Population Dynamics and Economic Development: Elements of a Research Agenda

Prepared by the Population and Development Working Group of the Center for Global Development

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Summary

This report of the Population and Development Working Group of the Center for Global Development outlines a research agenda to investigate the relationship between reproductive health and population dynamics, and key economic features at household, community and national levels. A special focus is on the type of research that would be useful to economic and health sector policymaking by national governments and donor agencies working in sub-Saharan Africa. The document represents the "best guesses" of experts in the fields of demography, economics, sociology, epidemiology, public policy and related disciplines who were convened between February and June 2005, with the support and interest of the William and Flora Hewlett Foundation, the UK Department for International Development, and the World Bank.

In its work, the Working Group placed priority on research that would be most likely to inform current policy questions about how to allocate scarce resources to achieve higher rates of economic growth and a faster reduction in poverty. This is done with the recognition that orienting research in this manner may miss excellent, innovative ideas for research on historical trends and fundamental relationships that may not appear to be associated with "policy variables," as currently defined. Thus, this research agenda makes no claim to represent the breadth of useful and important social science related to elucidating relationships between economic, demographic and health variables.

The Working Group identified three main substantive areas under which lines of empirical research would be useful for the medium-term policy agenda. For each, investment in data collection and application of appropriate research strategies promise to lead to more definitive and generalizeable findings than has been possible in the past. These substantive priorities can be summarized:

(1) Given the projected trends in fertility and mortality changes, what are the implications for economic growth and income distribution and the incidence of poverty?

(2) How does investment in reproductive health affect economic conditions at the household level, including the producti vity, labor force participation and savings behavior of women, children and households?

(3) How do different types of investments in reproductive health affect the health of women and children? How does the type and organization of services affect their effectiveness, including ability to reach poor and vulnerable populations?

The Working Group identified four priorities for data collection, each of which would benefit from higher levels of investment.

(1) There is a need for improvement in current methods to collect current period and retrospective data through **cross-sectional household data**. The main area for improvement is in ensuring that, where possible, *both* demographic and economic information is collected. In particular, the Working Group suggested that the Demographic and Health Surveys supported by USAID could work toward inclusion of economic variables; and the Living Standards Measurement Surveys supported by the World Bank could refine their collection of health and health service use information.

(2) There is an opportunity for building a stronger evidence base with the development of **panel data** sets. Establishing one or more African sites for panel data collection – including demographic, health, fertility histories, education, labor market, migration and household structure variables – would constitute a resource for current and future researchers. Importantly, panel data collection should be designed to follow those who migrate out of the research area, because these individuals are likely to have different economic (and other) outcomes than those who remain.

(3) Data sets comprised of **sub-national data** should be developed, at least for several relatively large countries in which there is substantial internal variation. Within-country analysis has the advantage of controlling for time-invariant fixed effects. Ideally, these data would include information about program exposure and program characteristics, population characteristics and demographic behavior, and economic conditions (labor force participation rates by sector, savings rates, income per capita, wage rates, by gender and age, and others).

(4) Opportunities should be sought to use **random assignment evaluation** methods. Experience has shown that the quality of evidence that can be derived from a well-designed evaluation can have more value to the policy and program design process than dozens of weakly designed retrospective evaluations that provide no way to estimate the true impact of a particular program.

These are broad recommendations, which can serve primarily to organize and orient what will, by necessity, need to be a creative enterprise on the part of researchers from a variety of disciplines, bringing to bear their own curiosity and ingenuity. Social science advances primarily by a sort of uncoordinated "triangulation": investigators working from different social science foundations (economics, sociology, anthropology, and political science), using distinct data sets and methods, gradually converge on an understanding of basic relationships that seem to be generalizeable over time and space. That understanding of basic relationships can then inform real-world policies and best practices.

The Working Group hopes that the three substantive priorities and four priorities for data collection will be taken by funders and the research community as points of

departure for their investments of material resources and time – with the aim of developing, over time, the body of evidence that will inform good policymaking.

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Introduction

Accelerating economic growth and sharing the benefits of that growth to reduce poverty are the core missions of virtually all national governments in low- and middle-income countries, and of most international development agencies. In sub-Saharan Africa, the challenge of achieving those missions is acute: Since the mid-1960s, average real income growth has been close to zero, while the number of people in poverty has increased from about 184 million in 1985 to more than 300 million in 2000. The range of solutions proposed (and being attempted) is far-reaching, from major institutional change at the highest levels to targeted health, nutrition and education pilot projects within a few districts – but most observers agree that the development of appropriate policies and programs is hampered by lack of knowledge about the determinants of economic growth and the factors that lead to exit from poverty. In this, economics, demography, sociology and other social sciences have much to offer.

Recognizing the potential value of research to better understand key aspects of economic development, the Center for Global Development convened the Population and Development Working Group to review existing knowledge gaps, and outline an agenda for promising questions to investigate, as well as improved methods.

Defining an agenda of research to respond to the needs of any policy community is challenging. The multi-year timeframes for social science research often are at odds with the policymakers' short-term needs for useful evidence; when the policy community asks for definitive conclusions, social science researchers may answer with inferences that are heavily qualified – specific to a particular time and place, limited by the need to employ assumptions about factors that cannot be directly observed. These tensions are not easily resolved.

Despite the difficulty and inherent frustrations, however, examining the policy applications of social science research is essential to ensure its relevance. There is much to be gained from attempts to understand the central policy questions and audiences *from the outset* of a research project or program.

This document outlines a research agenda to investigate the relationship between fertility and other dimensions of reproductive health, population dynamics and key economic features at household, community and national levels. A special focus is on the type of research that would be useful to economic and health sector policymaking by national governments and donor agencies working in sub-Saharan Africa. The document represents the "best guesses" of experts in the fields of demography, economics, sociology, epidemiology, public policy and related disciplines convened as CGD's

Population and Development Working Group between February and June 2005. (See appendix A for list of Working Group members.[1]) The Working Group's effort was informed in important ways by a gathering of leading policymakers on May 9, 2005, that sought comments on a draft version of this research agenda from those who represent the eventual audience and users of the research findings. This work also benefited from access to background papers prepared for a related undertaking by the John D. and Catherine T. MacArthur Foundation.

