. The initial numbers suggest that the extra asset accumulation can more than compensate for the marginal support of the additional children foregone, but this finding is preliminary and not yet confirmed.

## 2.2.4 Investments in Children

Economists have formulated a variety of models linking family size with child outcomes, beginning with the quantity/quality tradeoffs described by Becker (1960). It is difficult to measure the causal impact of an increase in the number of children on child outcomes because households select into larger or smaller families, and a family’s optimal tradeoff between the quantity and quality of children may be simultaneously determined. The Hewlett-supported studies have provided new insights into this relationship.

Sinha and Varghese (World Bank) are using three rounds of the National Family Health Surveys (also known as the Indian DHS surveys) in northern India to analyze the impact of a government effort that provides financial incentives for female births on investments in daughters.<sup>15</sup> Thus far, they have estimated the impact of the program on girls’ health and nutritional status using a difference-in-differences approach, com-

paring eligible girls (those belonging to poor households and certain castes) before and two years after the program was introduced and controlling for parental and other household and village level characteristics. The results suggest that while the program had no significant effect on girls’ nutritional status, it has increased the probability that girls receive childhood immunizations, particularly immunization against measles. In current work, the authors are analyzing the latest round of NFHS data to extend the analysis along two dimensions—estimating the impact of the program on girls’ education and estimating the impact on boys’ outcomes.

Rogers and Dang (World Bank) are using an innovative approach to examine the relationship between family size and investments in education. Their approach involves estimation of the correlation between fertility rates and expenditures on private tutoring (and/or private education in general) in a multi-country cross-sectional setting. They are using two separate datasets for their analysis. The first consists of variables extracted from World Bank LSMs, concentrating on household surveys from a group of countries for which data on private tutoring expenditures is available: Albania, Bosnia and Herzegovina, Brazil, Ghana, India, Jamaica, Tajikistan, and Vietnam. Their second database consists of variables extracted from the panel data from the Vietnam Household Living Standards Survey (VHLSS) 2002, 2004, and 2006. These household survey variables will be linked to a national database of university entrance examination takers at the Ministry of Education.<sup>16</sup> While they do not have a clear source of exogenous variation in fertility, Rogers and Dang used data from multiple countries to show that there is a strong negative relationship between fertility and investments in private tutoring. As the authors gain access to the panel dataset they are collecting in Vietnam, they plan to investigate how fertility decline and the corresponding increase in investment in children are likely to affect educational outcomes, wages, and inequality.<sup>17</sup> These results are important from a policy perspective. Private tutoring has become a widespread phenomenon in many countries, but very little empirical research has been done on its correlates, possible causes, and consequences. If the linkage between household structure and household spending on private tutoring exists, it will have considerable policy implications for family planning programs and forecasting of education trends.

Another study on this theme is being conducted by Hooimeijer (Utrecht University) and Musahara (National University of Rwanda) in Rwanda. Their research program addresses the hypothesis that reproductive health policies and practices can bring down excess fertility in the short run and will create income surplus at the household level to

invest in the health and education of the children. They are using a combination of micro-economic longitudinal surveys with additional information on health care services in this region to test these hypotheses. The authors expect the research project to be completed within the next year.

In a separate study, Schady and Paxson (World Bank) have gone beyond simply looking at fertility decline or mother's reproductive health and have directly examined the results of early childhood interventions that are often "bundled" together with reproductive health programs. They are collecting a panel dataset in Ecuador to assess the relationship between family size and early childhood development interventions.<sup>18</sup> The preliminary analysis of their panel data from Ecuador suggests that children who were targeted by the interventions were able to reverse a substantial fraction of the deficits in physical, motor, cognitive, and behavioral outcomes observed at baseline. Improvements occurred among children who were 3-to-4-years-old at baseline, as well as those who were 5-to-7-years-old at baseline, suggesting there is some potential for catch-up. Children who benefited from the early childhood interventions were also more likely to enroll in preschool or school earlier. This is an interesting and important insight for policy-makers for it suggests that while bundling early childhood interventions with reproductive health programs may be expensive, it may have strong effects and may improve child well-being even in the absence of the possible quantity-quality tradeoffs. The program also yields key insights into best practices for such programs by examining the differential impacts of cash transfers and/or fortified food impacts. This evaluation will provide policy-makers with better evidence for creating successful programs.

Last, Fambon (University of Yaoundé II) uses data from the second Cameroon Household Consumption Survey (CHCS II) to estimate the impact of adult literacy on child nutritional outcomes and disaggregates these effects by zone of residence, poverty status and gender. He specifically addresses the issue of endogeneity of the literacy variable in the children's health production function by using a variety of possible instrumentation methods. He finds that the literacy status of the household head and nutrition of under-3-year-old children are positively and significantly related. This result is interesting for it suggests that education may be a complement to investments in reproductive health and health programs more generally.

Overall, the results of this branch of research suggest that improvements in reproductive health and decreases in fertility are associated with increased investments in children's health and education. This is seen for a diverse set of out-

comes: immunizations, anthropometric indicators, investments and outcomes related to schooling, and even basic literacy and numeracy skills. As will be seen in the sub-section below, numerous reproductive interventions are also associated with improvements in children's birth weights, reductions in the incidence of tetanus, and improvements in survival probabilities.

### 2.2.5 Further Insights on Program Design

Almost all the studies described above yield interesting insights into the best practices for reproductive health programs. Additional studies focus primarily on the issue of program design and particularly on the issue of the cost-effectiveness of reproductive health services. While some researchers are using existing datasets and analyzing the effectiveness of existing (and past) interventions, other researchers are using randomized controlled trials. The studies below are grouped by the issues that are likely to be of interest to policy-makers and summarized accordingly and in Table 4.

#### The effectiveness of immunizations and other forms of antenatal care

Adeoti (University of Ibadan, Nigeria) is using two-staged-least-squares methods on longitudinal data from the National Living Standards Measurement Survey of Nigeria to understand the determinants of household usage of government-provided programs for children's immunizations. He finds a strong negative relationship between childhood immunization programs and childhood mortality rates in both rural and urban areas. Moreover, where immunization services are available within a short distance, mothers are best able to ensure timely immunizations for their children. From the policy perspective, these results suggest that immunizations are effective in reducing mortality rates, and immunization services are best utilized by women when they are available close to her home.

