

**Fewer and Healthier?  
Fertility Transitions and Children's Health Dividends  
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**ABSTRACT**

As fertility decline has commenced globally, interest has emerged over the demographic dividends associated with the decline. While the bulk of previous work has estimated the macroeconomic dividend in terms of savings, economic growth, and poverty reduction, some of this dividend is expected in terms of human capital development. This study seeks to estimate the macro level human capital dividends, specifically those associated with child health, from fertility transitions. Additionally, this study fills a geographic gap in the literature, by locating this research in sub-Saharan Africa, a region in the early stages of its transitions and where the potential dividends from transitions are of key policy interest. Use of multiple waves of DHS data from six Sub-Saharan countries makes it possible to consider how health dividends vary over time and within households (by gender), between households (by family structure), and by country context.

**INTRODUCTION**

The fertility decline predicted by demographic transition theory has commenced in nearly every corner of the globe. Over the past two decades, declines in TFR have been registered in south central Asia (36%), southeast Asia (29%), Latin America and the Caribbean (30%), and sub-Saharan Africa (20%) (UN 2004). With these substantial declines in fertility, theory predicts the emergence of a "demographic dividend". The essence of the demographic dividend argument is that, as fertility declines, the age structure of the population shifts to improve dependency ratios- namely that there are fewer child dependents to be supported by each working aged person. However, the window of time that counties have to capitalize upon the dividend is relatively short, as the dependency ratio begins to worsen over time as older workers retire and the proportion of elderly dependents expands.

Given the potential of this dividend to improve national level outcomes, policymakers and researchers alike have developed an interest in assessing the magnitude and circumstances under which this dividend is most likely. The bulk of this work has sought to estimate the macroeconomic dividend in terms of savings, economic growth, and poverty reduction (Birdsall, Kelley, and Sinding 2001; Bloom, Canning, and Sevilla 2002; Mason and Lee 2005; Greene and Merrick 2005). However, some of this dividend is expected in terms of *human capital development*, specifically in the schooling and health of national populations. While past research has investigated the micro-links between smaller family size and human capital (Blake 1981; Lloyd 1994; Cassen 1994; Desai 1995;), few studies have estimated the macro level gains in human capital associated with fertility transitions. The few studies to do so have further focused on the gains in terms of *schooling* (Knodel, Havanon and Sittitrai 1990; Anh et al. 1998; Bhat 2002; Lam and Marteleto 2005 Eloundou-Enyegue and Giroux 2007). With the exception of the last study, past research in this area has also focused on Asian and Latin American countries.

This study seeks to fill two gaps in previous research on the human capital dividends from fertility transitions. The first, substantive, gap is filled by addressing the macro level improvements in *child health* associated with these transitions. The second, geographic, gap is filled by locating this research in *sub-Saharan Africa*, a region in the early stages of its transitions and where the potential

dividends from transitions are of key policy interest. The study will use multiple waves of DHS data from six Sub-Saharan countries. The replication of DHS surveys across many sub-Saharan countries affords historical and comparative investigations that will make it possible to consider how the health dividends vary within households (by gender), between households (by family structure), and by country context. Evidence on the magnitude and distribution of these dividends will help public health officials and policymakers more effectively target policy in these areas.

## **BACKGROUND**

Much of the previous work examining the relationship between sibsize and human capital outcomes has occurred at the micro level and been grounded in dilution theory (Blake 1981) According to this perspective, as couples have fewer children, finite family resources are spread amongst fewer children, increasing the resources available per child and improving individual child outcomes. While there is some evidence that greater sibsize improves child outcomes, especially in the case of older children (Chernocovsky, 1985; Gomes 1984), most of the evidence from developing countries suggests that a greater number of siblings is disadvantageous for child's well-being, both in the case of education and health. Using DHS data from Mali, Lalou and Mbacke (1993) found that having a greater number of siblings increased the likelihood children experiencing malnutrition. Similarly, using data from 16 DHS surveys, Desai showed that children in larger families have lower height-for-age ratios (Desai 1993).

While this perspective has been criticized on a variety of fronts -- it does not consider distribution of resources within the family, it ignores broader social and economic context, it cannot fully inform our understanding of macro level processes if it is based in micro level analysis -- it continues to permeate current research and provides a helpful framework to begin thinking about the macro level dividends. Moreover, the criticisms levied against this approach can be incorporated into a more fully developed framework that can further our understanding the relationship between fertility decline and macro level health outcomes. The framework proposed for this paper considers the following:

First, even if declines in family size do lead to improvements in child health, this does not mean that all children will experience identical improvements in health outcomes. On the contrary, it is likely that concurrent changes in family structure may result in an inequitable distribution of the dividend. A vast literature in developed countries has pointed to the fact that some family types are associated with disadvantageous outcomes (McLanahan 1994). More recently, interest in the role of family structure in developing countries has emerged and studies suggest that current shifts in family structure, stemming partially from delayed marriage and higher adult mortality, are likely to reduce the amount of adult support available to children (Kirk and Pillet 1998; Cohen 1998; Case et al. 2004). Additionally, even within family types, previous work suggests that there may be a gendered distribution of resources. Thus, this project examines how health outcomes vary by family size and gender.

Furthermore, despite improved dependency ratios as fertility declines, it is likely that some countries will be better positioned to take advantage of the dividend than others. The social, economic and political context under which the declines in fertility have occurred has been quite different. The type of funding available to national health care systems, macroeconomic growth, educational expansion, and other all vary by country and will lead to variation in the levels of the health dividend. Previous work by Desai (1993) found that the relationship between sibsize and height-for-weight was

heavily dependent on the extent to which parents bore the cost of child welfare. Given the pressure many governments are under to reduce public expenditures, one expects that the role of the state in subsidizing health care will have significant implications for the level of dividend that these countries can expect. Using data from 6 sub-Saharan countries, with varying infrastructure and health policies, can help us understand the extent to which context matters.