Purpose of the Research Agenda

This research agenda lays out the questions that merit particular attention from researchers interested in contributing conceptual and empirical work that could inform current economic policy debates in sub-Saharan Africa. In addition, it highlights the main types of data that would be required to effectively examine the questions. As such, this agenda provides an input into the decisions by funding agencies and research groups, who often must make difficult choices about where to place scarce time and material resources.

The Working Group placed priority on research that would be most likely to inform current and future policy questions about how to allocate scarce resources to achieve higher rates of economic growth and faster reduction of poverty. This is done with the recognition that orienting research in this manner may miss innovative and excellent ideas for research on historical trends and fundamental relationships that may not appear to be associated with "policy variables," as currently defined. Thus, this research agenda makes no claim to represent the breadth of useful and important social science related to elucidating relationships between economic and demographic and health variables.

Why More Research?

Since the 1960s, a notable evolution has occurred in policymakers' views about the relationship between reproductive health and economic outcomes. In broad strokes, policy discourse has moved from consideration of how rapid population growth affects the prospects for growth in national income, to how to stimulate use of family planning services to improve household welfare and maternal and child health, to how to finance and implement a broad set of reproductive health services – including but not limited to family planning.[2]

[1] This document is based on input from Working Group members in meetings, e-mail discussions, written comments and technical notes. Although this statement of research priorities represents meaningful agreement among Working Group members, not all members of the group may agree with the details of each statement.

[2] Reproductive health services refer to the set of health services that are provided to improve or maintain good reproductive health; depending on setting, these may include family planning, safe motherhood/maternal and child health services, adolescent health and well-being services provided in or outside the school setting, prevention and treatment of HIV/AIDS and other sexually-transmitted diseases,

In some cases, influential research has contributed to movement of the policy agenda; for example, research results calling into question the intuitive notion that rates of high population growth yield lower rates of economic growth have been a factor in the shift in policy debates away from using a macroeconomic rationale for investments in family planning programs. In other cases, policy shifts have altered research. In the past 10 years or so, since the 1994 International Conference on Population and Development in Cairo, examining the relationship between population dynamics and economic change has been seen by some as a distraction from a core women's health and rights agenda.

Today, two types of policymakers – roughly labeled as "economic policymakers" and "health policymakers" – can benefit from a deeper understanding of the relationship between economic outcomes (at national and household levels), reproductive health and population dynamics. While outcomes may be measured at the household level, one of the objectives is to help build insights into the economy-wide implications of investments in reproductive health. Economic policymakers who are concerned about economic growth and/or poverty reduction could benefit from the creation of a broad base of evidence about the relationship between desired economic outcomes and a variety of possible investments – social programs, infrastructure or other sectors. Included in that base of evidence would be information about the extent to which investments in reproductive health programs lead to changes in household, community and national welfare, within particular policy contexts.

Policymakers and program designers within (and sometimes outside) the health sector who are committed to investing in health improvements could benefit from more rigorous research that estimates the effectiveness (and cost-effectiveness) of different types of health programs in yielding health benefits, as well as broader social returns. Use of such information would improve the efficiency of spending on health, which must be examined to make the most of the resources available, and to make the case for additional support.

The interests of these two types of policymakers, and the corresponding research questions, are related: If economic policymakers have an interest in investing in reproductive health programs (or health more generally), then surely it is important to know what makes those programs work more or less effectively. Similarly, if health sector leaders are assessing how to allocate their sector resources, some understanding of the "beyond-health" impact of particular types of services can help to inform that analysis and decision making.

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and reduction in harmful traditional practices. Additional definitions of key terms can be found in Appendix 2.

Why Sub-Saharan Africa?

The Working Group considered a broadly policy-relevant research agenda, but reserved special attention for issues that are particularly present in current-day Sub-Saharan Africa. The reasons for a focus on sub-Saharan Africa can be placed into four categories:

- Demography: The demographic future of Africa will be different from other regions, because progress through the demographic transition has been slow and the severity of the AIDS epidemic is altering the rate of adult mortality. Questions can be raised about whether Africa will experience the "demographic dividend" that has been identified in other developing regions with declines in fertility. Those questions come because fertility remains relatively high, even if it is falling in some countries. In Uganda, for example, it is projected that by the year 2025 the population growth rate will remain above 3 percent per annum. In addition, the large population of young people, with about half of the population under 15 years of age, places sub-Saharan Africa in a critical demographic situation.

- Poverty: This part of the world is one of the poorest and most economically backward regions of the world. The challenge of helping this region move through the demographic transition is exacerbated by the overwhelming concentration of poverty.

- Household behavior: Africa may be characterized by key differences in the micro-foundations of fertility change and reproductive behavior – that is, either qualitative or quantitative differences in the relationship among household size and structure, income, education, employment opportunities and other factors than has been observed in other regions. Although it is risky to attribute too much to cultural variation, the patterns of child fostering, marriage and gender relations and roles are notably different in Africa than in the (more studied) regions of Latin America and Asia.

- Growth path: Many African countries, particularly those that are very small and/or landlocked, pose distinct challenges in terms of economic growth and poverty reduction. A current debate going on now among economists highlights two views of the future success for Africa economically: One view could be called a "hollowing-out view" – landlocked countries have relatively few opportunities in a global economy, causing some to expect more migration to coastal areas and to cities, where it would make sense to invest in export-oriented industries that would generate

the kind of dynamic which occurred in East Asia some decades ago. The contrasting view recognizes the role of agricultural development in all regions in the world as triggering a dynamic growth process; therefore, the key in terms of investments in Africa include putting resources, including human capital (health and education) into rural areas, to increase agricultural productivity. Understanding which of these possible paths will lead to broadly shared economic growth is high on the policy agenda, both within African countries and in the international agencies that seek to support their economic decision making.