Five additional studies are focusing on the immunization and birth-weight issue. First, Ouattara, Diallo, Kouadio, Ouattara, and Kablan (Côte d'Ivoire Centre for Economic and Social Research) are using DHS data to analyze the impact of reproductive health inputs such as tetanus vaccinations on the birth weight of newly born children. Second, Kaba, Doumbouya, and Keita are using DHS data from Guinea to test the hypothesis that immunization against neonatal tetanus is complementary to the behaviors and other health services which improve birth weight, namely, antenatal care, food supplements, and behavioral change during pregnancy. Third, Dramani and Laye are using DHS data from Senegal to estimate the demand for tetanus immunization and the impact of this immunization on children's

birth weights. They are particularly interested in the role of the mother's age and education in determining usage of this particular health care service.

Fourth, Okurut (University of Botswana) uses two-staged-least-squares methods on the 1996 Botswana Family Health Survey (BFHS) to estimate the relationship between improved access to reproductive health services (tetanus immunization and quality antenatal care) and the birth weight of children. He finds evidence of a strong positive relationship.<sup>19</sup> The same question and approach is also used by Agbodji, Abalo, Kouassi, Johnson, and Issifou who use data from Togo. They also find that tetanus immunizations for mothers increased children's birth weights and reduced infant and child mortality rates.

These results suggest that tetanus immunizations must be central to reproductive health programs for they have direct impacts on the well-being of women and their children in many different settings.

### **Cost-effective delivery of malaria treatments**

Johannes (University of Dschang) is analyzing the cost effectiveness of three possible malaria treatments at a prenatal clinic in Cameroon to understand the effect of these treatments on birth weights and survival probabilities of babies whose mothers were infected by malaria. This is an important issue because pregnant women in many parts of Sub-Saharan Africa are particularly vulnerable to malaria and as a result may experience harmful effects.<sup>20</sup> The results of this study are likely to be of considerable interest to policy-makers for it will shed light on whether malaria treatments should be bundled with reproductive health programs, and if so, how this can be done in a cost-effective way.

### **Cost-effective delivery of family planning services**

Ssewanyana and Kasirye (Makerere University, Uganda) use data from Uganda to examine the cost effectiveness of four family planning interventions: oral contraception, female sterilization, injectables, and condoms. Using a nationally representative survey of 8,531 women, they estimate cost-effectiveness ratios in relation to number of births averted for women ages 15 to 49.<sup>21</sup> Thus far, the results suggest that injectables are the most efficient and cost-effective method but may not be suitable for all women. This is an important study from the perspective of program design for it compares the costs and effectiveness of competing interventions in a setting where population growth rates are high (3.2 percent per year) and access to contraception is limited (only 1 in 5 women use contraception). It also confirms that effective reproductive health programs must feature several options for women.

A similar study is being performed by Mugo, Muriithi, Kibaru, and Kizito (University of Nairobi, Kenya) who are evaluating the provision of reproductive health services in the Thika district of Kenya. They are categorizing provider type and services, organizational forms, management systems, and delivery modes and are conducting a cost effectiveness analysis of these services by studying utilization patterns and benefits to women.

Finally, Bundoo and Sunkur are performing a similar analysis for Mauritius. Since nearly three-quarters of women in this country report usage of contraception, they expand their focus to other variables such as treatments of sexually transmitted diseases and in particular, HIV prevalence. Their data has been collected from three sources: the Ministry of Health and Quality of Life, the Mauritius Family Planning and Welfare Association, and the Action Familiale over the period 1989 to 2005 and provide an excellent opportunity for evaluating the cost effectiveness of reproductive health interventions over time. The results of all these studies are likely to be of great interest to policy-makers if they shed light on the most cost-effective strategies of delivering reproductive health services to women in a variety of different contexts. The work of Ruben and Kamazima, described previous in this section, is also likely to enrich these perspectives.

### **The value of “cash incentives” versus other types of interventions**

Vera-Hernandez is implementing a randomized controlled trial in Malawi to better understand the role of cash incentives versus other types of interventions. His randomized experiment includes offering monetary incentives to individuals to engage in volunteering, counseling, voluntary counseling and testing for HIV, and the adoption of HIV risk-reduction strategies.<sup>22</sup> The project will provide insights on the added benefit (if any) of cash transfers in reproductive health programs.

The Dow project described earlier is relevant here. Like Vera-Hernandez, his intervention tests the effectiveness of not only reproductive health services (prevention of HIV and family planning) but also two types of additional interventions: cash transfers and services that aim to increase literacy, and employment and general “life skills” among young people in Tanzania. The results of these studies will inform policy-makers of the comparative benefits of these types of interventions and will also provide insights into whether different interventions reinforce each other (and are complementary) or are substitutes.

### **Should other family members (husbands, for example) be involved?**

Ashraf and Field also address the issue of program design and argue that the impact of a reproductive health program

may depend on factors such as the level of awareness and involvement of a woman's husband. Their experiment is based at a public health clinic in Lusaka, Zambia, and is designed to reduce the cost of and improve access to modern contraceptive methods to women who visit the center.<sup>23</sup> Their control group took a baseline survey and also received information about HIV and condom use. The

treatment group additionally received information about family planning methods and vouchers that provided them with free reproductive health services.<sup>24</sup> An additional feature of this study is randomization of the husband's knowledge of his wife's access to contraception. The treatment population was thus divided into two: one group received the vouchers on their own, while the other group

