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Consistencies and contradictions: Revisiting the relationship between women's education and infant mortality from a distributional perspective

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ABSTRACT

The connection between women's education and infant mortality is one of the most consistent and powerful relationships established in public health. A large body of cross-national research highlights the benefits of women's access to education, especially for improving population health in developing countries. However, most of this literature assumes the relationship is uniform across cases. In this study, we revisit the education-health link using a distributional approach. To do so, we conduct a series of unconditional quantile regression analyses that estimate the impact of female secondary school enrollment on infant mortality rates across 153 countries from 1970 to 2016. This technique allows for the possibility that the relationship between education and health may vary across the distribution of mortality. Indeed, results show that the education advantage is distribution-specific. We find that the expected benefits of women's education are limited to the middle of the distribution where infant mortality rates range from about 11 to 55 deaths per 1000 live births. However, we find no significant effect where mortality is comparatively low or high. Both consistent with and contradictory to prior research, these findings provide a more nuanced picture of how women's access to education relates to global health inequalities.

1. Consistencies and contradictions: revisiting the relationship between Women's education and infant mortality

Despite considerable progress over the last few decades, the worldwide burden of infant mortality remains immense and persistent. Globally, infant mortality rates have been on the decline for more than 3 decades, from an average of 92 deaths per 1000 live births in 1970 to an average of 20 deaths in 2016 (see Fig. 1). Yet, almost 4 million children die before their first birthday, mostly from preventable causes. Current trends predict that approximately 24 million more newborns will die between 2020 and 2030 (United Nations Children's Fund, 2020). Consequently, reducing infant mortality retains a prominent spot on the list of the United Nations' Sustainable Development Goals (SDG #3).

Of course, the risk of infant mortality is not distributed equally around the world. The country in which a child is born is a key determinant of life chances (Gates and Gates 2019; Korzeniewicz and Moran 2009). According to the latest UNICEF (2020) estimates, "A child born in sub-Saharan Africa is 10 times more likely to die in the first month of life than a child born in a high-income country and 12 times more likely to die than a child born in the region of Australia and New Zealand" (p. 18). For this reason, social scientists

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and public health experts are interested in identifying factors that contribute to such disparities across countries.

Women's empowerment is often lauded as the key to improving child health outcomes, since women's resources and opportunities shape those of their children (World Bank 2011). Indeed, a large body of scholarship published in a wide range of social science, health, development, and policy outlets substantiates this claim across multiple cultural contexts (Abreha and Zereyesus, 2021; Boehmer and Williamson 1996; Doku et al., 2020; Pratley 2016; Scanlan 2004; Smith et al., 2003). Although scholars generally agree on the importance of women's empowerment, they disagree on the measurement of this frequently used but elusively defined term. Entire books and articles are devoted solely to this controversial issue, underscoring the complexity of the term (Beteta 2006; Grabe 2012; Narayan-Parker 2005; Richardson 2018).

We focus specifically on women's education because it is widely used as a proxy for empowerment (Burroway 2015) and is one of the most well-studied correlates of child health (Bollen et al., 2001). Over time, female secondary school enrollment has trended steadily upward, a pattern that is concomitant with declines in infant mortality (see Fig. 1). As the well-known African proverb goes, "If you educate a man, you educate an individual. But if you educate a woman, you educate a nation." This adage succinctly summarizes a large body of scholarship that highlights the benefits of women's education, especially for improving population health and development in poor countries (see Bollen et al., 2001; Hobcraft 1993; Gakidou et al., 2010; Mensch et al., 2019 for reviews).

Indeed, the impact of women's access to education reaches far beyond individuals, or even families. Expanding women's educational opportunities improves the lives of entire communities (Burroway and Hargrove 2018) and, according to the proverb, even nations. Some scholars go so far as to say that the connection between maternal education and child mortality is one of the most consistent and most powerful relationships established in public health (Gakidou et al., 2010). A recent UNESCO report underscores this claim, asserting that "*Girls' and women's education has the power to save lives*, stimulating multiplier effects that reduce poverty, maternal and infant mortality, and early marriage" (United Nations EducationalScientific and Cultural Organization, 2019: 2, emphasis added).

But is this almost universal faith in women's education misplaced? While it is possible that the advantages of educating women are ubiquitous, it is also possible that such advantages are context-dependent. In this study, we use unconditional quantile regression (UQR) analysis to re-examine the relationship between female education and infant mortality across 153 countries from 1970 to 2016. Unlike traditional regression techniques that estimate the relationship between predictor and outcome variables at the mean, quantile regression is designed to assess distributional impacts (Koenker and Bassett 1978). Rather than assuming a consistent relationship across all cases, our analyses allow for the possibility that the education advantage varies depending on the observed mortality rate. To our knowledge, whether or not the education advantage is distribution-specific has not previously been tested.

Results show that the expected benefits of women's education are limited to fewer than half of all cases. We estimate that the impact of female secondary school enrollment is significantly negative between the 30th and 70th percentiles of mortality rates. That is, women's access to education is associated with reduced infant mortality in cases with relatively moderate rates of mortality (11–55 deaths per 1000 live births). However, education is not significantly associated with infant mortality in the lower or higher ends of the mortality distribution. These findings are both consistent with and contradictory to prior research, which suggests that the relationship between women's education and population health is more complex than currently understood. Although education is associated with improvements in infant mortality in many cases, its benefits are not universal.

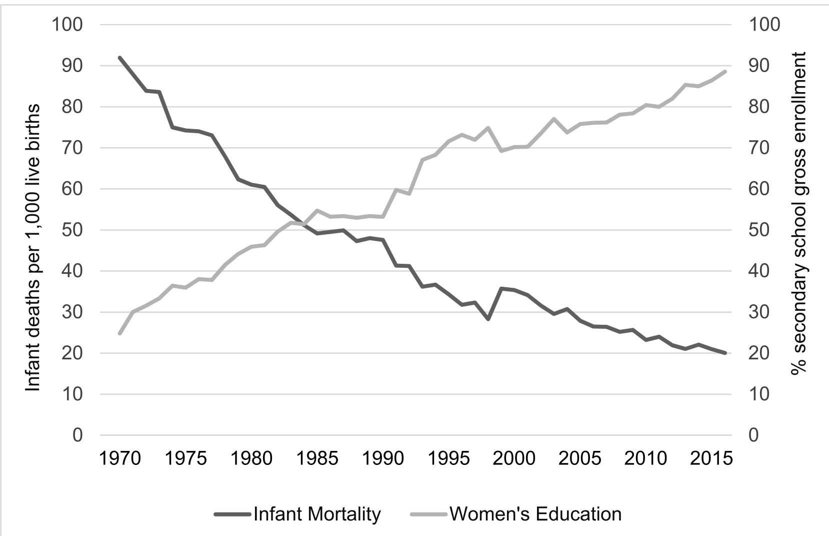

Fig. 1. Global trends in infant mortality and Women's education.

2. Why does Women's education improve child health?

In his seminal 1979 study, John C. Caldwell claimed that maternal education is the single most important determinant of child mortality (Caldwell, 1979). After several decades of research, there is wide support for the importance of women's education but still no scholarly consensus on the causal mechanisms that explain *how* it improves child health (Burroway and Hargrove 2018; Cleland and Van Ginneken 1988; Hobcraft 1993; Vikram et al., 2012).

Perhaps most importantly, education is a key determinant of income. Educated women are more likely to find employment opportunities in the formal labor market and can expect to earn higher wages, which strengthens their autonomy and bargaining power in the household (Nussbaum 2003; Oyitso and Olomukoro 2012; Verick 2014). Education also gives women greater health knowledge and fosters the use of health services like hospitals and antenatal clinics (Glewwe 1999; Shahabuddin et al., 2015; Vikram et al., 2012; Yebyo et al., 2015). Better educated women are more likely to know where health facilities are, to understand the importance of modern healthcare, and to comply with treatment regimens (Somefun and Ibisomi 2016; Taye et al., 2015). Plus, language skills that are accumulated through formal education help women to communicate more effectively with health care providers (Joshi 1994).

In addition to healthcare, education shapes other consequential actions as well. For instance, education is related to delayed marriage, reduced fertility, and other reproductive health behaviors (Adamczyk and Greif, 2011; Behrman 2015; Murtin 2013), which contribute to better maternal and child health. Finally, educated women engage in higher levels of political participation, allowing them to demand more resources for their children through electoral processes (Nussbaum 2003; Sahu and Yadav 2018).