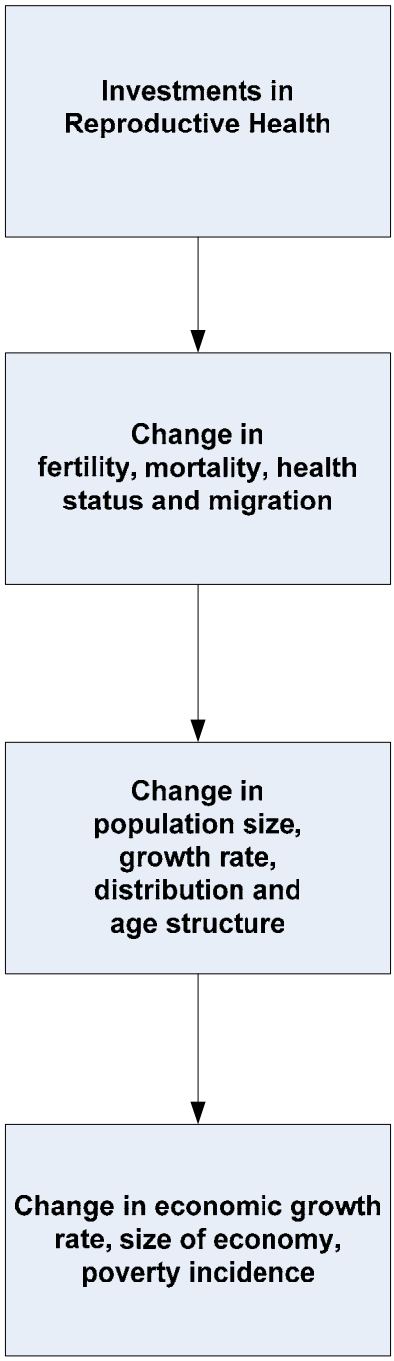
In addition to these reasons, a focus on sub-Saharan Africa is merited simply because of the historical lack of investment in strong data systems and broad access to data by social science researchers in that region – and thus the large marginal value of more investment today in the collection and use of data for guiding the design of policy and its subsequent evaluation. Aside from Demographic and Health Survey data, high quality data sources are quite limited in Sub-Saharan Africa, as is the current capacity for social science research. Registration of births and deaths is incomplete, and labor market surveys may miss large portions of the working population because of the predominance of own-production and informal sector work. At the margins, a focus on building data infrastructure in Africa, with broad access by the global research community, can yield important results – both for Africa-specific policy and, perhaps, for more general application.

Conceptual Frameworks

The relationships between investments in reproductive health, on the one hand, and economic growth and poverty reduction, on the other, can be viewed from demographic, behavioral and health service delivery angles. All are valuable and help to frame the research agenda.

Basic Demographic Relationships. From the demographic perspective alone, investments in reproductive health can be viewed through changes in fertility, mortality, and migration (see Figure 1). 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, in turn, can result in changes in population growth rate and size, age structure, and spatial distribution (urban vs. rural density, for example). This type of demographic change may then be expected to have an impact on the rate of economic growth – for example, all else being equal one would expect growth rates in income per adult to increase if a period of high fertility is followed by a period of low fertility, as the relatively large cohort from the high-fertility period moves into the most economically productive stage of life, while supporting fewer dependents.

Figure 1: Basic Demographic Relationships



There are community and sector effects of rapid population growth, which are not captured in Figure 1, but are also important to keep in mind. Many parts of sub-Saharan Africa are still experiencing high birth rates, which is placing a strain not only at the household level, but also increases the burden on resource allocation in the education and health sectors. For example if birth rates are high, school enrolments will also grow by a certain percentage, making it more difficult for governments to raise per pupil expenditures.

Basic Behavioral Relationships. From the behavioral perspective, the picture becomes markedly more complex. By behavior, we mean the decisions that women (and their partners) and families make about childbearing, household structure, employment, savings and other important life choices, and how those decisions are affected by the availability of reproductive health services. As shown in Figure 2, the set of behaviors that might be related to reproductive health service availability is impressive in its breadth. Depending on women's education, health status, and expectations about roles as mothers, wives and workers, access to reproductive health services can lead to particular types of changes, both directly and indirectly. The direct effects can be seen in changes in childbearing patterns; the availability of modern contraception can result in later age at first birth, longer birth intervals and/or a lower number of births during a woman's reproductive years. The direct effects can also be seen in the health status of women, men and children. In contrast to the basic demographic framework, in this perspective morbidity is highlighted in addition to mortality.