**Table 4: Summarized Studies Pertaining to Further Insights on Program Design**

| Project Title  | Funding Program    | Country   | Dataset   | Household Income and Savings  |
|--|--------------------|---|---|---|
| Determinants of Birth Weight in Botswana   | AERC               | Botswana  | Botswana Family Health Survey   |   |
| A Cost-Effectiveness Analysis of Malaria Prevention Among Pregnant Cameroonian Women   | AERC               | Cameroon  | Demographic and Health Survey   |   |
| Incidence of Antenatal Healthcare on Children's Birth Weight in Côte d'Ivoire  | AERC               | Côte d'Ivoire   | Demographic and Health Survey   |   |
| Demand for Reproductive Health Services in Guinea: Determinants of Birth Weight  | AERC               | Guinea  | Demographic and Health Survey   |   |
| Characterization of Reproductive Health Services and Cost Effectiveness Analysis of Family Planning Provision in Thika District, Kenya                     | AERC               | Kenya   | Prospective data collection   |   |
| Demand for Reproductive Health and Child Mortality in Nigeria  | AERC               | Nigeria   | National Living Standard Survey   |   |
| Reproductive Health in Togo: An Empirical Analysis of the Determinants of Demand   | AERC               | Togo  | MICS-3  |   |
| Cost Effectiveness of Reproductive Health Interventions in Uganda: The Case For Family Planning Services   | AERC               | Uganda  | Demographic and Health Survey   |   |
| Enhancing the Economic, Health, and Social Capabilities of Highly Vulnerable Youth   | Hewlett/ESRC Teams | South Africa  | Prospective data collection   |   |
| Fertility, Intergenerational Transfers, and Economic Development in South Africa   | PRB Global Teams   | South Africa  | Cape Area Panel Study (ongoing collection); National Income Dynamics Study (ongoing collection) | Income effects due to unexpected or unwanted fertility; Time-series evaluation of demographic change at the household-level |
| Poverty, Gender Inequities, and Sexual/Reproductive Health: An Impact Evaluation of a Combined Economic and Psychosocial Intervention in Southern Tanzania | PRB Global Teams   | Tanzania  | Prospective data collection   |   |
| Experimental Approaches to Assessing the Economic Determinants and Consequences of Contraceptive Adoption in Zambia  | PRB Global Teams   | Zambia  | Prospective data collection   | Shocks due to household reproductive morbidity and mortality  |
| Socio-Economic Impact of Reducing Premature Adult Mortality: The Case of Antiretroviral Treatment For HIV/AIDS Patients                                    | World Bank         | Burkina Faso, Ghana, India, Kenya, Mozambique, Rwanda, South Africa | Prospective data collection   | Expenditure and household income changes due to increased access to antiretroviral therapy                                  |
| Marriage Transitions and HIV/AIDS in Malawi  | World Bank         | Malawi  | Prospective data collection   |   |

received them in the presence of their husbands. So far, the results suggest that the presence of a husband reduced the use of vouchers by 9 percent (from 51 percent) and also reduced a woman's choice of a long-term contraceptive method over no-method by 6.4 percent (from 34 percent). Evidence from sub-groups so far suggests that effect is driven by average differences in fertility desires by gender.

Women whose husbands want more children are less likely to participate in any aspect of the contraceptive program.

This has important policy implications, for it suggests the impact of a reproductive health program is likely to depend on the structure of a household, the heterogeneity of fertility preferences within a household, and crucially on whether

| Female Labor Supply and Skill Formation  | Investments in Children   | Macro Policy | Insight on Program Design   | Investigators and Institutions  |
|--|---|--------------|---|---|
|  |   |              | The effect of access to reproductive healthcare on children's birth weight  | Francis Nathan Okurut, University of Botswana   |
|  | Pregnancy morbidity/mortality and its effect on child investment                        |              | Cost effectiveness of malaria treatments at a prenatal clinic   | Johannes Tabi Atemnkeng, University of Dschang  |
|  |   |              | The effect of access to reproductive healthcare on children's birth weight  | Mama Ouattara and Souleymane Sadio Diallo, Côte d'Ivoire Centre for Economic and Social Research          |
|  |   |              | The effect of access to reproductive healthcare on children's birth weight  | Aboubacar Kaba and Sékou Falil Doumbouya, Pauvrete et des Politiques Economiques                          |
|  |   |              | Evaluating provision of reproductive health services  | Mercy Mugo and Peterson Junius Muriithi, University of Nairobi  |
|  | Impact of demand for reproductive health services on child mortality                    |              | Determinants of household usage of child immunization   | A.I. Adeoti, University of Ibadan; and Nigerian Institute of Social and Economic Research (NISER), Ibadan |
| Impact of age and education for women and demand for immunizations                       | Impact of demand for reproductive health services on child mortality                    |              | The effect of access to reproductive healthcare on children's birth weight  | Akoété Ega Agbodji and Kodjo Abalo, University of Lome  |
|  |   |              | Cost effectiveness of contraception options   | Sarah Ssewanyana and Ibrahim Kasiry, Makerere University  |
| Provision of economic literacy, skills, reproductive health, and AIDS education to youth |   |              |   | Kelly Hallman, Population Council   |
| Consequences of teen childbearing on education outcomes                                  | Evaluation of secondary caregiver grants on child quality                               |              |   | David Lam, University of Michigan; and Murray Leibbrandt, University of Capetown                          |
| Impact of skill acquisition on female labor supply                                       |   |              | Increased understanding of cash incentives  | Will Dow, University of California, Berkeley  |
| Effect of contraceptive access on female labor participation                             | Effect of contraceptive access (as evidenced by decreased fertility) on child education |              | The 'value' of male contraceptive education in household fertility decision-making; Peer contraception knowledge and its effect | Nava Ashraf and Erica Field, Harvard University   |
|  |   |              |   | Damien de Walque, World Bank  |
|  |   |              | Interaction effects between marriage, fertility decisions, and HIV/AIDS prevalence  | Kathleen Beegle and Berk Ozler, World Bank  |

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and/or how husbands are included in programs. This is a particularly important issue in light of the fact that many (and in some places most or all) practitioners in rural Zambia in particular and throughout Africa in general still require husbands to explicitly give consent before providing women with contraceptive methods.<sup>25</sup>

### **How to best incorporate HIV-related services into reproductive health programs?**

De Walque (World Bank) is assessing the impact on income of the reduction of premature adult mortality due to access to antiretroviral treatment, using longitudinal household surveys of HIV/AIDS patients (as well as other households from the general population serving as control) in Burkina Faso, Ghana, Mozambique, Rwanda, Kenya, South Africa, and India.<sup>26</sup> Results of this study are not yet available, but insights from this study will be of considerable importance to policy-makers for it is likely to provide significant information on the health as well as the socio-economic benefits of antiretroviral treatment programs in several different countries.

Beegle and Ozler (World Bank), are developing a longitudinal dataset on a sample of 1,185 young adults in Malawi that covers sexual relations, transitions into marriage, socio-economic status (both prior to and after marriage), and the spread of HIV/AIDS.<sup>27</sup> This research will provide insights

into many of the variables that are described in this section and provide policy-makers with valuable insights into the best practices for combating the spread of HIV in Sub-Saharan Africa. This is important considering that the relationship between sexual relationships prior to marriage and HIV transmission risks remain poorly understood in this part of the world. Some of the micro-studies described earlier will also yield insights into best practices for combating the spread of HIV. Lam and Leibbrandt and Hallman explore how to reduce HIV risks among adolescents.