Regardless of the intervening mechanisms, the key message of these studies, which largely focus on a single country at a time, is unequivocally clear: increasing women's access to education improves child health. Cross-national studies support this conclusion.

3. Cross-national comparative research

Cross-national analyses are important complements to the case and regional studies described above because they allow scholars to make empirical generalizations about the patterns between women's status and health across the world (Burroway 2015; Scanlan 2004). Quantitative comparative studies provide a "big-picture" look at the societal-level factors that contribute to health disparities across the world (Harris and White 2019). For more than 25 years, social scientists have demonstrated a positive relationship between women's education and wellbeing across countries. Even while controlling for other socio-political and economic factors that may explain health trends, findings from cross-national studies consistently reinforce the conclusions made from case studies (Boehmer and Williamson 1996; Frey and Field 2000; Heaton et al. 2005; Hertz et al., 1994; Lena and London, 1993; Shandra et al., 2005; Subbarao and Raney 1995; Shen and Williamson 1997, 1999, 2001; Wickrama and Lorenz 2002).

Cross-national research from the last decade in particular shows that female secondary school enrollment is associated with improvements in infant and child mortality (Coburn et al., 2015; Farag et al., 2013), HIV/AIDS (Burroway 2012), child malnutrition (Burroway 2017; Smith and Haddad, 2015), and human development (Sanderson 2010). Other measures of women's education (i.e., primary school enrollment, average years of schooling, literacy rate, gender school ratio) are similarly related to a variety of health outcomes, including infant and child mortality (Burroway 2015; Pamuk et al., 2011; Pérez-Moreno et al., 2016; Sartorius and Sartorius, 2014), HIV/AIDS (Shircliff and Shandra 2011), maternal healthcare (McTavish et al., 2010), and lifespan inequality (Clark and Snawder, 2020). Some scholars go so far as to claim that women's education is even more consequential for infant mortality and child health than economic development (Burroway 2016a; Schell et al., 2007; Subbarao and Raney 1995).

However, one limitation of prior cross-national work is that it overlooks the potential for women's education to have distribution-specific effects on health. This oversight is largely due to the methods typically used to assess relationships between the two. When using traditional regression techniques, evaluation studies estimate a "common effect." That is, they assume that women's education has the same impact on every case included in the analysis (Heckman et al., 1997). This is reflected by a single coefficient that summarizes the relationship between the predictor and outcome.

While this assumption may be substantively plausible, it has not previously been tested empirically. Given the highly skewed distribution of mortality rates, the mean effect of women's education might provide an especially poor indication of how women's education relates to infant mortality rates across a wide range of contexts (Gamper-Rabindran et al., 2010; Hao and Naiman, 2007). What further motivates our application of quantile regression to the education-health link is that conceptually different perspectives on the same research questions can add valuable insight. New methodological innovations can complicate and contradict even long-standing findings in development studies (Burroway 2016b; Brady et al., 2007). For these reasons, we revisit the role of women's education in promoting health with the use of quantile regression analysis, a technique that allows for the possibility that the impact of education may not be uniform across cases.

4. Analytic approach

We use a quantile regression technique designed for analyzing panel data to re-examine the relationship between women's education and infant mortality across 153 countries from 1970 to 2016. We include all cases where data are available for each measure, yielding a sample of 3983 cases. A list of all countries included in the analysis appears in Appendix 1. Quantile regression modeling allows us to conduct more nuanced analyses of the education advantage than is possible with traditional regression models. By using this approach, we can estimate the potential health benefits of increasing women's access to education at different points along the distribution of infant mortality rates. By comparison, previous cross-national studies assume a consistent effect across cases.

It is important to note that both conditional and unconditional quantile regression models are available. Going forward, we refer to them as CQR and UQR, respectively. While they share the common feature of estimating distribution-specific effects, they differ in important ways. In multivariate applications, they produce results that are conceptually distinct. This is because of computational differences in how they are estimated (Killewald and Bearak 2014; Lin 2015). We emphasize these distinctions because the two approaches address different research questions and produce different estimates from the same set of observations (Firpo et al., 2009; Porter 2015). However, as evidenced by prior applications in sociology, the distinction between the two is not readily apparent which can lead to misapplications of quantile regression analyses (e.g. Budig and Hodges 2010).

In this study, we employ UQR for two reasons. First, we are interested in whether the education advantage in countries with high rates of infant mortality differs from the education advantage where mortality rates are comparatively low. Second, we must control for numerous factors that prior work has shown to be influential on population health. With the application of UQR, the inclusion of control variables does not alter the quantiles of the outcome. For example, if we include a control for economic development, a UQR model specified at the 90th percentile will estimate the impact of education on infant mortality – controlling for economic development – where mortality rates are higher than 90% of cases.

In contrast, CQR models redefine the distribution of the outcome conditional on the covariates (Firpo et al., 2009; Killewald and Bearak 2014). In other words, the results of a CQR analysis specified at the high end of the distribution would indicate the size, direction, and statistical significance of the education advantage where the infant mortality rate is *higher than expected given the country's level of economic development*. The distribution of mortality rates – when conditioned on economic development – is necessarily distinct from the unconditional distribution of mortality. For example, mortality rate can be much higher than expected given how economically developed a country is but also lower than the mortality rate we observe in most of the other countries. If not for this distinction, there would be no reason to include a control for economic development when testing the education-health link.

We generate UQR estimates of the education advantage using the recentered influence function (RIF) (Borgen 2016; Firpo et al., 2009). The recentered influence function for the pth quantile is

$$RIF(Y; q_p, F_Y) = q_p + \frac{p - 1\{Y \leq q_p\}}{f_Y(q_p)}$$

where Y is the observed outcome, q_p is the value of Y at quantile p, and F_Y is the cumulative distribution function of Y. The probability density of Y at quantile p is denoted as $f_Y(q_p)$ and is approximated with a kernel function. The indicator function, $1\{Y \leq q_p\}$, identifies whether the value of the outcome in each case is less than the value of the outcome at quantile p. When we use this technique, the addition of control variables does not redefine the quantiles (Porter 2015). We can therefore estimate the education advantage in reference to the distribution of mortality rates at any quantile of the distribution greater than 0 and less than 1.

We conduct our analyses in Stata 15 using the xtrifreg command developed by Borgen (2016). To account for unobserved heterogeneity in our panel data, we specify country-specific fixed effects and robust standard errors clustered by country. The following equation represents the UQR model for panel data:

$$Y_{it} = \alpha + \beta_1^{(p)} x_{it1} + \ldots + \beta_n^{(p)} x_{itn} + u_i^{(p)} + \varepsilon_{it}^{(p)}$$

Given the observed values of infant mortality (Y) and women's education (x_1) for each country i and year t, the model estimates the education advantage (β_1) at the p^{th} quantile of infant mortality, net of the impacts of theoretically relevant controls (β_n). The model includes a constant term (α), country-specific error terms that are constant over time (u_i), and error terms specific to each country at each year (ε_{it}).

Using the UQR model with fixed effects, we estimate the education advantage across the distribution of infant mortality and present results from a total of 9 regression analyses. In the first analysis, we specify $p = .10$. This model estimates the education advantage at the 10th percentile of infant mortality. Next, we specify $p = .20$ which estimates the education advantage at the 20th percentile. We continue in increments of 0.10 through $p = .90$, or the 90th percentile of infant mortality.

5. Measures

To reevaluate the relationship between women's education and health from a quantile analytic perspective, we draw on prior research to specify the outcome and predictor of interest, as well as a series of theoretically relevant control variables. Descriptive statistics for all measures appear in Appendix 2. Unless otherwise noted, data are from the World Bank, 2019 *World Development Indicators*.

We focus on *infant mortality* because it is commonly used as a barometer of the overall health of a population (Reidpath and Allotey 2003) and the general level of development in society (Scanlan 2004). Infant mortality is measured as the number of infants who die before their first birthday, expressed per 1000 live births. Fig. 2 illustrates the distribution of infant mortality rates across all 3983 cases. Among 153 countries over the period of 1970–2016, infant mortality ranges from 1.6 to 202.6 deaths per 1000 live births.