## RESEARCH QUESTIONS

Overall, this project will answer three research questions:

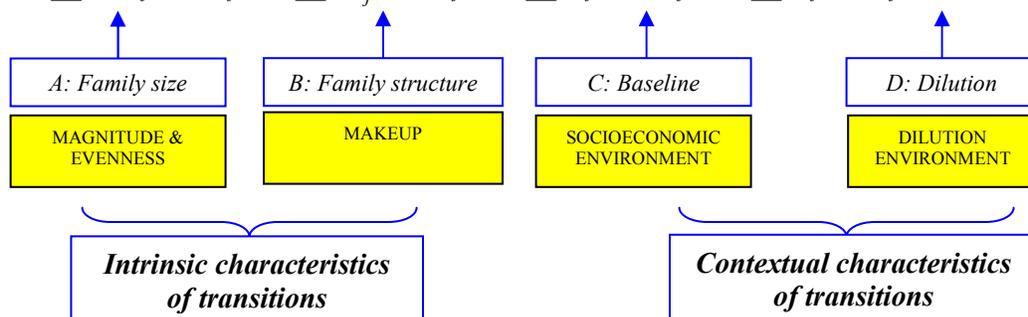
- 1) Is there evidence of a macro-level health dividend? If so, what is the magnitude of the dividend?
- 2) How does the magnitude of the dividend vary across countries?
- 3) Is the dividend shared evenly within national populations? How does the magnitude of the dividend vary by family structure and gender?

## CONCEPTUAL AND ANALYTICAL FRAMEWORK

Much of the previous work grounded in dilution theory allows us only to make limited inference at the micro level. Attempts to extrapolate into macro-level relationships have often resulted in three related fallacies, including an ecological, a temporal, and a distributional fallacy. The ecological fallacy arises when one use micro-level results to infer a macro-level impacts. The temporal fallacy arises when one infers the health impacts of fertility *declines* from cross-sectional studies. As Thornton (2001) argued, this amounts to “*reading history sideways.*” Finally, we cannot use micro level evidence to infer macro outcomes, as this ignores the distribution of sibsize and family types within the population. Knodel (1990) recognized this and, in his study of the relationship between family size and educational outcomes, attempted to account for it using multilevel approaches that shift from macro-level influences to individual experiences and back to macro-level outcomes. This advancement resulted in a better understanding of the macro level dividend, but, as the authors acknowledged, still did not account for the potential influence of changing dilution and socioeconomic environments on the dividend. This project builds upon Knodel’s advancements and additionally accounts for these factors.

Thus, while this project starts with a dilution theory framework, it expands it in several ways when estimating the health dividends. First, it considers the variation in health dividend, depending on family type. Second, it takes into account the fact that gender norms within the household may result in differing levels of the dividend depending on whether the child is male or female. Third, the project uses data from multiple countries to examine how the formation of the dividend plays out differently under varying country contexts. Last, this project uses an empirical approach that avoids problems of ecological fallacies that have emerged in previous work. In this expansion of the dilution framework (see Eloundou-Enyegue and Giroux 2007), the basic health dividend from fertility transitions can be expressed as:

$$\Delta R \approx [\sum \bar{\beta}_s \bar{w}_j * (\Delta S_j)] + [\sum \bar{X}_j * (\Delta w_j)] + [\sum \bar{w}_j * (\Delta \alpha_j)] + [\sum \bar{w}_j * ((\bar{S}_j \Delta \beta_s) + \Delta \beta_j)]$$



Where  $j$  index different subpopulations,  $w$  represent their relative size, and  $S$  is the average sibsize within each subpopulation and  $\beta_s$  and  $\beta_j$  represent the dilution associated with family size and structure, respectively.

The framework further addresses the distributional issues by considering how the health dividends are unevenly distributed across family types and gender for instance. Across family types, the disequalizing effect from transitions is expressed as:

$$\Delta I \cong \left[ \sum_j (\overline{w_j r_j} - \overline{w_j}) (\overline{\beta_s}) (\Delta S_j) \right] + \left[ \sum_j (\overline{r_j} - \overline{\ln r_j}) \Delta w_j \right] + \left[ \sum_j (\overline{w_j r_j} - \overline{w_j}) \Delta \ln(\alpha_j) \right] + \left[ \sum_j (\overline{w_j r_j} - \overline{w_j}) ((\overline{S_j} \Delta \beta_s) + \Delta \beta_j) \right]$$

Thus the framework decomposes changes in children’s health outcomes into four components, 1) the influence of the magnitude and evenness of decline in family size; 2) the influence of changing family structure; 3) the influences of baseline changes in health under the general influence of policy and socioeconomic change; and 4) the devolution environment, i.e., the extent to which dilution from family size and/or family structure changed over time. With this approach one can assess the extent to which each factor influences the magnitude and distribution of the health dividend. The data from DHS will be used to estimate this model across several sub-Saharan countries.

## DATA & METHODS

This project will rely primarily on Demographic Health Survey Data from sub-Saharan Africa, using multiple country and county periods. Initial work will be conducted using all surveys from Ghana, Tanzania, Kenya, Madagascar, Burkina Faso and Zambia. Depending on time, resource, and data constraints, additional counties may be examined as well. While the DHS data allows for an analysis of an array of health outcomes, this project will examine height for age, immunization status, and infant and child mortality.

The analyses will distinguish between the changes due to general socioeconomic transformations and those associated with the declines in fertility in these countries. The project will also use simulation methods to anticipate future dividends depending upon the patterns of future declines in fertility and changes in family structure.

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