In summary, the research on program design improves understanding of reproductive health program best practices. We have learned the following: inclusion of tetanus immunization and/or low-cost malaria treatments can increase infant birth weights and reduce child mortality; some forms of family planning services are more cost-effective to deliver than others (for example, injectables), but a choice of methods may still be favorable since women have different needs; cash incentives for favorable reproductive health outcomes may have different effects than other interventions; and HIV risk reduction modules and skill-building programs may be particularly important among adolescents. We have also learned that the success of programs may depend heavily on contextual factors and the inclusion/exclusion of particular family members.

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## 3. Key Achievements

The research studies described above are each noteworthy and promise numerous individual scholarly achievements. Taken together, these studies contribute knowledge in several important dimensions.

A first major achievement are the new and innovative systems of data collection and research design that have made it possible to study and identify causal relationships that have previously been difficult (if not impossible) to identify. The use of randomized interventions and the commitment to collecting longitudinal data in new locations have done much to shine light on the interrelationships among these issues. The new datasets will likely provide research opportunities to scholars for many years to come. Foster and Weil's ARIS-REDS data, for example, is now one of the longest nationally representative panel datasets from South Asia and will likely be used by researchers to analyze many issues related to development in this region. The datasets compiled by Bussolo, van der Mensbrugge, Madvedev, and Hoyos and Horowitz are similarly significant achievements. The GTAP global macroeconomic data, used in a global general equilibrium model (distinguishing 80 countries or regions and 40 sectors), and the global database with household surveys of 95 developing countries, present numerous opportunities to future researchers.

The significance of the methods used by the Hewlett-sponsored research go well beyond the academic realm. They provide policy-makers with crucial insights into the importance of scientifically piloting and testing new policy proposals before rolling them out over an entire population. They also illustrate the value of combining high quality data monitoring tools with appropriate methods to track program effects over time.

Second, they cover new geographies that have previously been at the margins of demographic and economic data-collection efforts. The majority of the new research projects described in this paper are being conducted in Africa, in countries such as Botswana (Nathan), Burkina Faso (Fillipe), Cameroon (Johannes; and Fambon, Baye, Tamba, Noumba), Cote d'Ivoire (Ouattara, Diallo, Kouadio, Ouattara and Kablan), Congo (Makosso, Pongui and Koyangozo), Ghana (Ernest and Allan), Malawi (two studies, by Baschieri and Beegle and Ozler), Rwanda (Hooimeijer and Musahara), Senegal (Dramani and Laye), Tanzania (Dow; Rubin and Kamazima), South Africa (Hallman; Lam and Leibbrandt),

Togo (Agbodji, Abalo, Kouassi, Johnson, and Issifou), Uganda (Ssewanyana and Kasirye), and Zambia (Field and Ashraf; Mutoti and Nkombo). The studies will collectively focus new attention on issues of reproductive health in Sub-Saharan Africa where the "triple crisis" of poverty, gender inequalities, and AIDS has threatened to undermine decades of progress in the region.

A related contribution from the research studies is to prioritize sub-populations that have previously been neglected. The research on the effects of reproductive health shocks on adolescents (Hallman, Lam and Leibbrandt, and Beegle and Ozler) is particularly noteworthy in this regard. Very little has been previously uncovered about transitions into and socio-economic implications of marriage in Sub-Saharan Africa. Given the low levels of female education in the region and low access to labor markets, marriage is often the alternative to continued schooling and, as such, is a powerful determinant of women's lifetime well-being as well as that of her children. The effort to better understand these transitions and compare them to the experiences of other population sub-groups is truly noteworthy.

Third, the Hewlett-funded research studies tackle the challenging topic of macroeconomic effects of health and reproductive health improvements. The macro relationships studied by Foster and Weil for example, suggest that the relationship between health improvements and economic growth depend on fertility patterns, are weaker, take a long time to be realized, and are vastly more complicated than previously believed. In developing important macro models that are parameterized by historical micro estimates, they have tapped new sources of data and opened up a broad range of new methods and new research questions that will provide a foundation for much needed new macro research.

Fourth, the research on the individual level and household level impact of reproductive health interventions has also yielded a broad range of insights on the direct and indirect effects of many different types of reproductive programs. The new Hewlett-sponsored research is generating a much-needed evidence base. We are learning that reproductive health shocks can translate into shocks to household income and expenditure that can be both short and long-term (Filippe, Hill and Aryeetey, Hooimeijer and Musahara), though these vary based on a household's access to health-care services, socio-economic status, age composition, access

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to economic opportunities and social networks and support structures (Thomas and Frackenburg, Lam and Liebbrandt, Hill and Aryeetey, Hooimeijer and Musahara). Moreover, the new studies also show that reproductive health policies and practices can bring down excess fertility in the short run and will create income surplus at the household level that can be used to increase savings and assets (Thomas and Frankenburg) or to invest in the health and education of children (Sinha and Varghese, Rogers and Dang, Hooimeijer and Musahara, Schady and Paxson).

Finally, important contributions are being made in the area of program design. The results from several studies on cost effectiveness of health care delivery options in Sub-Saharan Africa are particularly noteworthy. These studies are shedding light on the least expensive and most practical approaches to deliver family planning services (Ruben and Kamazima; Mugo, Muriithi, Kibaru, and Kizito), tetanus inoculations (Ouattara, Diallo, Kouadio, Ouattara, and Kablan; Kaba, Doumbouya, and Keita), improved birth weights (Nathan; Ouattara, Diallo, Kouadio, Ouattara, and Kablan; Kaba, Doumbouya, and Keita), and HIV treatment and risk reduction (De Walque; Beegle and Ozler).

The research is also showing that the effect of a reproductive health program on women's health and socio-economic status may depend on how the program is structured. We

are learning that some forms of service delivery and organizational structure may have a greater impact on actual outcomes than others (Ruben and Kamazima as well as Mugo, Muriithi, Kibaru, and Kizito). Additional research from randomized evaluations is showing that cash incentives may have a very different impact than learning and peer demonstration (Dow). Moreover, a population where a substantial fraction of mothers are adolescents or young women will respond differently to an intervention than where they are a minority (Lam and Liebbrandt). Finally, we are also learning that the effectiveness of the program may also depend on how (if at all) a husband is included in the program. Future results will provide key insights into the value and differential effects of these approaches.