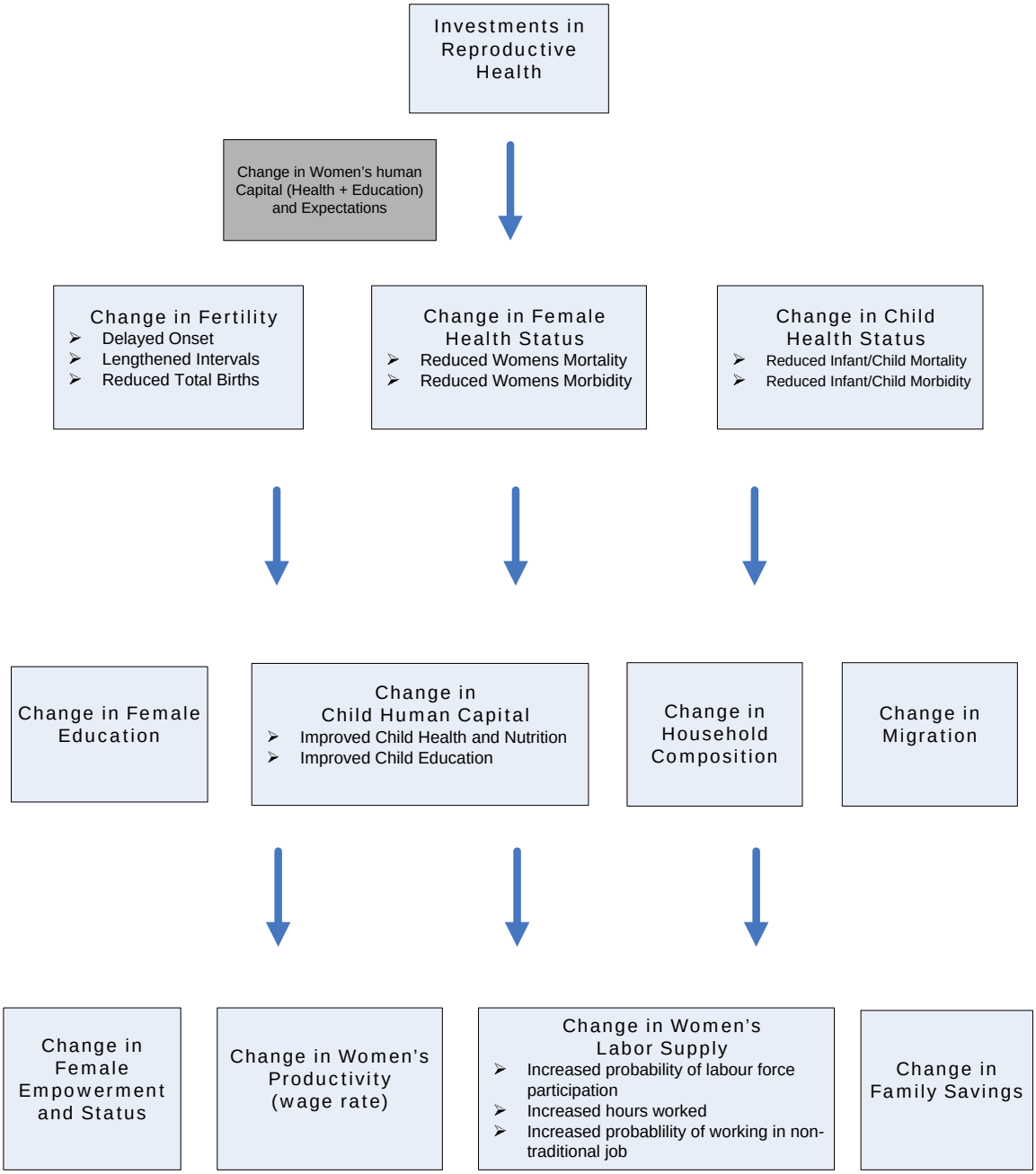
The indirect behavioral effects of access to reproductive health services can be seen in women's decisions about education (particularly if the reproductive health information and services are available to young women before they have completed their secondary or higher level education), investments in child health, nutrition and education, and migration and household structure. So, for example, decisions by married women to limit pregnancies through the use of contraception can be related to decisions to invest more in the medical care and schooling of the (smaller number of) children in a family. Similarly, the impact of reproductive health services on both fertility and the health status of women can affect the likelihood of internal or international migration.

At the next level of indirect effects, key economic and social outcomes observed at the household and community levels are affected by the number of births a woman has, her health status, and the intervening decisions about investments in children's human capital, household structure and migration. For instance, both past and prospective control over childbearing afforded by modern contraception can change women's labor force participation (in both quantity and quality); productivity can be affected by both fertility and health status changes; and savings behaviors can be altered by the changed expectations about the need to invest in children, long-term transfers back to elderly parents from children, and so forth.

In addition, although difficult to capture in specific metrics, the empowerment of women in households and communities can be altered by changes in childbearing patterns. These economic and social outcomes are, themselves, related to

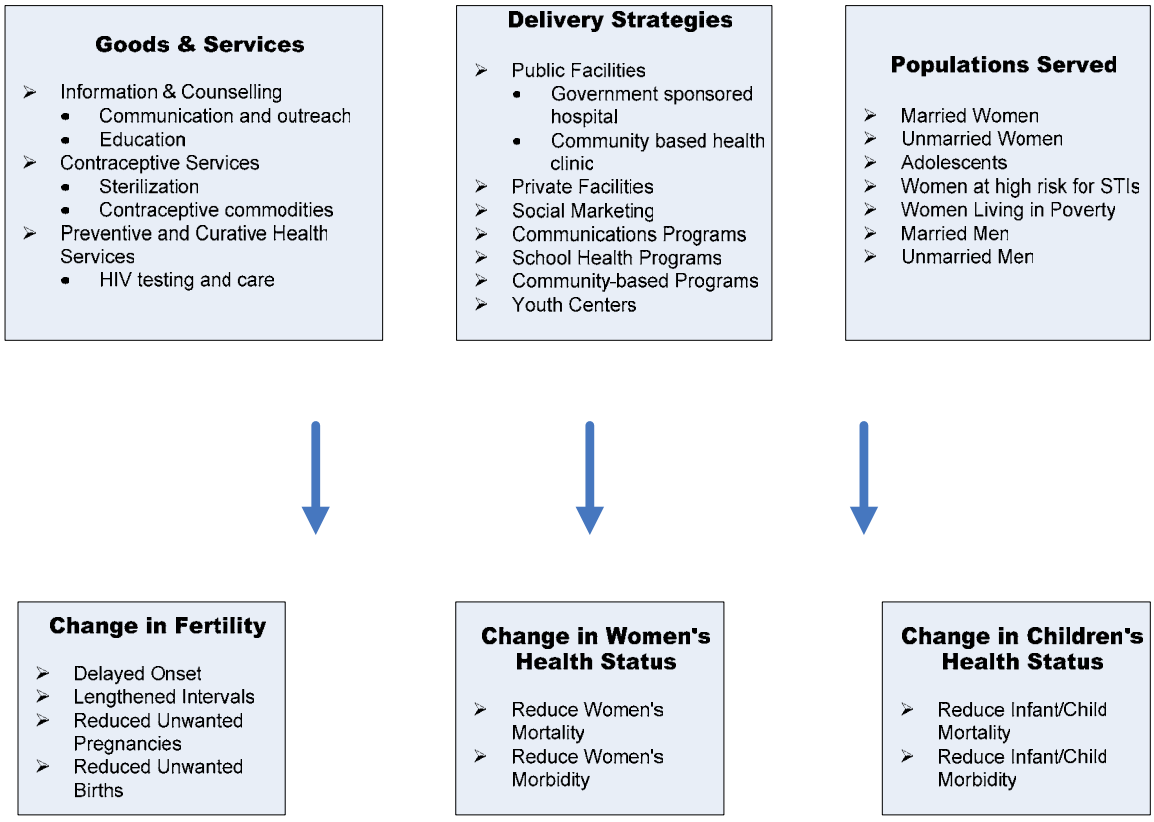
macroeconomic phenomena (labor supply, economy-wide productivity and economic growth rates, national savings rates).