In addition to this wide range, the distribution of mortality is also heavily skewed. The mean mortality rate is 40.8. However, at the median (Q50), infant mortality is only 25.6 deaths per 1000. The severity of the skew is further illustrated by the fact that mortality is lower than 50 deaths per 1000 in 67.4% of cases (2,688). In contrast, mortality rates are greater than 150 in only 0.01% of cases (44). With such a highly skewed distribution, it is likely that estimating a single effect across all levels of infant mortality will obscure a considerable amount of variation in the extent to which women's education relates to population health (Hao and Naiman, 2007). This is consistent with prior work that suggests mean-based indicators of the education-health link are problematic for substantive reasons

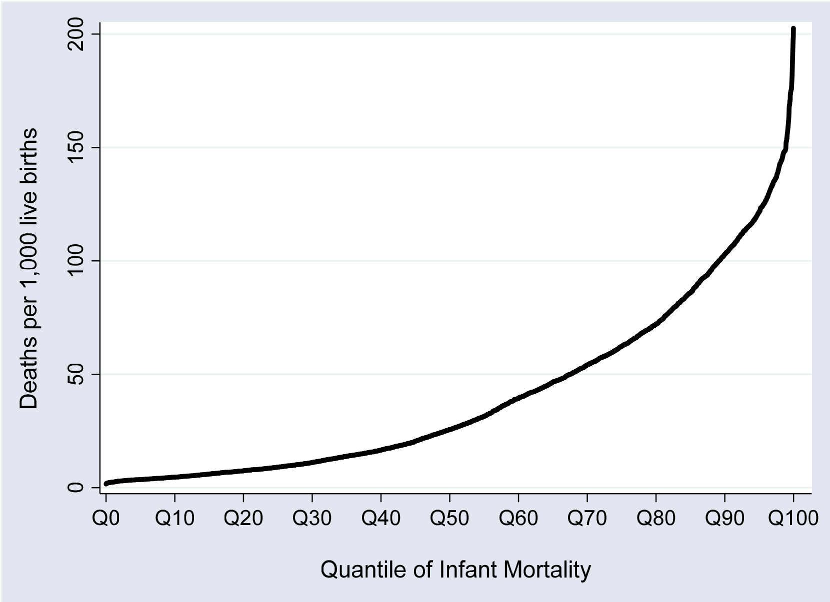

Fig. 2. Distribution of infant mortality by quantile.

(Gamper-Rabindran et al., 2010).

This leads us to propose that the impact of women's education will vary across the distribution of infant mortality. Following prior work (Brady et al., 2007; Burroway 2015; Coburn et al., 2015), we measure women's education as gross *female secondary school enrollment*. This measure includes the female population enrolled in secondary school (regardless of age). It is expressed as a percentage of secondary school-aged children. Because women of all ages are included, enrollment can be greater than 100%.

Of course, women's education is only one of many factors that drive cross-national differences in health and wellbeing. For this reason, we control for a number of socioeconomic, demographic, and political factors that could also potentially affect infant mortality. As with women's education, the extent to which each control variable impacts infant mortality rates may (or may not) vary across the distribution of mortality.

First and foremost, we use *gross domestic product (GDP)* per capita (measured in current U.S. dollars) to denote a country's level of economic development. The prominent demographer Samuel Preston, 1996 (: 531) remarks, "The major emphasis during the last half-century … has been on explaining movements in aggregate-level indices of mortality by reference to economic factors." This view has been popularized by prominent economists and others who stress that economic development is the *most* effective way to improve population health and well-being (Collier 2007; Firebaugh 2003; Pritchett and Summers 1996; Sachs 2005). A substantial body of empirical evidence supports this claim (Firebaugh and Beck 1994; Lange and Vollmer, 2017; Shandra et al., 2004). However, others reject the dominant paradigm that tightly links economic development with wellbeing (Bambra 2011; Brady et al., 2007; Kapoor and Debroy, 2019; Nussbaum 2003; Page and Pande 2018; Sen 1999). Indeed, there is evidence of the limits to this relationship (Brady et al., 2007; Clark 2011; Cole 2019). Some countries achieve better health than expected relative to their level of economic development *and vice versa* (Ragin and Bradshaw 1992; Shen and Williamson 2001).

We also control for urbanization by including the *urban population* as a percent of the total population. Cities provide many advantages over rural areas regarding the availability of services that promote good health, such as water, sanitation, housing, and healthcare (World Health Organization, 2016).[1] Urban workers also tend to have better opportunities and earn higher wages (Bloom et al., 2008), enabling a higher quality of life. On the other hand, rapid urbanization often results in a range of health hazards, including overcrowding, substandard housing, inadequate sanitation and waste disposal, and population demands that exceed service capacity (Moore et al., 2003). Plus, the population density of cities contributes to the incubation and rapid spread of infectious diseases (Neiderud 2015).

Because fertility and mortality are intimately related, we include the *total fertility rate*, which indicates the average number of births per woman of childbearing age. All else equal, higher fertility means the chance for higher mortality (Jorgenson and Rice 2012).

[1] In additional sensitivity analyses not shown, we examine several of these health-related variables directly. First, we control for access to clean water and sanitation facilities. While this does not alter the main findings, we omit these variables in the final models due to excessive multicollinearity. Second, we consider public health spending (% GDP) as a measure of government support for healthcare infrastructure. Again, the main results and conclusions are robust. Unfortunately, data on health spending are not available until 1990, which considerably limits our longitudinal analysis. We omit this variable from the analysis in order to preserve the timespan of over 4 decades. Third, physicians per 1000 and hospital beds per 1000 are other potential measures of healthcare access, but these data are extremely sparse for our sample and timeframe.

Indeed, high fertility tends to coincide with high mortality in countries that have not yet experienced the demographic transition (Reher, 1999). But beyond this direct link, declines in fertility are also related to improvements in women's health and status which, in turn, contribute to lower infant mortality (Wickrama and Lorenz 2002).

Prior research suggests that several interrelated dimensions politics are consequential for population health (Dawson 2010; Muntaner, 2013; Klomp and de Haan 2009). Thus, we use three variables to assess the political context of a nation and its potential impact on infant mortality. First, we measure *democracy* using the Polity IV Project's polity scale that ranges from strongly autocratic (−10) to strongly democratic (+10). Scores are awarded on the basis of competitiveness and openness of executive recruitment, constraints on the chief executive, the competitiveness of political participation, and the regulation of participation (Marshall et al., 2018).[2]

Populations living under democratic regimes tend to have better health outcomes (Mackenbach 2013; Muntaner, 2013). In theory, democracy improves well-being by creating an avenue for people to identify basic needs and demand an appropriate governmental response (Sen 1999). Through contested elections, citizens in a democracy can penalize their political leaders if they fail to adequately protect the population from preventable illness and premature mortality (Wigley and Akkoyunlu-Wigley, 2011). Thus, democratic governments typically spend more on social services such as education and health (Nelson 2007). A long history of cross-national research in political science and sociology shows that democracy is associated with the provision of basic needs (Moon and Dixon 1985; London and Williams 1990) and improved infant mortality and life expectancy (Klomp and de Haan, 2009; Lake and Baum 2001; Przeworski et al., 2000; Wigley and Akkoyunlu-Wigley 2011). However, this relationship is called into question by several recent cross-national studies that do not find direct effects of democracy on infant mortality or child health (Burroway 2016b; Ross 2006; Shandra et al., 2012; Swiss et al., 2012). This may be due, in part, to sample selection biases (Ross 2006) or lack of longitudinal analyses (Swiss et al., 2012).

Second, we expect *political violence* to adversely affect infant mortality rates because it can interrupt economic growth, depress food production, and destroy infrastructure and social institutions (Carlton-Ford and Boop 2010; Scanlan and Jenkins, 2001). For these reasons, episodes of violence tend to increase poverty and undernourishment, limit access to education and potable water (Gates et al., 2012) and accelerate disease transmission (Randall, 2005). We include a measure that encompasses all episodes of international, civil, and ethnic violence and warfare for each country that is directly affected. Each episode of violence is judged for its magnitude of social impact and then assigned a score on a scale of 0–10. We use the sum of all scores in a given country-year (Marshall 2019).[3]

Third, *regime stability* is measured as the number of years since the most recent political regime change. A regime change is indicated by a three-or-more point change on the polity scale over the course of three or fewer years (Marshall et al., 2018). We expect that stability will be associated with improved infant mortality because governments are more willing to invest in health during extended periods of peace. Plus, political instability that is associated with riots and civil unrest often disrupts the delivery of healthcare and other services (Carlton-Ford and Boop 2010; Klomp and de Haan 2009).