While many of these results are preliminary, the new research highlights the importance of looking beyond the proximate effects of reproductive health programs and examining their impact on a broad array of indicators. It illustrates for example, that evaluating family planning programs by looking only at their impact on contraceptive use or even completed fertility potentially misses important ways in which these programs affect the lives of women, their children and families. This is a very important set of insights for ensuring continued support for reproductive health programs in the developing world.

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## 4. Gaps

As recognized by the 2005 Working Group, social science research advances through the process of uncoordinated “triangulation”: investigators working from different disciplines use a variety of methods and datasets, and gradually converge on an understanding of basic relationships between variables. The research outlined in this paper has proceeded in this manner—academics from different disciplines and different locations have simultaneously worked on similar themes, but used different datasets and different approaches to structure their work. The key achievements have been summarized in the sections above. This section will address some of the open questions that could benefit from further research.

Consider first the issue of the relationship between fertility change, economic growth, the distribution of income, and the incidence of poverty. The research by Ashraf, Foster, and Weil suggests that the relationship between health improvements and macroeconomic growth is contingent upon a timely fertility response. In some cases (such as East Asia), health improvements have led to fertility decline and economic growth. In other cases (such as Sub-Saharan Africa), health improvements have been slow to feed into higher rates of economic growth mainly because health improvements also led to higher rates of child survival and increased numbers of women of childbearing ages. The analysis raises some important issues. One issue is whether the two dimensions of health considered by the authors—life expectancy and prevalence of malaria and tuberculosis—go far enough toward measuring the overall health of a population. Many countries have prioritized and achieved significant reductions in infant and child mortality prior to increases in life expectancy. Others have reduced the prevalence of diseases such as measles before they have combated the problems of malaria and TB. If improvements in health could be more comprehensively measured in Ashraf, Foster, and Weil’s analysis, the results would indeed be stronger.

A second issue concerns the assumptions in the model. The model assumes that improvements in life expectancy occur within a context of stable fertility rates, constant population growth rates, and constant “relative sizes” of different population age groups. It also assumes that in the aftermath of the change in life expectancy, fertility adjusts proportionally at each age such that the growth rate of the population eventually returns to its pre-shock level. The model could be modified to incorporate improved estimates from micro data on

the nature and timing of fertility transitions. Gaining a better understanding of the timing and length of such transitions is an important topic for future research.

A final comment on the macro studies is that they could significantly benefit from considering the possibility of non-linear and dynamic relationships between key variables. It may be useful for example, to think about the possible role of thresholds in the relationships between variables like growth and fertility, and examine the changes in relationships past these thresholds. While these models are vastly more complicated than the linear theoretical and empirical models, and also do not have strong predictive power, they are more likely to shed light on why these relationships are different in different parts of the world.

There are also interesting unaddressed questions on the micro analysis side of the research. There is a need for greater clarity on the metrics that should be used to evaluate and measure the benefits of population and reproductive health programs. The measures featured in the Hewlett studies are quite broad and include everything from HIV reduction rates to labor force participation rates of women to improvements in household savings. An interesting question is whether any standard set of metrics could be constructed and applied to these programs, even if only to quantify their effectiveness in improving women’s health.<sup>28</sup>

The 2005 Population and Development Working Group recognized the need to define and quantify concepts such as women’s empowerment, decision-making authority, social networks, and economic productivity. The group expected that these aspects of women’s lives are likely to be dramatically impacted by population policy but noted that there are currently no established methods for measuring them. Some progress has been made in this direction. Dow, for example, develops measures of basic financial literacy, gender/power inequities within the household, and decision-making in sexual and reproductive health decisions. But on the whole, we still lack precision in this area.

The work of Ashraf and Field suggests new places to look for answers to these questions. Their research suggests that in our search for measures of empowerment and decision-making authority, we should attempt to define and quantify contextual variables such as the control structure of a household. One promising approach toward addressing this issue is perhaps a

commitment to using both qualitative and quantitative research methods. Qualitative research—encompassing ethnographic accounts of decision-making, focus groups, anthropological analyses into systems of organization—all contribute toward an understanding of the context in which decisions are made. This qualitative research may also provide an understanding of the parameters under which the results of the quantitative analysis should be interpreted.

Though much research has already focused on Sub-Saharan Africa, it is increasingly clear that we need a greater understanding of the African family. The role of extended family members, non-householder family members, the meaning of marriage for men and women, and the cultural context in which economic decisions are made remain poorly understood despite the enormous strides made by the Hewlett researchers in collecting cross-sectional and quantitative data from this region. Again, the use of qualitative research is useful to bridge this gap. Collaborations with local researchers and efforts to combine perspectives from several disciplines can together improve future knowledge in this area.

To what extent can the results of the small-scale randomized controlled trials be generalized and extended beyond the region of study? To what extent do they measure decision-making in a *specific* time and place, and to what extent do they tell us about general principles of human decision-making behavior? This issue pervades much of empirical social science research. Wherever empirical results are based on small datasets from particular geographic locations at particular points in time, the relevance of the results typically remains in question until similar studies either confirm the finding or enrich our understanding of it. The Hewlett-funded randomized controlled trials, however, have several features that make the issue of generalization particularly challenging. First, many of the trials are quite small and limited in scope to a small region of a particular country. Second, the interventions themselves are often quite complex and have features such as the provision of conditional cash incentives (conditional on particular outcomes), financial literacy training, career and vocational counseling, the inclusion of an additional household member (husband) in the counseling session, etc. Where a particular intervention is observed to have had a strong effect, the precise drivers of success are not always clear.

The problem of generalization pertains not only to the randomized controlled trials but also to the cross-sectional and panel datasets that have been discussed in this paper. Some of the results that are based on detailed panel studies in a particular country may have significant insights for that particular context but have limited application elsewhere.<sup>29</sup>

There are two possible strategies of addressing this problem in the short-term. One is to bring together all the survey questionnaires and all the datasets that have been collected as part of this effort and explore whether there are opportunities for testing a single hypothesis on more than one dataset through possible collaborative research between scholars who have worked on separate regions.<sup>30</sup> A second strategy would be to encourage the researchers to supplement their analysis with data from major national surveys (such as the Demographic and Health Surveys or Living Standard Measurement Surveys) wherever possible, to provide a sense of how representative their samples are and what the scope of the results may be.