Figure 2: Basic Behavioural Relationships



Health Services Delivery. From the health service delivery perspective, it is possible to make much more nuanced distinctions among the different types of services and interventions that constitute "reproductive health." As shown in Figure 3, reproductive health services may (and often do) include the delivery of contraceptive information and commodities, sterilization and other long-term contraceptive services involving surgical procedures, preventive and curative health services, counseling and broad information, communication and education efforts. They can be organized through the public and/or private sectors, with or without an element of social marketing.

Figure 3:
Types of Reproductive Health Services



And they can be directed toward married and/or unmarried women (with or without their partners) of different ages and stages in their reproductive histories. Remembering the

earlier frameworks, it is possible to imagine that the type of reproductive health service provided is strongly related to the fertility, morbidity, mortality and migration outcomes that are then linked, through intermediate variables, to broader economic impacts. So, for example, reproductive health services that are directed at adolescents are likely to affect transitions to adulthood, and multiple crucial decisions about women's education, marriage and economic mobility and activity. At the same time, reproductive health services that assist women in limiting the total size of their family at the time when they have completed desired childbearing may have an impact on later-in-life employment, savings and investment in children's education, health and nutrition. In addition, reproductive health services that prevent or treat STIs may increase worker productivity and contribute to the empowerment of women. Ultimately, different programs are likely to affect the welfare of different population groups, and thus the personal distribution of benefits by economic strata and region of a country.

The demographic, behavioral and health service frameworks represent stylized versions of reality, and necessarily omit multiple intervening variables, contextual factors – both those that are related to policy, and those that are defined by culture – and reciprocal relationships. However, they are useful in highlighting three potential (and simultaneously occurring) pathways between investments in reproductive health and economic changes. In the demographic framework, fertility and mortality changes that result from access to reproductive health services drive a set of dynamics in the size, structure and distribution of the population, which then affect economic growth and poverty incidence. In the behavioral framework, fertility, morbidity and mortality changes that result from access to reproductive health services are part of a broad set of decisions about women's (and children's) roles and opportunities in the household and the broader society. These include decisions about investments in women's and children's education, women's labor force participation, productivity and savings, and empowerment and control over resources more generally. In the health service framework, different types of inputs and service delivery strategies and patient (or client) populations are viewed as leading to different types of fertility and health outcomes, which then link back to the behavioral and demographic frameworks. These frameworks help to set the stage for the types of policy-relevant research questions and methods that can help increase our collective understanding of whether and how investments in reproductive health have short-, medium and/or long-term economic impacts.

Empirical Challenges

Major empirical challenges have hindered the development of an evidence base about the economic impact of investments in reproductive health that stands up to methodological critiques. Central challenges can be briefly summarized:[3]

[3] Parts of this section are excerpted from notes by Working Group members T. Paul Schultz and Andrew Foster.

(1) Establishing causation. A considerable amount of policy-oriented research on the relationship between reproductive health (or fertility) and social and economic outcomes has depended on interpreting the correlations between "dependent" and "independent" variables as a causal effect which policy makers can assume will persist if policies are able to change the level of the independent variables. Even when efforts are made to take other factors that are associated with the dependent variable into account, this approach runs the risk of greatly overstating the possible relationship. It is entirely possible that unobserved variables, such as heterogeneous preferences across adults in their demand for children and for women's work outside of the family and for child quality, may explain co-variation across family-related behaviors, such as women's education, declines in their fertility, improvements in their health, and gains in their children's health, schooling, and interregional migration. From a statistical perspective, isolating and estimating the magnitude of the true causal relationships requires specifying a forcing or identifying variable that provides exogenous variation in fertility; then this exogenous variation is used to assess, for example, fertility's causal impacts on many other family welfare outcomes over time. The current economics literature provides a dozen such studies based on the following instrumental variables: (1) twins and multiple births; (2) the sex of initial births; (3) miscarriage of a women's first (or subsequent) birth(s); (4) weather shocks that contribute to frequency of childhood diseases; or (5) local access to programs that reduce the cost of avoiding a birth, such as family planning activity, or access to reproductive health services, or child health inputs; and (6) local access to educational opportunities and labor market returns for educated workers. However, the small number of such studies testifies to the difficulty of this research strategy.

Complications arise even when one of the identifying variables is used, however. It is entirely possible that health and family planning programs are not introduced randomly. It is in fact probable that programs are targeted to groups that have the most to benefit from the services, or have the greatest political influence over the distribution of program services. Because of this, it is again difficult to estimate the "cross-effects" between fertility and women's welfare and children's human capital.

This problem is yet more pronounced in the cross-country analyses that have been much of the "bread-and-butter" of macroeconomic work. While there is clearly systematic variation across countries in measures of the quality of human resources such as health status, the underlying drivers of this variation are likely to vary across countries. In some countries, for example, higher levels of health may be attributable to a particularly effective public health system, while in other countries it may simply reflect favorable environmental conditions. Research strategies that control for this type of variation are required to isolate effects such as climate and endemic diseases.

(2) Definition and measurement of key variables: Economic demography benefits from having several outcome measures that are relatively straightforward, such as "live births." But some key concepts are very difficult to operationalize. Among the most difficult are "women's empowerment" and "broadening of social networks," which are considered (and seen in qualitative research) to be closely associated with women's control of their sexual behavior, and the timing and number of pregnancies. Another is women's productivity, which is often captured solely in terms of participation in the labor market. Improved domestic productivity, which may be a prime outcome of better reproductive health, is difficult to measure in a consistent way and may not be reflected in GNP.

In macroeconomic research that involves comparisons across countries, data quality and comparability problems are profound. Individual countries may have quite different institutions for collecting and compiling the data on which key statistics are reported at the national level. Within country analysis also has the advantage of controlling for time-invariant fixed effects, for example geography, the policy environment, and so forth.