We also include two measures of a country's global ties: trade and international nongovernmental organizations (INGOs). *Trade openness* is measured as the sum of exports and imports of goods and services as a percentage of GDP. Some scholars suggest that integration into the world economy through trade liberalization is the optimal path to economic development (Haque 1999; Hall 2011). Such integration allows countries to "catch up" in income and productivity (Gilpin 2001) and subsequently the whole population benefits from increased social mobility and better well-being (Haque 1999; Firebaugh and Beck 1994). Thus, international trade can potentially improve child health insofar as it contributes to increasing economic growth (Levine and Rothman 2006). On the other hand, dependency and world-systems scholars warn that these benefits accrue unevenly across countries (Moore et al., 2006). Trade relationships between countries are unequal, tending to favor powerful states and impeding economic growth in developing countries (Wallerstein 1974). Indeed, some cross-national research shows that trade adversely affects infant mortality (Moore et al., 2006; Shandra et al., 2012; Shen and Williamson 2001).

Finally, we expect stronger ties to world society to correspond with lower mortality rates. Direct organizational ties – especially INGO memberships – are associated with conformity to world cultural principles including the treatment of health as a human right (Boli and Thomas 1999; Inoue and Drori 2006). Although its substantive focus is on the natural environmental, there is growing evidence that the significance of national ties to world society varies depending on political economic context (Mejia 2020; Shorette 2012; Tester 2020). This suggests that the education advantage may vary across the distribution of infant mortality. Following prior work in this tradition (Boyle et al., 2015), we include a count of *INGO memberships* in all models. INGO data are drawn from the annual volumes of the Union of International Associations' *Yearbook of International Organizations*.

6. Results and discussion

Results of the UQR analysis are presented in Fig. 3 and Table 1. Fig. 3 graphically depicts the estimated impact of women's education, the key predictor of interest. For the sake of clarity, we do not illustrate the estimates for control variables in Fig. 3, although they are present in the models. Table 1 then displays estimates for *all* covariates at each specified quantile. Again, a quantile represents

[2] We also employ the Freedom House 7-point scale of political rights and civil liberties in additional analysis not shown. The primary substantive results remain the same. We elect to use data from the Polity IV Project because the polity scale is a better measure of contestation (Lake and Baum 2001).

[3] Corollary analyses show that international sources of violence have a larger impact on infant mortality. However, each type of violence follows the same general pattern. The primary results are not altered by disaggregating the indicators of political violence.

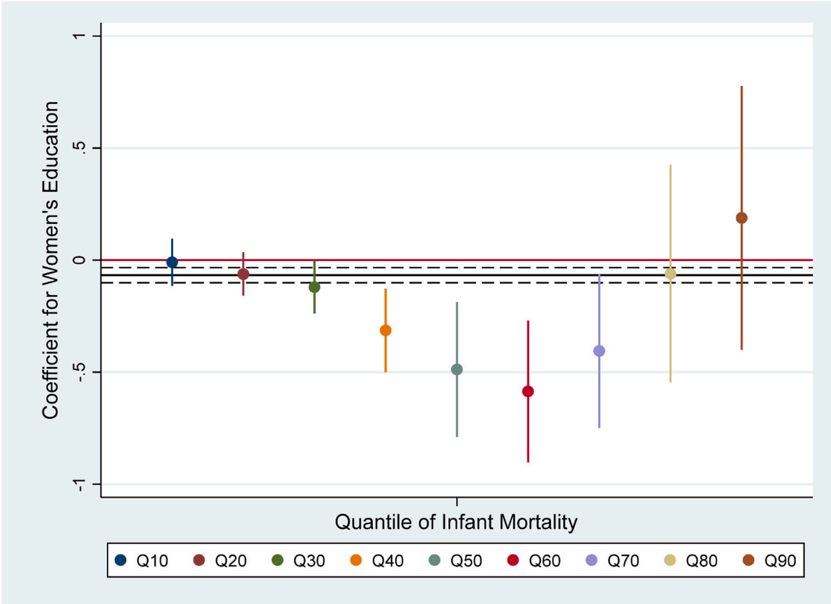

Fig. 3. Estimated relationship between Women's education and infant mortality by quantile.

Table 1

Results of unconditional quantile regression analyses of infant mortality Rates, 1970)–2016.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
	Q10	Q20	Q30	Q40	Q50	Q60	Q70	Q80	Q90
Female Secondary School Enrollment	-.009 (.053)	-.062 (.050)	-.121* (.059)	-.313** (.094)	-.488** (.152)	-.586*** (.160)	-.405* (.174)	-.061 (.245)	.188 (.298)
GDP per capita	-.001*** (.0001)	-.001*** (.0001)	-.0002 (.0001)	.0001 (.0001)	.0003* (.0001)	.0004** (.0002)	.0003 (.0002)	.0004 (.0003)	.0001 (.0004)
Urban Population	.0747 (.103)	.136 (.147)	-.030 (.211)	-.088 (.280)	-.337 (.404)	.123 (.514)	-.076 (.591)	−0.765 (.970)	−2.388 (1.670)
Fertility Rate	-.244*** (.063)	-.214** (.0693)	-.080 (.123)	.021 (.181)	.596* (.293)	1.842*** (.357)	2.690*** (.448)	3.765*** (.699)	2.521** (.943)
Democracy	.059 (.072)	-.0069 (.112)	-.043 (.161)	-.256 (.266)	-.446 (.425)	-.707 (.482)	.255 (.449)	-.998 (.855)	−2.964* (1.395)
Political Violence	.001 (.182)	.160 (.203)	.402 (.342)	-.052 (.569)	.778 (.827)	4.435*** (1.241)	1.807 (2.052)	-.702 (2.227)	−6.456 (3.864)
Regime Stability	-.060 (.033)	-.0413 (.0521)	-.098 (.062)	-.173 (.091)	-.275 (.154)	.0939 (.161)	.258 (.188)	.012 (.264)	-.182 (.335)
Trade Openness	-.048* (.020)	.0123 (.023)	.027 (.036)	.024 (.043)	-.031 (.0484)	-.105 (.078)	-.017 (.083)	.076 (.145)	-.057 (.167)
International NGOs	-.011*** (.00186)	-.013*** (.002)	-.006*** (.002)	-.003 (.002)	.001 (.003)	-.002 (.004)	-.001 (.004)	.001 (.006)	-.001 (.009)
Constant	28.28*** (6.680)	26.85** (8.536)	31.72* (14.90)	46.68* (19.40)	61.60* (26.86)	8.805 (35.88)	−19.04 (42.27)	−20.98 (67.44)	148.2 (108.0)
Summary Statistics									
R^2 within	.4896	.4988	.2738	.2451	.3337	.4293	.4163	.3939	.2304
R^2 between	.4384	.5035	.6441	.6650	.7446	.7343	.7100	.5887	.3900
R^2 overall	.4700	.5532	.5609	.5921	.6655	.6710	.6358	.5257	.3009
Total Observations	3983	3983	3983	3983	3983	3983	3983	3983	3983
Number of Countries	153	153	153	153	153	153	153	153	153

Robust standard errors clustered by case in parentheses; ***$p < .001$, **$p < .01$, *$p < .05$ (two-tailed tests).

the value of the outcome that is higher than that percentage of cases. For example, infant mortality is 4.7 deaths per 1000 at quantile 10. This means that a mortality rate of 4.7 is greater than 10% of cases. Each coefficient and standard error represent the relationship between the predictor variable and infant mortality at the specified quantile. Q10 denotes quantile 10 or the 10th percentile. Q20 denotes quantile 20 or the 20th percentile, and so on.

In Fig. 3, the y-axis represents the estimated impact of women's education on infant mortality rates. The x-axis represents the full distribution of mortality. The red horizontal line across the middle of the graph at zero indicates a null effect, or no relationship. The area below the red line indicate a decrease in infant mortality. As a point of reference, the black horizontal line represents the point estimate that is produced by traditional two-way fixed effects regression (with 95% confidence intervals marked by the surrounding dashed lines). Consistent with previous work, the black line is below zero, indicating that women's education is related to reduced mortality. That line is also constant across the distribution of infant mortality because the traditional model only estimates one coefficient, regardless of the mortality rate.

In contrast, the UQR model estimates the distribution-specific impacts of women's education. The colored circles represent point estimates produced by nine UQR analyses (with 95% confidence intervals marked by whiskers). Each circle indicates the relationship between women's education and infant mortality at different points along the mortality distribution. The size of the education effect is shown by the distance that lies between the colored dot and the red line. The farther the distance, the bigger the effect. Statistical significance is shown with 95% confidence intervals. Whiskers that do not overlap with the red line indicate a statistically significant effect. Whiskers that do not overlap with the horizontal dashed lines indicate UQR estimates that are significantly different from those estimated by conventional regression analyses.