Can the types of programs that have been studied here be truly scaled up by policy-makers and put into practice? As mentioned above, many of the research studies reviewed in this paper have focused on complicated interventions such as cash incentives that are conditioned on obtaining negative test results in laboratory tests for STIs (Dow and Vera-Hernandez), or forms of rigorous counseling and education (Dow, Hallman, Vera-Hernandez, Ashraf and Field). Even when implemented on a small-scale experimental basis, such interventions are often expensive, require strong and reliable supply chains of equipment and testing supplies, and most importantly, a significant administrative infrastructure that can provide sophisticated training and oversight. For such policies to be scaled up over the population of a district or an entire country, policy-makers would need to secure significant long-term financial and administrative support or else identify the core drivers of success of these programs and scale only the most effective components appropriately. In future research, a summary paper that presents and compares the costs of the various types of reproductive health programs that have been implemented by Hewlett researchers would be very helpful toward addressing this issue.

How do the reproductive health interventions described in these studies compare with other types of poverty alleviating and growth-enhancing interventions that have already been set in place by governments in a variety of countries? Are they more or less expensive than existing policy options such as micro-credit policies, cash transfers to sub-populations at risk of falling into poverty, food and nutrition support programs and prenatal and antenatal programs and vaccination and nutritional supplementation programs that are aimed at improving early childhood outcomes. To answer these questions, we need better estimates of both the benefits and the costs of these programs and we will need to compare them to the benefits and costs of other poverty alleviating programs.

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The results of the macro studies and the results of the micro studies raise an important set of questions regarding the best timeframe for evaluating reproductive health programs. Many of the reproductive health programs that have been featured in the micro level experimental studies have been implemented on a relatively short horizon of one to three years. Yet existing research suggests that some of the best and most impactful programs have taken up to 20 years to have their strongest effects (Joshi and Schultz, 2007; Thomas and Frankenburg, 2008). The issue of time is particularly impor-

tant when it comes to identifying the impact of fertility decline on measures such as household savings and asset holdings, women's empowerment, investments in children, and more broadly, economic growth and the reduction of poverty. Some of these variables are likely to change slowly and the effect of fertility decline may take time to become visible to a researcher. From the standpoint of policy-makers and financiers, it is crucial to better understand what can be expected of a best practice reproductive health program in the short, medium, and long-term.

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## 5. Recommendations

**T**he Hewlett Foundation and its partners have succeeded in dramatically increasing researcher interest and activity on the relationship between population and reproductive health and economic outcomes in African countries, communities, and households. The research funding programs have collectively attracted excellent economic and other scholars to explore new hypotheses, new methods, and new data in an effort to produce research that will eventually be utilized by policy-makers and others to inform policies and programs.

The future success of the Hewlett partnership investment in the research agenda for population and economics depends on continuing to build the evidence base via contributions from the research community, and converting that evidence into locally relevant information and advocacy messages for policy-makers, program implementers, and other donors. A longer term measure of success will be a sustained increase in capacity of the researchers—especially economists and especially based in Africa—to continue to focus on issues of population influences on poverty and other economic outcomes. Here are several challenges for the Hewlett partnership to consider if it wishes to achieve those objectives:

**Growing the Evidence:** A nascent international community of research practice in population and poverty has been created that embraces some common goals. The first priority of the researchers is to further the breadth and depth of research contributions in this sub-field of economics, and the associated disciplines represented in the community. The researchers will be facilitated in this objective if there is a small but continuing funding stream to build the cohesiveness of the researcher network and seek entry points to connect the research to other streams of economic and development thinking. One aspect of this can be in updating the 2005 research agenda with new and emerging research needs, such as further pushing the envelope on the role of small, randomized experiments, and new topical issues. This need will be addressed in part by the three-year CGD work program that includes support to the population and poverty research agenda. A piece of this work program could be to commission meta-analysis of the growing body of evidence and identify significant gaps such as age structure effects or economic effects from changes in dependency ratios over time. There is a risk that the conclusion of the currently funded research projects will mark

a major diminution in research activity in this sub-field, and that there will no replacement funds to spur the researchers to continue developing methods, data, and scientific inquiry on this topic.

**Conversion to Policy and Advocacy:** The findings that are beginning to emerge from the population and poverty research projects need to be utilized beyond the research world. The funding partners embody a mix of objectives—including making purely scientific advances—but share the intention of influencing donor and developing country policies and programs in family planning, reproductive health, gender empowerment, and other development goals. This objective will be advanced through a well-coordinated combination of research translation, policy analysis and communication, and advocacy. The researchers must be an integral part of this effort, but the overall effectiveness depends on having a systematic strategy informed by local/country needs and opportunities. This need will be addressed by a concerted effort by the group of funders and their relevant policy and advocacy grantees. There is a risk that the progress made on the research agenda set forth in 2005 will not translate well into opportunities for progress on the advocacy agenda, either because of dilution in moving from research to policy messages, or because of a mismatch between research findings and policy/program needs. This latter issue can be addressed in part by carefully examining how closely the research supply matches the demand as part of the research translation step in this process.

**Sustainability of Capacity:** Momentum has been spurred for researchers across the globe to delve into questions of population impacts on economic outcomes. In order to reap the long-term benefits of the significant investment made by the donors and research funders in this effort, the momentum needs to be sustained across a changing landscape of pressing policy issues in Africa and through new generations of researchers and intellectual challenges. This need will be addressed in part through the IIE dissertation fellows program and the strong network of young scholars receiving support to build both their research and their policy communication talents in this sub-field. It will be supported as well through the Hewlett Foundation's other investments in African training institutions. There is a risk that the focus on economic skill-building and outcome measurement will be lost over time through programmatic evolution and shifting priorities.

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## Endnotes

<sup>1</sup> For a thorough summary of past research on the topic of reproductive health and its determinants, its known impacts, and other questions that are not being explored in this paper, readers are referred to Greene and Merrick (2005).

<sup>2</sup> GTAP is a multi-institutional research program whose goal is to improve the quality of quantitative analysis of global economic issues within an economy-wide framework.

<sup>3</sup> Standard macroeconomic analyses of cross-country growth (as in the work of Barro and Sala-i-Martin 1995; Bloom and Sachs 1998; Bhargava et al. 2001) are based on a model in which economic growth during an interval of time is a function of initial income (because of conditional convergence), economic policy variables, and other structural characteristics of the economy, including indicators of population health. In most cases, the estimates suggests that each 10 percent improvement in life expectancy at birth is associated with a rise in economic growth of at least 0.3 to 0.4 percentage points per year, holding other growth factors constant.