Defining Policy-Relevant Questions

The three frameworks described above correspond, in rough terms, to three levels or types of policy decision making: The demographic framework corresponds to macroeconomic decision making; the behavioral framework corresponds to decisions about the impact of public policies and investments on economic and social welfare at the household and community levels; and the health service framework corresponds to decisions about how to use resources (either within or outside of the health sector) specifically to achieve health and fertility outcomes. For each of these, the Population and Development Working Group suggests a core question to be addressed, as well as particular research strategies that can be useful in answering the question.

Macroeconomic policy. At the macro-economic level, the main policy focus tends to be on achieving sustained growth in national income. Central policy concerns include monetary and fiscal policies – for example, how to maintain a favorable exchange rate, how to keep inflation within limits – as well as broad strategic questions about what type of economic development pathway to follow. In general, discussion of demographic change in Africa has been largely absent from policy discourse and, if included, is taken as a "given" rather as something to be affected (over the long term) by economic policy.

Several factors related to population size and age structure can influence the impact of macroeconomic policies. These include: the size and structure of labor supply, which in the aggregate can affect the average wage rate, tax revenues and inflationary pressures; and the level of savings, which is a function of the proportion of the population in different age-cohorts, combined with age-specific patterns of savings and consumption. Conversely, macroeconomic policies provide the context in which

decisions are made about entry and exit from the labor market, and the relative value of investments in children (through education) and other types of investments.

The Population and Development Working Group proposes that the lines of research to inform macroeconomic policy be developed under the following overarching question:

Given the projected trends in fertility, mortality and migration, what are the implications for economic growth and income distribution and the incidence of poverty?

- **How do policy variables, such those influencing labor force participation and savings, affect the implications of population on economic growth and the incidence of poverty?**
- **What assumptions are made in macroeconomic models at national and regional levels in sub-Saharan Africa with respect to labor supply and savings? What do these assumptions imply for reproductive health interventions, and does reality reflect these levels and trends in reproductive health investments?**
- **How might those growth and poverty implications change with different fertility and mortality trends?**
- **How might the implications vary depending on the causes of the fertility and mortality trends?**

Many of these relationships will be difficult to detect, because of the vast range of influences at the macroeconomic level and the empirical challenges highlighted earlier. However, there is room for progress to be made.

The Population and Development Working Group identified two ways to construct a sound evidence base about the effects of reproductive health programs on aggregate economic outcomes.

(1) Map micro-level to macro-level phenomena. In this dual approach, micro-level data from well-designed studies can be used to estimate the direction and magnitude of key relationships – for example, the relationship between exposure to family planning services and labor market participation of women. These parameters can then be applied to the observed situation (i.e., the level of exposure to family planning in sub-national units or across countries) and the outcome (women's labor force participation) can be modeled. This modeled result can then be compared to empirical observations to validate (or not) the hypothesis that the relationships seen at the micro-level hold up at the aggregate level.

(2) Look at within-country variation. Sub-national analysis has the potential to address the multiple problems that have limited the value of cross-country analyses. With regard to data comparability and quality, there is generally a central national office setting data collection policies, even when data collection is organized at a lower level of analysis such as the state. Thus, one can be reasonably sure that any variables generated at the sub-national level are at least trying to focus on the same concept.

At a subnational level there may be a more clearly articulated set of theoretical structures and sources of variation that can be applied. So, for example, a particular policy such as a health or agriculture program may be introduced at a national level, but have very different potential for impact at local levels because of environmental or other geographical variation. At least some subnational units may be relatively homogenous in terms of population characteristics, thereby permitting reasonably clean comparisons to be made.

Poverty reduction policy. High on the agenda for economic policymaking in low-income countries is the allocation of scarce financial and institutional resources to reduce poverty. Developing country leaders, donors and lenders collectively face the challenge of identifying the optimal combination of financial commitments to infrastructure, agriculture, civil service and other public sector reform and modernization, health, education and other sectors, with the aim of reducing poverty in the fastest and most sustained manner.

For this level of policymaking, it is reasonable to ask whether and under what conditions investments in reproductive health would lead to changes in poverty incidence and "pro-poor" growth. The Working Group proposes a core question to guide the lines of policy-relevant research:

How do investments in reproductive health affect economic conditions at the household level, including the productivity, labor force participation and savings behavior of women, children and households?

- **What is the impact of reduced fertility on women's economic activity, their schooling outcomes, and the schooling outcome of their children?**

For example, under this broad question the following more detailed ones suggest themselves:

(1) If improvements in women's health lead to increase in labor supply and/or productivity outside the home – that is, that healthy women are able to devote more hours to the labor market, or produce more per hour, or engage in micro-enterprise. At the household level, this can translate into greater income per capita or per adult-equivalent. At the aggregate level, it can translate into

economic growth. Here, as elsewhere, context clearly matters. In this case the central contextual factors are labor demand (especially for women's labor) and "friendliness" to entrepreneurship: If women are better able or more inclined to enter the labor market, will jobs that take advantage of their productivity be available? Are barriers to entry into small businesses very high? How does this relationship play out in countries and regions that differ in their ability to absorb labor in general, and female labor in particular?

(2) If lower fertility and/or the ability to control the timing of pregnancy makes it possible for women to engage in productive work outside the home, including through the establishment of small enterprises. The context-related questions are the same as in (1), above. In addition, investigation is required to understand how the African patterns of child fostering may affect reproductive preferences and behavior and decision-making with regards to child health and schooling, as well as the relationship between fertility and labor force participation.

(3) If lower fertility makes it more likely that households will save more of their income, in the aggregate (and in the presence of a functioning credit market), these changes in savings behavior can have macroeconomic consequences. Again, conducting research across a variety of economic contexts can help shed light on how the relationship between fertility and savings is mediated by contextual factors.

(4) If reductions in the prevalence of unprotected sex among youth lead to improved school continuation rates, enhanced job skills and better health during the adolescent years. If young people are empowered to control their reproductive lives at a young age, this will allow them to stay in school longer, delay marriage and childbearing, plan and career and have greater control over their future lives.