First and foremost, UQR estimates show a substantial departure from traditional regression by revealing how much the education effect varies across levels of infant mortality. Fig. 3 illustrates that the effect of female secondary school enrollment (net of all control variables) is *not* consistent across all levels of infant mortality. At each quantile, the strength of the education advantage is different. What is perhaps most surprising is that education is not significantly related to mortality in a substantial portion of cases. Indeed, the almost universally acknowledged education-health link appears to be driven by a large effect among a relatively small group of cases (i.e., those countries clustered around the 50th to 70th percentiles of the mortality distribution).

Table 1 shows the full results of the UQR analyses and demonstrates again that education is not significantly related to mortality in the tails of the distribution (Models 1, 2, 8, and 9). We find no association between education and mortality in countries where infant mortality rates are lower than 7.6 (Q20 and below) or higher than 74.3 (Q80 and above). This represents a substantial portion of the infant mortality distribution. It also illustrates the advantage of UQR, as such a finding would be obscured by traditional regression techniques.

Models 3 through 7 show that the expected benefits of women's education are concentrated among countries in the middle of the distribution of infant mortality, at the 30th through 70th percentiles. That is, women's education has a statistically significant association with infant mortality only in countries where mortality ranges from about 11 to 55 deaths per 1000. But, even among the cases where education exhibits health benefits, the size of the education advantage varies considerably. At Q30, the magnitude of the education coefficient is relatively small (-0.121). This is in contrast to Q60, where the coefficient is nerly five times larger (-0.586). Once again, such variation underscores the utility of UQR.

On the whole, these results suggest that traditional panel models are likely ***over***estimating the effect of education in countries where infant mortality is relatively low or high, given that education is statistically insignificant in Q10, Q20, Q80, and Q90. However, they are simultaneously ***under***estimating the effect of education in the middle of the distribution. This is not only where the education advantage is the largest, but it is also where UQR estimates are statistically different from traditional regression estimates. Both trends have important implications. They suggest that efforts to improve infant mortality by way of increasing women's education may be misplaced in some countries, whereas such efforts should be redoubled in others.

Looking at the full set of estimates in Table 1, we can rule out the possibility that the insignificance of education is a result of simply having too little or too much variation to explain at the very low and high ends of the distribution of infant mortality. Table 1 shows that other societal-level factors are consequential where education is not. GDP per capita, trade openness, and international NGOs are all significantly associated with a mortality decline in countries where infant mortality is already very low (Models 1 and 2), whereas democracy is associated with such a decline in countries where infant mortality is at its highest (Model 9). We also find that fertility is significantly related to mortality across the majority of quantiles, although the direction of the effect varies. Consistent with prior work on the demographic transition, Models 5 through 9 show that high fertility is associated with increased mortality in countries with median and high rates of infant mortality (Q50 through Q90). Contrary to expectation, however, higher fertility rates are associated with health benefits in countries where infant mortality rates are already low (Q10 and Q20).

Some of the distributional patterns demonstrated in Table 1 have implications for ongoing debates in social science research. For example, we find a complex relationship between economic development and infant mortality that undermines the dominant paradigm. First, the expected benefits of GDP are limited to low-mortality cases (Q10 and Q20). In addition, GDP is associated with significantly *higher* mortality rates as the education advantage reaches its peak in the middle of the mortality distribution (Q50 and Q60). The effect of economic development is otherwise conspicuously absent. This pattern is robust to alternative model specifications including the exclusion of education from the analyses. This finding supports a growing chorus of scholars who emphasize the limits of economic development for improving wellbeing, especially in developing countries.

Similar to GDP per capita, the health benefits of trade openness are concentrated at the *lowest* end of the mortality distribution (Q10). This pattern lends some limited support to the world-systems argument that participation in international trade leads to uneven benefits across countries. However, trade openness is not significantly related to infant mortality in Q20 through Q90. Thus, contrary to the expectations of both world-systems and trade liberalization proponents, trade does not appear to be a particularly salient influence across the distribution of child health. The expected negative impact of international NGOs is also located at the lower end of the mortality distribution. Its significant impact includes Q10, Q20, and Q30. However, we fail to detect a significant impact at Q40 and above. This is consistent with a growing body of work that suggests the effects of world society integration vary depending on context.

The benefits of democracy, on the other hand, are concentrated at the *highest* end of the mortality distribution (Q90). The lack a of significant negative effect across models along with positive point estimates in Q10 and Q70 lends some support to McGuire's (2020) argument that democracy is usually beneficial for population health, but the effect may be large or small, negative or positive, depending on the context. Our results underscore the need for more nuanced investigations of the democracy-health link.

Similarly, we detect the expected ill effects of political violence. However, they are limited to cases in which infant mortality is moderately high (Q60). However, despite the evidence of its health benefits in prior work, regime stability does not emerge as a significant predictor of mortality rates across the distribution of cases. Overall, the impact of political context on infant mortality is surprisingly limited. Finally, the null effect of urbanization aligns with the ambiguous relationship between cities and health that appears in prior work.

Taken together, these findings reveal the importance of adding nuance to quantitative, cross-national analyses of health outcomes. The relationship between women's education and infant mortality is not as straightforward as previous literature suggests. The same might be said for many of the control variables, as well. Of course, quantile regression is not without its limitations. Because one can specify any number of quantiles, the choices are infinite at the researchers' discretion. For this reason, we conduct sensitivity analyses at additional quantiles. The main patterns and conclusions remain the same. Despite such challenges, this study contributes to existing health and development literature by demonstrating the utility of a methodological technique that has endless applications.

7. Conclusion

A wealth of prior cross-national research reports that increasing women's access to education is beneficial to population health (Burroway 2016a; Brady et al., 2007; Coburn et al., 2015; Nussbaum 2003). This study introduces a novel approach to reassessing this well-established phenomenon. Rather than assuming the education-health link is uniform across all countries, we allow for the possibility of variation. Using unconditional quantile regression, we demonstrate that the education advantage is more complex than currently understood. Results reveal that the size *and* significance of the education advantage varies considerably depending on context.

Consistent with prior work, we find significant impacts of women's education on infant mortality rates. However, contrary to previous assumptions, this relationship only holds between the 30th and 70th percentiles of infant mortality where deaths range from about 11 to 55 per 1000 live births. We find that education does *not* significantly improve infant mortality rates where they are already very low or very high. In fact, we fail to detect the well-established education-health link in at least 40% of cases. Further, we find that where the relationship is significant, the size of the impact varies considerably. For example, we estimate that the education advantage at the 60th percentile (where mortality is about 39 per 1000) is nearly five times larger than it is at the 30th percentile. This represents a significant departure from previous work.

While the strength of quantitative studies lies in their ability to identify patterns across a large number of countries, the typical approach relies on averages which results in extremely general conclusions. Conversely, case studies that tackle the mechanisms behind the education-health relationship are extremely specific, often relying on data that are very limited in time and scope. Our approach bridges this gap to some extent. It combines the scope of cross-national research with the specificity of case studies to produce a more complicated picture of the relationship between women's education and infant mortality around the world.

The variation in the degree to which education reduces mortality (or not) goes unnoticed in traditional regression analyses. Thus, the findings from this study underscore the importance of accounting for such heterogeneity. The findings could also, in part, explain the reason that there is wide disagreement on the mechanisms linking women's education to child health. Perhaps scholars cannot pinpoint why education matters precisely because of the fact that it does not matter to child health in the same way across all countries and time points.

Our findings underscore prior cautions against taking a one-size-fits-all approach to development (Cornwall and Brock, 2005; Viterna and Robertson 2015). Public health officials may be especially interested in targeting areas of the world where health outcomes are worst. If the education advantage is assumed to apply equally in all cases, then policymakers may be inclined to promote women's education as a way to reduce infant mortality where rates are extremely high. However, our findings suggest that such efforts are likely to be fruitless in those particular contexts. Instead, policymakers should look to other mechanisms of reducing infant mortality where mortality is highest. Policies intending to improve health outcomes by means of educating women are likely to be most effective where mortality rates are between 25 and 55 deaths per 1000 live births. This is encouraging, as the UQR estimates suggest that educational expansion may have an even larger impact on infant mortality in some contexts than previously imagined.

More broadly, this study has implications for health and development research beyond women's education and infant mortality. Our results suggest that a wide range of development predictors *and* outcomes would benefit from a similarly more nuanced analysis. For each predictor in this study, we estimate a different impact at different points along the distribution of mortality. This is important to note because significant distributional effects may be obscured by traditional mean-based analyses. Using a different methodological approach might help shed some light on old questions.