<sup>4</sup> This research has led to three additional papers on related themes: In the first paper the authors have included other channels from fertility to economic outcomes, including the change in parental time devoted to child rearing vs. market labor, and the relationship between fertility and schooling attainment. The authors expect the conclusions to be similar to the first paper, i.e., the effect of health improvements on GDP may be mitigated in the absence of fertility decline. The second paper, “How Relevant is Malthus for Economic Development Today?” will be published in the *American Economic Review Papers and Proceedings* volume in May 2009. The third paper, “Is it Africa’s Turn: A Forum on Progress in the World’s Poorest Region,” was

published in the *Boston Review* (May/June 2008). David Weil’s contribution is “Rapid Population Growth Raises the Stakes for African Governments.” In this paper Weil argues that Africa is going to experience a huge increase in population over the next several decades, and this has implications for food security, urbanization, and governance.

<sup>5</sup> Most economic models assume that market mechanisms can appropriately price natural resources. Increases in population increase the demand for such resources and raise their price, creating incentives for technological innovation and adoption (such as drip irrigation). These mechanisms can slow down or even fail if natural resources fail to be priced appropriately.

<sup>6</sup> ARIS stands for “Additional Rural Incomes Survey” and REDS stands for “Rural Economic and Demographic Survey.” The dataset was designed to constitute a nationally representative rural sample of Indian households and contains detailed economic, demographic, and village level information. Households and village data were first collected in 1969. Subsequent rounds were collected in 1970, 1971, 1982, and 1999.

<sup>7</sup> The 1981-1982 Nutrition Survey of Bangladesh serves as the baseline. A newly completed survey of the households in the same 14 villages including a re-survey of all surviving members of the households surveyed in 1981-1982, will provide multi-level (individual, household, and village) longitudinal survey information on the nutritional intake, exposure to indoor air pollutants, health status, activities, cognitive function, strength, and economic productivity of over 4,000 men and women.

<sup>8</sup> The authors use a unique data infrastructure, the “Database Developing World” (DDW), in which household level datasets for 90 developing countries have been connected, cleaned, made comparable, provided with additional household-structure variables, and supplemented with indicators at the district and national level that are used to explain household-level processes.

<sup>9</sup> Angrist and Evans (1998) present an instrumental variables strategy based on the sibling sex mix in families with two or more children. The validity of this instrument arises from the fact that some parents in the context studied (the contemporary United States) prefer a mixed sibling sex composition and thus among parents who have at least two children, those with two boys or two girls are more likely to go on to have a third child. Because child sex is virtually randomly assigned, a dummy for same sex sibling pairs provides an instrumental variable that can be used to identify the effect of childbearing on a range of economic and family outcomes.

<sup>10</sup> Only this component of the data-collection effort has been funded by Hewlett.

<sup>11</sup> South Africa has a public program providing direct financial assistance to poor mothers (Child Support Grant) and a generous program providing financial support to the elderly. This latter program provides indirect financial support to poor mothers when their parents or grandparents who are drawing a state pension provide transfers to the mother, as well as nonfinancial support for teen mothers when poor mothers co-reside with grandparents. The study will examine the impact of both these programs, and examine whether the effects of the programs vary by age and economic status of the mother who is being supported.

<sup>12</sup> The authors will not be able to assess causality until they collect our second wave of data late in 2009, e.g., whether this is because young people with more assets are able to attract more partners (as has been reported for males) or because the partners give them the assets (as is reported for females).

<sup>13</sup> The project, “Siyakha Nentsha,” is being randomized to 10th and 11th grade classrooms. It adapts a curriculum that was originally designed for out-of-school young people for use with slightly younger in-school youth in 10th and 11th grade. The study includes the following groups: a control group that receives no intervention; one study group that receives HIV/AIDS and reproductive health education along with activities to build social networks to help youth have peers and adults to draw upon; and a second study group that receives all of the above along with economic skill-building activities, such as learning how to build and manage assets.

<sup>14</sup> Between 1990 and 1996, the program aimed to provide a midwife in every non-metropolitan township or village in Indonesia. These midwives were important health resources in their communities for they provided services such as prenatal and delivery care, screening for reproductive cancers, reproductive tract infections, sexually transmitted diseases and information about nutrition, and hygiene and sanitation practices during and after pregnancy. They also treated non-obstetric patients, including men.

<sup>15</sup> The program is known as the “Apni Beti Apna Dhan” (which translates to “My daughter, My wealth”) program and was in effect in the state of Haryana in northern India. Since 1994, eligible parents have been offered a financial incentive if they give birth to a daughter.

<sup>16</sup> Vietnam is an interesting case to investigate, because laws there restricted family size to two children per family. Because enforcement varies, this rule suggests several possible instruments for exploration: (i) whether the parents are government officials (or employees), since such officials risk more when they violate the policy; (ii) whether the family is from an ethnic minority, because the fertility laws are de facto more lenient on ethnic minorities; and (iii) the quality of governance in the district. Another possible instrument is lagged fertility. A final pos-

sible instrument is religious affiliation, depending on what various religions in Vietnam preach regarding fertility control.

<sup>17</sup> The paper on the multicountry evidence on private tutoring has come out in the Fall 2008 issue of the *World Bank Research Observer*. For the Vietnam study, the GSO has provided the data for the household survey and the associated school survey. One of the authors has spent time cleaning the data (in part because of some implementation problems by the GSO, especially on the matching of the surveys), in collaboration with colleagues from the University of Minnesota and the World Bank’s Hanoi office. The authors hope to soon have the data ready for preliminary analysis.

<sup>18</sup> The data were collected as part of a randomized experiment whereby one group received cash transfers; a second group received cash transfers as well as fortified food; and a third group served as a control group. So far, two waves of data collection have been completed. Further data is expected to be cleaned and analyzed in the months ahead and will further enrich our understanding of the role of such interventions.

<sup>19</sup> Placental parasitemia, for example, retards the growth of the fetus and increases the prevalence of low birth weight among newborns.

<sup>20</sup> Unlike cost benefit analysis—which appraises the desirability of a particular intervention to determine whether the benefits outweigh the costs—CEA appraises competing interventions. The costs and outcomes and CEA are measured in different units. This is also another advantage of CEA over CBA in health evaluation in that ethical issues of attaching a monetary value to any one’s health are avoided.