(5) If lower fertility results in higher levels of investment in children's education and health – investments that will yield benefits for households and for nations in later years through increased labor market participation and productivity. In this case, a central part of this question is how the relationship between fertility and investment in children varies depending on the quality, accessibility of primary and secondary education. In other words, what are the contextual variables that condition whether or not a decrease in fertility pays off in economic terms through future generations' productivity?

The Working Group suggests several research strategies that can be employed to deal with the empirical challenges noted above.

The first such strategy is using available household survey data to examine what economists call "reduced form" estimates of the relationship between exposure to a particular health or family planning program and economic outcomes of interest, such as hours worked or wages (as an indicator of productivity). This strategy takes for granted that some of the strength of the observed correlation between use of family planning

services, say, and labor market participation by women could be (and likely is) the result of the fact that women who use family planning are, in fundamental ways, different than women who do not – possibly in ways that are unobservable. Thus, the policy implications derived from such estimates should be tempered by caveats about over-estimating and over-interpreting the strength of the causal link. But the great advantage of focusing on reduced form estimates is that they do not force the type of mental gymnastics required for a much more detailed examination of a range of intermediary relationships, given only cross-sectional data for one period of time.

The second research strategy is to use panel survey data to examine behavior of a cohort of women as they move through different "states" in their lifetime, with those states being defined by their marital, health and motherhood status, as well as their labor market participation. Because panel surveys follow a portion of the life course of a set of women (or couples), they permit researchers to avoid the heroic assumptions that are often made to interpret differences between age groups in a cross-section, as though they represent differences in behavior across different points in a life cycle. This important advantage must be weighed against the added expense and time required to generate panel survey data, which require following individuals and segments of households as they divide and reassemble themselves over time. In addition, the inevitable loss to follow-up of some individuals may bias the findings in research using panel data. Efforts must be made to correct for the selective loss of highly mobile individuals from the data set.

Health-related policy. The range of reproductive health interventions and dimensions of those interventions is indeed vast, and encompasses everything from policy to social mobilization to direct service provision. Within the provision of services, there are many variations depending on the type and quality of care provided and the populations to which the services are targeted delivered.

In this domain, there is considerable room for research contributions, particularly as choices are being made about the type of reproductive health services to provide. The main focus should be on developing a base of evidence about "best practices" for particular populations of interest, such as adolescents (both girls and boys), women who are early in their reproductive period, and older women.

The Population and Development Working Group suggests that the core question to be answered can be stated as:

How do different types of investments in reproductive health affect health outcomes for women and children? How does the type and organization of services affect their effectiveness, including their ability to reach poor and vulnerable populations?

- **What are the most effective strategies to improve health and fertility outcomes among adolescents?**

- **When and how can integration of reproductive health and HIV/AIDS prevention, care and treatment programs benefit particular populations?**

This can be articulated in more detail:

(1) To affect particular types of women's (and children's) health outcomes for a given population, what set of interventions and services is most effective – for example, comparing a program that offers contraceptive services plus counseling only with a program that provides contraceptive services, counseling and prevention and treatment of sexually transmitted infections? Or comparing a program that offers HIV prevention education and services to adolescent girls to a program that integrates these services with other components, such as literacy, financial and livelihood training? From the results of this type of research, combined with careful studies of service delivery costs, it would be possible to estimate the cost-effective approach to achieve particular types of health outcomes.

(2) To affect particular types of health and fertility outcomes and behaviors for a given population, what are the combinations of health and education interventions (or services) that are the most cost-effective?

(3) What are the practical strategies for integrating reproductive health and HIV/AIDS prevention, care and treatment programs?

Increasingly, innovative research strategies are being used to answer questions such as these. The gold standard of evaluation methods, and one that is well accepted in medical circles, is the randomized trial, in which comparisons are made between 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). Because individuals studied are assigned at random to the "treatment" and "control" groups, the underlying assumption is that they are similar in all respects, on average, and so the differences observed between the groups reflect the "true" effect of the treatment. This method stands in striking contrast to the types of standard evaluations that are conducted in social programs, in which before-program health status (or other outcomes) are compared to after-program outcomes. With those approaches, the differences over time observed are often attributed to the program, but in fact they easily could have been due to other influences, such as broad changes in income, living conditions, or other factors.

Another common evaluation methodology compares the health or other outcomes of those who voluntarily participate in a particular program with those who do not. Again, the differences observed are very possibly due to underlying differences between program participants and non-participants, rather than to the program itself. For these reasons, random assignment methods produce a higher quality of evidence for policymaking, and outcome data should be collected both before and after program treatment starts in both treatment and control communities.

Random assignment methods can and have been applied to the evaluation of a broad range of social programs, from particular types of teacher training to deworming of children to "conditional cash transfers" where mothers are paid on a monthly basis to take their children for well child care and nutritional monitoring. Randomization of medical treatment may occur at the individual level, whereas policy treatment variation is typically randomized at the community level, as with Progresa, and that provides the opportunity to embed the random assignment in the village dissemination of the program. These applications have demonstrated that it is possible to embed a random assignment evaluation into programs that are gradually scaled-up, thus permitting policymakers to learn whether a program is working as it is expanding.

Random assignment evaluations face multiple challenges, including (in many cases) resistance by program managers. The most common concern is about the ethics of providing particular services only to one part of the population and not to others that are included within a research project. Given that very few programs can be taken to scale instantaneously, this concern can largely be dealt with by considering the "treatment" and "control" groups simply as "with program now" and "with program later" groups. This can largely be justified by the need to scale up the program to treat some communities first, and then expand the program to include the remaining communities, but determine which communities fall into the first and second program expansion by nonpartisan random assignment.