Indeed, results of our study suggest that quantile regression has the potential to add to some of the classic and ongoing debates in the social sciences, such as the relationships between population health and theoretically contentious predictors like economic growth (Cole 2019), foreign investment (Mihalache-O'Keef and Quan, 2011), trade (Burroway 2017), democracy (Wang et al., 2019), treaty ratifications, and foreign aid (Cole and Reynolds 2019). Although we focus our remarks largely on education, we recognize that other variables like these deserve further exploration in future research, and we hope that other scholars take up this call.

Along the same lines, we acknowledge that women's education is but one indicator of women's empowerment. Empowerment is a multi-dimensional concept that is operationalized in many different ways (see Malhotra and Schuler, 2005 for a review). Although it is beyond the scope of this paper, an analysis of other indicators would further contribute to the literature on women's empowerment. For example, longitudinal data on women's labor force participation can be found through the World Bank's *World Development Indicators*. The *Women, Business, and the Law* database provides 50 years of data on a variety of laws affecting women across 190 countries, including laws relating to land and property rights (World Bank 2021). Furthermore, the V-Dem project recently released a "women's political empowerment index" that spans over 170 countries from 1900 to 2012 (Sundström et al., 2017).

The current analysis of women's education and infant mortality is merely a starting place. We look forward to continuing in this line of research, using these datasets and expanding the application of UQR to continue exploring the complex dynamics of macro-historical change.

Declaration of competing interest

None.

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Appendix 1. Countries Included in Analyses

Afghanistan	Congo, Republic	Iran	Myanmar	Sri Lanka
Albania	Costa Rica	Iraq	Namibia	Sudan
Algeria	Cote d'Ivoire	Israel	Nepal	Surinam
Angola	Croatia	Italy	Netherlands	Swaziland
Argentina	Cuba	Jamaica	New Zealand	Sweden
Armenia	Cyprus	Japan	Nicaragua	Switzerland
Australia	Czech Republic	Jordan	Niger	Syria
Austria	Denmark	Kazakhstan	Nigeria	Tajikistan
Azerbaijan	Djibouti	Kenya	Norway	Tanzania
Bahrain	Dominican Republic	Korea, Rep.	Oman	Thailand
Bangladesh	Ecuador	Kuwait	Pakistan	Timor-Leste
Belarus	Egypt	Kyrgyzstan	Panama	Togo
Belgium	El Salvador	Lao, PDR	Papua New Guinea	Tunisia
Benin	Equatorial Guinea	Latvia	Paraguay	Turkey
Bhutan	Eritrea	Lebanon	Peru	Turkmenistan
Bolivia	Estonia	Lesotho	Philippines	Uganda
Botswana	Ethiopia	Liberia	Poland	Ukraine
Brazil	Finland	Libya	Portugal	United Arab Emirates
Bulgaria	France	Lithuania	Qatar	United Kingdom
Burkina Faso	Gabon	Luxembourg	Romania	United States
Burundi	Gambia	Macedonia	Russia	Uruguay
Cambodia	Georgia	Madagascar	Rwanda	Uzbekistan
Cameroon	Germany	Malawi	Saudi Arabia	Venezuela
Canada	Ghana	Malaysia	Senegal	Vietnam
Cape Verde	Greece	Mali	Serbia	Zimbabwe
Central African Republic	Guatemala	Mauritania	Singapore	
Chad	Guinea-Bissau	Mauritius	Slovakia	
Chile	Guyana	Mexico	Slovenia	
China	Honduras	Moldova	Solomon Islands	
Colombia	Hungary	Mongolia	South Africa	
Comoros	India	Morocco	South Sudan	
Congo, Dem. Republic	Indonesia	Mozambique	Spain	

Appendix 2. Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Infant Mortality	40.80	39.28	1.6	202.6
Education	64.74	36.39	0	175.22
GDP per capita	8631.31	14,403.79	57.59	118,823.60
Urban Population	54.45	23.71	2.97	100
Fertility Rate	3.49	2.00	1.08	8.46
Democracy	2.90	7.27	−10	10
Political Violence	0.62	1.66	0	14
Regime Stability	26.38	31.3	0	207
Trade Openness	73.14	39.93	0.17	416.39
International NGOs	928.25	941.34	0	4379

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssresearch.2022.102697.

References

Abreha, Solomon Kibret, Zereyesus, Yacob Abrehe, 2021. Women's empowerment and infant and child health status in sub-saharan Africa: a systematic review. Matern. Child Health J. 25 (1), 95–106.
Adamczyk, Amy, Greif, Meredith, 2011. Education and risk sex in Africa: unraveling the link between women's education and reproductive health behaviors in Kenya. Soc. Sci. Res. 40, 654–666.
Bambra, C., 2011. Health inequalities and welfare state regimes: theoretical insights on a public health 'puzzle. J. Epidemiol. Commun. Health 65 (5), 740–745.
Behrman, Julia Andrea, 2015. Does schooling affect women's desired fertility? Evidence from Malawi, Uganda, and Ethiopia. Demography 52 (3), 787–809.
Beteta, Hanny Cueva, 2006. What is missing in measures of women's empowerment? J. Hum. Dev. 7 (2), 221–241.
Bloom, David E., Canning, David, Fink, Günther, 2008. Urbanization and the wealth of nations. Science 319 (5864), 772–775.
Boehmer, Ulrike, Williamson, John B., 1996. The impact of women's status on infant mortality rate: a cross-national analysis. Soc. Indicat. Res. 37, 333–360.
Boli, John, Thomas, George M. (Eds.), 1999. Constructing World Culture: International Nongovernmental Organizations since 1875. Stanford University Press, Stanford.
Bollen, Kenneth A., Glanville, Jennifer L., Stecklov, Guy, 2001. Socioeconomic status and class in studies of fertility and health in developing countries. Annu. Rev. Sociol. 27, 153–185.
Borgen, Nicholai T., 2016. Fixed effects in unconditional quantile regression. STATA J. 16 (2), 403–415.
Boyle, Elizabeth, Kim, Minzee, Longhofer, Wesley, 2015. Abortion liberalization in world society, 1960 – 2009. Am. J. Sociol. 121 (3), 882–913.
Brady, David, Kaya, Yunus, Beckfield, Jason, 2007. Reassessing the effect of economic growth on well-being in less-developed countries, 1980–2003. Stud. Comp. Int. Dev. 42, 1–35.
Budig, Michelle J., Hodges, Melissa J., 2010. Differences in disadvantage: variation in the motherhood penalty across white women's earnings distribution. Am. Socio. Rev. 75 (5), 705–728.
Burroway, Rebekah, 2012. A cross-national analysis of sex-specific HIV prevalence rates and women's access to property, land, and loans in developing countries. Int. J. Sociol. 42, 47–67.
Burroway, Rebekah, 2015. Women's rights save lives: a cross-national analysis of infant and child mortality and women's access to land, property, and loans in developing countries. Sociol. Dev. 1 (4), 418–441.
Burroway, Rebekah, 2016a. Empowering women, strengthening children: a multi-level analysis of gender inequality and child malnutrition in developing countries. Adv. Gend. Res.: Gender Food Prod. Comsump. After 22, 117–142.
Burroway, Rebekah, 2016b. Democracy and child health in developing countries. Int. J. Comp. Sociol. 57 (5), 338–364.
Burroway, Rebekah, 2017. Are all jobs created equal? A cross-national analysis of women's employment and child malnutrition in developing countries. Soc. Sci. Res. 67, 1–13.
Burroway, Rebekah, Hargrove, Andrew, 2018. Education is the antidote: individual- and community-level effects of maternal education on child immunizations in Nigeria. Soc. Sci. Med. 213, 63–71.
Caldwell, John C., 1979. Education as a factor in mortality decline: an examination of Nigerian data. Popul. Stud. 33, 395–413.
Carlton-Ford, Steve, Boop, Donielle, 2010. Civil war and life chances: a multinational study. Int. Sociol. 25 (1), 75–97.
Clark, Rob, 2011. World health inequality: convergence, divergence, and development. Soc. Sci. Med. 72, 617–624.
Clark, Rob, Snawder, Kara, 2020. A cross-national analysis of lifespan inequality, 1950-2015: examining the distribution of mortality within countries. Soc. Indicat. Res. 148, 705–732.
Cleland, John G., Van Ginneken, Jerome K., 1988. Maternal education and child survival in developing countries: the search for pathways of influence. Soc. Sci. Med. 27 (12), 1357–1368.
Coburn, Carolyn, Restivo, Michael, Shandra, John M., 2015. The World Bank and child mortality in sub-saharan Africa: a cross-national analysis of structural adjustment and health lending. Sociol. Dev. 1 (3), 348–373.
Cole, Wade, 2019. Wealth and health revisited: economic growth and wellbeing in developing countries, 1970 to 2015. Soc. Sci. Res. 77, 45–67.
Cole, Wade M., Reynolds, Megan M., 2019. We comply with a little help from our friends: human rights, development aid, and well-being. Soc. Forces 97 (4), 1631–1664.
Collier, Paul, 2007. The Bottom Billion: Why the Poorest Countries Are Failing and what Can Be Done about it. Oxford University Press, Oxford.
Cornwall, Andrea, Brock, Karen, 2005. What do buzzwords do for development policy? A critical look at 'participation', 'empowerment' and 'poverty reduction. Third World Q. 26 (7), 1043–1060.
Dawson, Andrew, 2010. State capacity and the political economy of child mortality in developing countries revisited: from fiscal sociology towards the rule of law. Int. J. Comp. Sociol. 51 (6), 403–422.
Doku, David T., Bhutta, Zulfiqar A., Neupane, Subas, 2020. Associations of women's empowerment with neonatal, infant and under-5 mortality in low-and/middle-income countries: meta-analysis of individual participant data from 59 countries. BMJ Global Health 5 (1), e001558.
Farag, Marwa, Nandakumar, A.K., Wallack, Stanley, Hodgkin, Dominic, Gaumer, Gary, Erbil, Can, 2013. Health expenditures, health outcomes and the role of good governance. Int. J. Health Care Finance Econ. 13 (1), 33–52.
Firebaugh, Glenn, 2003. The New Geography of Global Income Inequality. Harvard University Press.