<sup>21</sup> In a related project, he is also using longitudinal data collected in the same region to test several hypotheses related to reproductive health and the well-being of women and their children.

<sup>22</sup> The baseline survey and intervention necessary to address the first three questions were implemented in July and August of 2007. A follow-up survey (funded by Hewlett) will be conducted in early 2009. This facilitates the investigation of the broader impact of contraceptive adoption on outcomes for women and children, a more thorough analysis of decision-making within the household about fertility, and contraceptive adoption.

<sup>23</sup> These included the following: (i) appointment with dedicated family planning nurse at government clinic; (ii) guaranteed access to all forms of hormonal contraception, including two forms of long-term methods previously unavailable (one stocked out for years, one never made widely available); and (iii) no cost, no waiting time.

<sup>24</sup> For example, a recent survey of providers conducted by Family Health International and the Ghana Statistical Service

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found that “55 percent of family planning providers said that they required a spouse’s consent for providing one or more non-permanent methods. Family planning is seen as a decision for both partners. Without spousal consent, husbands might accuse wives of infidelity and blame the provider for any problems that occur.”

<sup>25</sup> Baseline surveys are completed in India, Kenya, and South Africa. Follow-up surveys ongoing in Burkina Faso, Ghana, Rwanda, and Mozambique. Results from the baseline surveys in Burkina Faso and Mozambique were presented at the International AIDS Conference in Mexico in August, 2008.

<sup>26</sup> The authors have relied on a new survey instrument called “partnership interviews” to interview and re-interview selected individuals and collect information on sexual activity over a six-month period. The authors are currently conducting HIV testing. This was postponed due to delays in research permission from the Nation Health Science Research Committee (since granted in December 2008).

<sup>27</sup> Health economists, for example, often employ disability-adjusted life years (DALYs) as the common metric to measure health outcomes across various conditions. Reproductive health outcomes cannot easily be included among these comparisons

for a variety of reasons. Pregnancy is not a disease and morbidities as well as mortalities related to it are not well measured. DALY estimates currently depend too much on maternal mortality, which itself is poorly measured.

<sup>28</sup> For example, it is unclear whether the distinctions noted by Hill and Aryeetey between “continuously impoverished” versus “newly impoverished” are specific to their area of study, or whether these distinctions would manifest differently in places where there are variations in the systems of health care delivery, economic roles for women, prevailing family structures, etc. Similarly, the results on adolescents (Hallman as well as Lam and Leibbrandt) and our understanding of the extent to which early parenthood impacts a woman’s life may be highly context-specific. In some settings, the effects may be transitory and young mothers may overcome them over time, while in others the stigma associated with early parenting or parenting out-of-wedlock may generate long-run effects.

<sup>29</sup> If, for example, the observations of the heterogeneity of the adolescent population that are developed in Lam and Liebbrandt’s work could be tested on a dataset from another country and another context, the range of results could provide interesting insights into the possible general application of results.



## Research Summaries

- 1.** The Effects of Health and Demographic Change on Economic Growth: Integrating Micro and Macro Perspectives—The Role of Population in Health-Income Causality: Ashley Lester and David Weil; Brown University Department of Economics and the Population Studies Training Center
- 2.** The Effects of Health and Demographic Change on Economic Growth: Integrating Micro and Macro Perspectives—Population Growth, Land Fragmentation, and Groundwater: Andrew Foster; Brown University Department of Economics and the Population Studies Training Center
- 3.** The Effects of Health and Demographic Change on Economic Growth: Integrating Micro and Macro Perspectives—Composition Bias in Estimating the Effect of Fertility Reduction on Economic Growth: Yona Rubinstein and David Weil; Brown University Department of Economics and the Population Studies Training Center
- 4.** The Effects of Health and Demographic Change on Economic Growth: Integrating Micro and Macro Perspectives—Long-Term Effects of Child Nutrition and Health on Adult Productivity in Bangladesh: Mark Pitt; Brown University Department of Economics and the Population Studies Training Center
- 5.** Reproductive Health, Empowerment of Women, and Economic Prosperity: Elizabeth Frankenberg and Duncan Thomas; Duke University
- 6.** Experimental Approaches to Assessing the Economic Determinants and Consequences of Contraceptive Adoption in Zambia: Nava Ashraf and Erica Field; Harvard University
- 7.** Reproductive and Overall Health Outcomes and Their Economic Consequences for Households in Accra, Ghana: Allan G. Hill, Ernest Aryeetey, and Kelly Blanchard; Harvard University
- 8.** Effects of Reproductive Health on Poverty in Malawi: Marcos Vera-Hernandez; Institute for Fiscal Studies
- 9.** Unintended Childbearing and Family Welfare in Rural Malawi: Angela Baschieri; London School of Hygiene and Tropical Medicine
- 10.** The Effects of Obstetric Complications and Their Costs on the Long-Term Economic and Social Well-Being of Women and Their Families in Burkina Faso: Véronique Filippi; London School of Hygiene and Tropical Medicine
- 11.** Enhancing the Economic, Health and Social Capabilities of Highly Vulnerable Youth: Dr. Kelly Hallman; Population Council
- 12.** Poverty, Gender Inequities, and Sexual/Reproductive Health: An Impact Evaluation of a Combined Economic and Psycho-social Intervention in Southern Tanzania: Will Dow; University of California, Berkeley
- 13.** Fertility, Intergenerational Transfers, and Economic Development in South Africa: David Lam and Murray Leibbrandt; University of Michigan and University of Cape Town
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- 15.** Socio-Economic Impact of Reducing Premature Adult Mortality: The Case of Antiretroviral Treatment for HIV/AIDS Patients: Damien de Walque; The World Bank
- 16.** Determining the Impact of Family Size on Child Welfare Across the Developing World: Deon Filmer, Jed Friedman, and Norbert Schady; The World Bank

17. Fertility and Women's Labor Force Participation in Developing Countries: Maria Porter and Elizabeth King; The World Bank
18. The Decision to Invest in Child Quality Over Quantity: Declining Fertility and Rising Investment in Private Tutoring: Halsey Rogers and Hai-Anh Dang; The World Bank
19. Family Size and Investments in Early Childhood Development in Ecuador: Norbert Schady and Christina Paxson; The World Bank
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21. Demographic Trends, Economic Growth, and Distribution Dynamics: Maurizio Bussolo; The World Bank
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