Random assignment of the population by region, household, or individual between a program treatment and control population facilitates more reliable program evaluation. However, it is also possible to assume that the selection into the treatment and control populations is based only on observable characteristics, with the remaining differences between outcomes of the treated and controls attributable to the effect of program. If the response of the population to the program is not homogeneous across groups defined by the observable characteristics, the treatment-control differences in outcome within (propensity score) matched groups can be weighted to conform with the population offered the program to infer the program's likely effect on different population mixes in future program expansions. This approach using propensity score matching or control function methods emphasizes that program effects cannot be inferred generally outside of the population groups for which there is a common support or representation in both the treatment and control population, or in other words extrapolation of program effects outside of the support depends on more restrictive functional assumptions. This approach allows for heterogeneity of effects and more flexible (semi-parametric) assumptions that the standard models of selection on unobservables do not.[4] Ideally, several approaches to program evaluation should be used to increase the confidence of

[4] For more information, see: Imbens, G. and J. Angrist, 1994. Identification and Estimation of Local Average Treatment Effects. *Econometrica* 62(2): 467-75; and Heckman, J., Ichimura, H., Smith, J. and Todd, P., 1998. Characterizing Selection Bias Using Experimental Data. *NBER Working Paper* No. W6699.

administrators in the program's average effect. This also suggests segments of the population who are most responsive to the program treatment and may be targeted in the future to increase program effectiveness.

Data Issues

The Working Group placed major emphasis on the creation of and broader access to three types of data, all of which would provide the substrate for creative and policy-relevant social science research.

First, there is a need for improvement in current methods to collect current period and retrospective data through cross-sectional household data. The main area for improvement is in ensuring that, where possible, *both* demographic and economic data are collected. (Currently, some demographic and health surveys collect little or no information about household income, consumption or the labor market activity of household members, while many economic and labor market surveys fail to collect even basic health and health service use data.) In particular, the Working Group suggested that the Demographic and Health Surveys supported by USAID could work toward inclusion of economic variables; and the Living Standards Measurement Surveys supported by the World Bank could refine their collection of health and health service use information.

The INDEPTH organization has also brought together 34 independent longitudinal data collection efforts in the developing world. The Secretariat, based in Accra, Ghana, has produced three monographs (including one on model life tables with real data from the developing world and another on health inequity in small areas) using data from Demographic Surveillance Sites in the developing world. There are currently challenges with respect to allowing more public access to this rich data source; but should the INDEPTH organization be pressed upon to facilitate greater access, it would provide an existing source of information from which to build further research.

Second, there is an opportunity for building a stronger evidence base with the development of panel data sets. Such data sets have been valuable in industrialized countries for tracking employment and other behavior over time. In the context of low-income countries, however, access to panel data is very scarce. Establishing or providing access to one or more African sites for panel data collection – including demographic, health, fertility histories, education, labor market, migration and household structure variables – would constitute a resource for current and future researchers. Importantly, panel data collection should be designed to follow those who migrate out of the research area, because these individuals are likely to have different economic (and other) outcomes than those who remain. Failing to follow them can lead to faulty conclusions.

Third, data sets comprised of sub-national data should be developed, at least for several relatively large countries in which there is substantial internal variation. Ideally, these data would include information about program exposure and program characteristics, population characteristics and demographic behavior, and economic

conditions (labor force participation rates by sector, savings rates, income per capita, wage rates, and others).

Fourth, opportunities should be sought to use random assignment evaluation methods. Experience has shown that the quality of evidence that can be derived from a well-designed evaluation can have more value to the policy and program design process than dozens of evaluations that do not provide a way to estimate the true impact of a particular program.

Appendix 1. Population and Development Working Group

Chair

Nancy Birdsall	Center for Global Development

Members

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John Bongaarts	Population Council
David Canning	Harvard University
Ibrahim Elbadawi	World Bank
Alex Ezeh	African Population and Health Research Center
Andrew Foster	Brown University
Alan Gelb	World Bank
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Simon Johnson	Massachusetts Institute of Technology
Calestous Juma	Harvard University
Cynthia Lloyd	Population Council
Elizabeth Lule	World Bank
Todd Moss	Center for Global Development
Mead Over	World Bank
John Page	World Bank
Lant Pritchett	World Bank
Geeta Rao Gupta	International Center for Research on Women
Khama Rogo	World Bank
T. Paul Schultz	Yale University
Chris Udry	Yale University

Invited Guests

Tamara Fox	William and Flora Hewlett Foundation
Judith Helzner	John D. and Catherine T. MacArthur Foundation

Project Management/Report Preparation

Ruth Levine	Center for Global Development
Subha Nagarajan	Consultant, Center for Global Development

NOTE: Working Group members were asked to participate on a voluntary basis and in their individual capacity. Institutional affiliations provided for identification only.

Appendix 2. Basic Definitions

Reproductive preferences refer to the number and timing of births that a woman or couple wishes to have.

Reproductive behavior includes the number and timing of sexual activity, contraceptive use, pregnancies and voluntary pregnancy termination.

Reproductive outcomes include the number of births, pregnancy-related morbidity and mortality, and fetal and perinatal morbidity and mortality.

Reproductive health refers to a broad range of physical health outcomes and conditions that are associated with reproduction and women's reproductive organs; it includes all reproductive outcomes plus cancer of reproductive organs (cervix, uterus, ovary, breast, etc.), and sexually-transmitted infections including HIV/AIDS.

Reproductive health services refer to the set of health services that are provided to improve or maintain good reproductive health; depending on setting, these may include family planning, safe motherhood/maternal and child health services, adolescent health and well-being services, prevention and treatment of HIV/AIDS and other sexually-transmitted diseases, and reduction in harmful traditional practices.

Savings rate refers to the proportion of income that is set aside for investment or future consumption during a particular period of time, such as a year.

Labor supply refers to the amount and type (skill level) of person-time available for wage employment.

Labor demand refers to the amount and type (skill level) person-time for which employers can and will pay.

Productivity refers to output per worker per hour in the formal and informal sector; unless otherwise specified, it does not refer to home production.

Poverty reduction refers to the diminution in the relative or absolute numbers of households that fall below the poverty line.

Economic growth means the increase in average output per person, or GDP per capita. GDP (measured as goods and services bought and sold) may not capture home production and consumption, child/elder/sick care, or black market/informal sector activities. These excluded factors tend to disproportionately be associated with the work of women.