Firebaugh, Glenn, Beck, Frank D., 1994. Does economic growth benefit the masses? Growth, dependence, and welfare in the third world. Am. Socio. Rev. 59 (5), 631–653.
Firpo, Sergio, Fortin, Nicole M., Lemieux, Thomas, 2009. Unconditional quantile regressions. Econometrica 77 (3), 953–973.
Frey, R. Scott, Field, Carolyn, 2000. The determinants of infant mortality in the less developed countries: a cross-national test of five theories. Soc. Indicat. Res. 52, 215–234.
Gakidou, Emmanuela, Cowling, Krycia, Lozano, Rafael, Murray, Christopher J.L., 2010. Increased educational attainment and its effect on child mortality in 175 countries between 1970 and 2009: a systematic analysis. Lancet 376 (9745), 959–974.
Gamper-Rabindran, Shanti, Khan, Shakeeb, Timmins, Christopher, 2010. The impact of piped water provision on infant mortality in Brazil: a quantile panel data approach. J. Dev. Econ. 92, 188–200.
Gates, Bill, Gates, Melinda, 2019. The Goalkeepers Report 2019: Examining Inequality: How Geography and Gender Stack the Deck for (Or against) You. Available at: https://www.gatesfoundation.org/goalkeepers/report/2019-report/#ExaminingInequality.
Gates, S., Hegre, H., Nygård, H.M., Strand, H., 2012. Development consequences of armed conflict. World Dev. 40, 1713–1722.
Gilpin, Robert, 2001. Global Political Economy: Understanding the International Economic Order. Princeton University Press, Princeton.
Glewwe, Paul, 1999. Why does mother's schooling raise child health in developing countries? Evidence from Morocco. J. Hum. Resour. 34, 124–159.
Grabe, Shelly, 2012. An empirical examination of women's empowerment and transformative change in the context of international development. Am. J. Community Psychol. 49 (1–2), 233–245.
Hall, Stuart, 2011. The neoliberal revolution. Cult. Stud. 25 (6), 705–728.
Hao, Lingxin, Naiman, Daniel Z., 2007. *Quantile Regression*. Series: Quantitative Applications in the Social Sciences. Sage Publications, Thousand Oaks, CA.
Haque, M. Shamsul, 1999. The fate of sustainable development under neo-liberal regimes in developing countries. Int. Polit. Sci. Rev. 20 (2), 197–218.
Harris, Joseph, White, Alexandre, 2019. The sociology of global health: a literature review. Sociol. Dev. 5 (1), 9–30.
Heaton, Tim B., Forste, Renata, Hoffmann, John P., Flake, Dallan, 2005. Cross-national variation in family influences on child health. Soc. Sci. Med. 60 (1), 97–108.
Heckman, James J., Smith, Jeffrey, Clements, Nancy, 1997. Making the most out of programme evaluations and social experiments: accounting for heterogeneity in programme impacts. Rev. Econ. Stud. 64 (4), 487–535.
Hertz, Erica, Hebert, James R., Landon, Joan, 1994. Social and environmental factors and life expectancy, infant mortality, and maternal mortality rates: results of a cross-national comparison. Soc. Sci. Med. 39 (1), 105–114.
Hobcraft, John, 1993. Women's education, child welfare and child survival: a review of the evidence. Health Trans. Rev. 3 (2), 159–173.
Inoue, Keiko, Drori, Gili S., 2006. The global institutionalization of health as a social concern: organizational and discursive trends. Int. Sociol. 21 (2), 199–219.
Jorgenson, Andrew, Rice, James, 2012. Urban slums and children's health in less-developed countries. J. World Syst. Res. 18 (1), 103–115.
Joshi, Arun R., 1994. Maternal schooling and child health: preliminary analysis of the intervening mechanisms in rural Nepal. Health Trans. Rev. 4 (1), 1–28.
Kapoor, Amit, Debroy, Bibek, 2019. GDP Is Not a Measure of Human Well-Being. Harvard Business Review. Available at: https://hbr.org/2019/10/gdp-is-not-a-measure-of-human-well-being.
Killewald, Alexandra, Bearak, Jonathan, 2014. Is the motherhood penalty larger for low-wage women? A comment on quantile regression. Am. Socio. Rev. 79 (2), 350–357.
Klomp, Jeroen, de Haan, Jakob, 2009. Is the political system really related to health? Soc. Sci. Med. 69, 36–46.
Koenker, Roger, Bassett, Gilbert, 1978. Regression quantiles. Econometrica 46 (1), 33–50.
Korzeniewicz, Roberto Patricio, Moran, Timothy Patrick, 2009. Unveiling Inequality: A World-Historical Perspective. Russell Sage Foundation, New York.
Lake, David A., Baum, Matthew A., 2001. The invisible hand of democracy: political control and the provision of public services. Comp. Polit. Stud. 34, 587–621.
Lange, Simon, Vollmer, Sebastian, 2017. The effect of economic development on population health: a review of the empirical evidence. Br. Med. Bull. 121 (1), 47–60.
Lena, Hugh F., London, Bruce, 1993. The political and economic determinants of health outcomes: a cross-national analysis. Int. J. Health Serv. 23 (3), 585–602.
Levine, David I., Rothman, Dov, 2006. Does trade affect child health? J. Health Econ. 25, 538–554.
Lin, Ken-Hou, 2015. The financial premium in the US labor market: a distributional analysis. Soc. Forces 94 (1), 1–30.
London, Bruce, Williams, Bruce A., 1990. National politics, international dependency, and basic needs provision. Soc. Forces 69 (2), 565–584.
Mackenbach, J.P., 2013. Political conditions and life expectancy in europe, 1900 – 2008. Soc. Sci. Med. 82, 134–146.
Malhotra, Anju, Schuler, Sidney Ruth, 2005. Women's empowerment as a variable in international development. In: Narayan-Parker, Deepa (Ed.), Measuring Empowerment: Cross-Disciplinary Perspectives. World Bank, Washington, DC, pp. 71–88.
Marshall, Monty G., 2019. Major Episodes of Political Violence (MEPV) and Conflict Regions, 1946-2018. Version MEPVv2018. Available at: https://www.systemicpeace.org/inscrdata.html.
Marshall, Monty G., Ted Robert, Gurr, Keith, Jaggers, 2018. Polity IV Project: Political Regime Characteristics and Transitions, 1800-2018. Version p4v2018. Available at: http://www.systemicpeace.org/inscrdata.html.
McGuire, James W., 2020. Democracy and Population Health. Cambridge University Press, Cambridge.
McTavish, Sarah, Moore, Spencer, Harper, Sam, Lynch, John, 2010. National female literacy, individual socio-economic status, and maternal health care use in sub-saharan Africa. Soc. Sci. Med. 71, 1958–1963.
Mejia, Steven Andrew, 2020. Global environmentalism and the world-system: a cross-national analysis of air pollution. Socio. Perspect. 63 (2), 276–291.
Mensch, Barbara S., Chuang, Erica K., Melnikas, Andrea J., Psaki, Stephanie R., 2019. Evidence for causal links between education and maternal and child health: systematic review. Trop. Med. Int. Health 24 (5), 504–522.
Mihalache-O'Keef, Andreea, Quan, Li, 2011. Modernization vs. Dependency revisited: effects of foreign direct investment on food security in less developed countries. Int. Stud. Q. 55 (1), 71–93.
Moon, Bruce E., Dixon, William J., 1985. Politics, the state, and basic human needs. Am. J. Polit. Sci. 29, 661–694.
Moore, Melinda, Gould, Philip, Keary, Barbara S., 2003. Global urbanization and impact on health. Int. J. Hyg Environ. Health 206, 269–278.
Moore, Spencer, Teixeira, Ana C., Shiell, Alan, 2006. The health of nations in a global context: trade, global stratification, and infant mortality rates. Soc. Sci. Med. 63, 165–178.
Muntaner, C., 2013. Democracy, authoritarianism, political conflict, and population health: a global comparative, and historical approach. Soc. Sci. Med. 86, 107–112.
Murtin, Fabrice, 2013. Long-term determinants of the demographic transition, 1870-2000. Rev. Econ. Stat. 95 (2), 617–631.
Narayan-Parker, Deepa (Ed.), 2005. Measuring Empowerment: Cross-Disciplinary Perspectives. World Bank, Washington, DC.
Neiderud, Carl-Johan, 2015. How urbanization affects the epidemiology of emerging infectious diseases. Infect. Ecol. Epidemiol. 5 (1), 27060.
Nelson, Joan M., 2007. Elections, democracy, and social services. Stud. Comp. Int. Dev. 41, 79–97.
Nussbaum, Martha C., 2003. Women's education: a global challenge. Signs: J. Women Culture Soc. 29, 325–355.
Oyitso, Mabel, Olomukoro, C.O., 2012. Enhancing women's development through literacy education in Nigeria. Rev. Eur. Stud. 4 (4), 66–76.
Page, Lucy, Pande, Rohini, 2018. Ending global poverty: why money isn't enough. J. Econ. Perspect. 32 (4), 173–200.
Pamuk, Elsie R., Fuchs, Regina, Lutz, Wolfgang, 2011. Comparing relative effects of education and economic resources on infant mortality in developing countries. Popul. Dev. Rev. 37 (4), 637–664.
Pérez-Moreno, Salvador, Blanco-Arana, María C., Bárcena-Martín, Elena, 2016. Economic cycles and child mortality: a cross-national study of the least developed countries. Econ. Hum. Biol. 22, 14–23.
Porter, S.R., 2015. Analyzing changes in distributions instead of means. In: Paulsen, M.B. (Ed.), Handbook of Theory and Research, Higher Education, vol. 30. Springer, Cham, Switzerland, pp. 335–381.
Pratley, Pierre, 2016. Associations between quantitative measures of women's empowerment and access to care and health status for mothers and their children: a systematic review of evidence from the developing world. Soc. Sci. Med. 169, 119–131.
Preston, Samuel H., 1996. Population studies of mortality. Popul. Stud. 50, 525–536.

