



Malaria ecology, child mortality & fertility



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ABSTRACT

The broad determinants of fertility are thought to be reasonably well identified by demographers, though the detailed quantitative drivers of fertility levels and changes are less well understood. This paper uses a novel ecological index of malaria transmission to study the effect of child mortality on fertility. We find that temporal variation in the ecology of the disease is well-correlated to mortality, and pernicious malaria conditions lead to higher fertility rates. We then argue that most of this effect occurs through child mortality, and estimate the effect of child mortality changes on fertility. Our findings add to the literature on disease and fertility, and contribute to the suggestive evidence that child mortality reductions have a causal effect on fertility changes.

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1. Introduction

The broad determinants of fertility are thought to be reasonably well identified by demographers, though the detailed quantitative drivers of fertility levels and changes are less well understood. The relationships between fertility and economic development, the status of women, access to family planning, pro-natalist or pro-planning policies, and mortality (both adult and child), have been elegantly theorized. Likewise, many researchers have empirically modeled these relationships in both cross-country and within-country analyses.

In quantitative terms, however, we continue to lack a good understanding of why some countries have experienced significant reductions of fertility rates, while many

remain with very high fertility rates. Fig. 1 maps the change in total fertility rates from 1965–2005, highlighting the variation across the developing world and even with regions. Much recent work has focused on the role of disease burden in driving fertility rates (Wilson, 2015; Lucas, 2013; Kalemli-Ozcan and Turan, 2011; Bleakley and Lange, 2009), with inconsistent results.

Most theories of the demographic transition put great stress on the causal link from high child mortality to high desired fertility. Simply put, when parents do not know whether their children will survive, they respond by having large families. In a high mortality context, cultural patterns – age of marriage, social norms in child rearing, community support structures – also favor high natality. The original model of the demographic transition, indeed, was driven almost solely by child mortality rates. Exogenous changes to child mortality (e.g., the advent of public health, safe drinking water, improved nutrition) were seen as the primary precursor to reduced fertility

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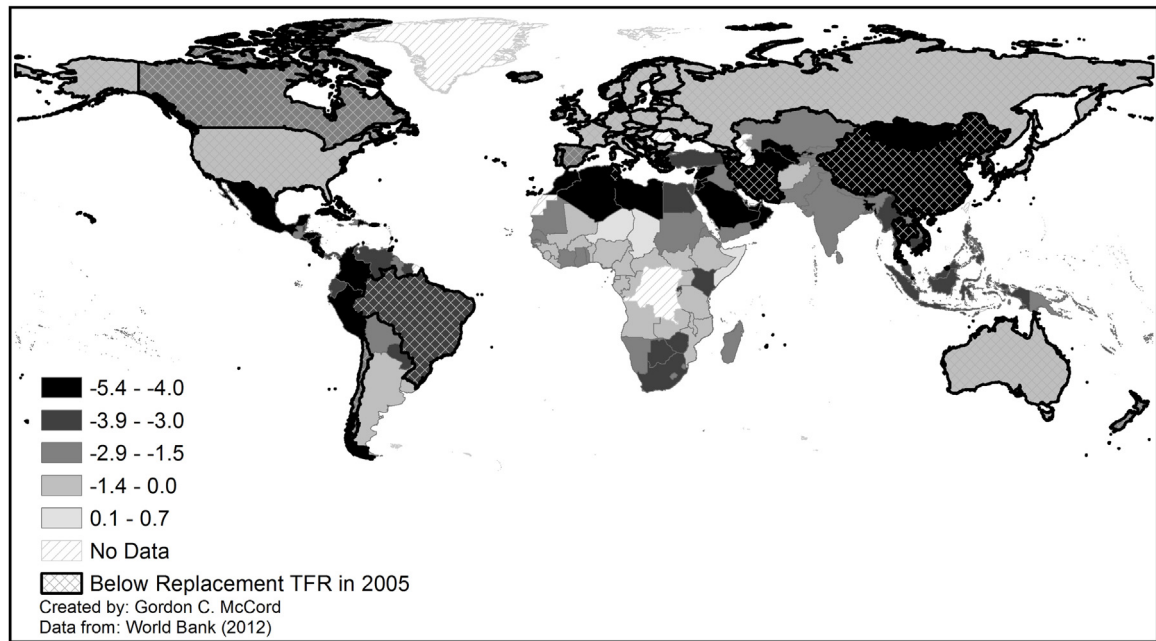


Fig. 1. Change in total fertility rates from 1965 to 2005.

rates – albeit with a lag of one or more generations. This lag reflected two things according to the standard analysis: first, the lag in perception of households that mortality rates had indeed come down persistently and reliably; and second, the lag in cultural norms surrounding marriage age, birth spacing, and family size all needed to promote the transition from high to low fertility. That said, recent experience suggests that the lag may be waning and that demographic transitions are happening with increased rapidity once “triggered”: whereas Western Europe’s transitions took over a century (1800–1930 for Britain), more recent large declines in fertility have happened in as little as twenty or fewer years, such as in Bangladesh, Mauritius, and Iran (Marandi et al., 2006). Most research attributes these declines to changes in access to family planning (Clel et al., 1994; Aghajanian, 1991), though in some countries like Colombia family planning explains less than 10% of fertility decline (Miller, 2009). Other scholars emphasize female education (Lavy and Zablotsky, 2015) and child mortality (Raftery et al., 1995), and still others suggest that with the advent of mass media, cultural changes – such as those related to fertility behavior – spread more rapidly than they once did (Cleland and Wilson, 1987; Bongaarts and Watkins, 1996). These shortening lags and the challenge of identifying the causal effect of these factors leave open questions as to the relative importance of child mortality reduction in the context of 20th century fertility declines.

One issue that complicates this line of research is the question of causal directionality between child mortality and fertility choice. As explained in Ronsmans (1996), there is a direct biological effect of high fertility on child survival: short birth intervals can prevent mothers’ nutrient repletion in low-income settings, thus

compromising the mother’s ability to provide nutrients to the fetus during pregnancy. Moreover, several scholars have shown that reduced family size affects human capital investment (Mogstad and Wiswall, 2016; Conley and Glauber, 2006; Joshi and Schultz, 2005). Likewise, the argument can be made that at least some of the powerful correlation represents increased child mortality due to higher fertility because of increased strain on household caloric resources and decreased parental care and supervision with the addition of more children.

With these concerns in mind, this paper uses a novel ecological index of malaria transmission – exogenous to human intervention – to study the effect of malaria on fertility. We find that temporal variation in malaria ecology is well-correlated to mortality, and pernicious malaria conditions lead to higher fertility rates. We then argue that most of this effect occurs through child mortality, and use an instrumental variable approach to estimate the effect of child mortality changes on fertility. Our results suggest that child mortality still plays a powerful role in fertility choice, an order of magnitude larger than the effect identified in some other studies using an IV approach (Schultz, 1997; Benefo and Paul Schultz, 1996; Drèze et al., 2001). We mention potential caveats to the identification strategy, but argue that the value of presenting a time-varying instrument to this literature is higher than the potential costs from concerns about the exclusion restriction. Our findings add to the literature on disease and fertility, and contribute to the suggestive evidence that child mortality reductions have a causal effect on fertility changes.

The paper proceeds by introducing an ecological index of malaria transmission strength in Section 2, followed by a discussion of relevant literature on child mortality and

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