Pritchett, L., Summers, L.H., 1996. Wealthier is healthier. J. Hum. Resour. 31 (4), 841–868.
Przeworski, Adam, Alvarez, R. Michael, Alvarez, Michael E., Cheibub, Jose Antonio, Limongi, Fernando, Papaterra Limongi Neto, Fernando, 2000. Democracy and Development: Political Institutions and Well-Being in the World, 1950-1990. Cambridge University Press, New York.
Ragin, Charles C., Bradshaw, York W., 1992. International economic dependence and human misery, 1938-1980: a global perspective. Socio. Perspect. 35 (2), 217–247.
Randall, Sara, 2005. The demographic consequences of conflict, exile and repatriation: a case study of Malian Tuareg. Eur. J. Populat. 21, 291–320.
Reher, David, 1999. Back to the basics: mortality and fertility interactions during the demographic transition. Continuity Change 14 (1), 9–31.
Reidpath, D.D., Allotey, P., 2003. Infant mortality rate as an indicator of population health. J. Epidemiol. Commun. Health 57, 344–346.
Richardson, Robin A., 2018. Measuring women's empowerment: a critical review of current practices and recommendations for researchers. Soc. Indicat. Res. 137 (2), 539–557.
Ross, Michael, 2006. Is democracy good for the poor? Am. J. Polit. Sci. 50 (4), 860–874.
Sachs, Jeffrey D., 2005. The End of Poverty: Economic Possibilities for Our Time. Penguin Press, New York.
Sahu, Tapan Kumar, Yadav, Kusum, 2018. Women's education and political participation. Int. J. Adv. Edu. Res. 3 (6), 65–71.
Sanderson, Matthew, 2010. International migration and human development in destination countries: a cross-national analysis of less-developed countries, 1970–2005. Soc. Indicat. Res. 96 (1), 59–83.
Sartorius, Benn K.D., Sartorius, Kurt, 2014. Global infant mortality trends and attributable determinants–an ecological study using data from 192 countries for the period 1990–2011. Popul. Health Metrics 12 (1), 29.
Scanlan, Stephen J., 2004. Women, food security, and development in less-industrialized societies: contributions and challenges for the New century. World Dev. 32 (11), 1807–1829.
Scanlan, Stephen J., Jenkins, Craig J., 2001. Military power and food security: a cross-national analysis of less-developed countries, 1970–1990. Int. Stud. Q. 45 (1), 159–187.
Schell, Carl Otto, Reilly, Marie, Rosling, Hans, Peterson, Stefan, Ekström, Anna Mia, 2007. Socioeconomic determinants of infant mortality: a worldwide study of 152 low-, middle-, and high-income countries. Scand. J. Publ. Health 35, 288–297.
Sen, Amartya, 1999. Development as Freedom. Anchor Books, New York.
Shahabuddin, A.S.M., Delvaux, Therese, Abouchadi, Saloua, Sarker, Malabika, De Brouwere, Vincent, 2015. Utilization of maternal health services among adolescent women in Bangladesh: a scoping review of the literature. Trop. Med. Int. Health 20 (7), 822–829.
Shandra, John M., Nobles, Jenna E., London, Bruce, Williamson, John B., 2004. Dependency, democracy, and infant mortality: a quantitative, cross-national analysis of less developed countries. Soc. Sci. Med. 59 (2), 321–333.
Shandra, John M., Nobles, Jenna E., London, Bruce, Williamson, John B., 2005. Multinational corporations, democracy and child mortality: a quantitative, cross-national analysis of developing countries. Soc. Indicat. Res. 73 (2), 267–293.
Shandra, Carrie L., Shandra, John M., London, Bruce, 2012. The international monetary fund, structural adjustment, and infant mortality: a cross-national analysis of sub-saharan Africa. J. Poverty 16 (2), 194–219.
Shen, Ce, Williamson, John B., 1997. Child mortality, women's status, economic dependency, and state strength: a cross-national study of less developed countries. Soc. Forces 76, 667–694.
Shen, Ce, Williamson, John B., 1999. Maternal mortality, women's status, and economic dependency in less developed countries: a cross-national analysis. Soc. Sci. Med. 49 (2), 197–214.
Shen, Ce, Williamson, John B., 2001. Accounting for cross-national differences in infant mortality decline (1965-1991) among less developed countries: effects of women's status, economic dependency, and state strength. Soc. Indicat. Res. 53, 257–288.
Shircliff, Eric J., Shandra, John M., 2011. Non-governmental organizations, democracy, and HIV prevalence: a cross-national analysis. Socio. Inq. 81 (2), 143–173.
Shorette, Kristen, 2012. Outcomes of global environmentalism: longitudinal and cross-national trends in chemical fertilizer and pesticide use. Soc. Forces 91 (1), 299–325.
Smith, Lisa C., Haddad, Lawrence, 2015. Reducing child undernutrition: past drivers and priorities for the post-MDG era. World Dev. 68, 180–204.
Smith, Lisa C., Ramakrishnan, Aida Ndiaye, Haddad, Lawrence, Martorell, Reynaldo, 2003. The Importance of Women's Status for Child Nutrition in Developing Countries. International Food Policy Research Institute, Washington, DC.
Somefun, O.D., Ibisomi, L., 2016. Determinants of postnatal care non-utilization among women in Nigeria. BMC Res. Notes 9 (1), 21.
Subbarao, Kalanidhi, Raney, Laura, 1995. Social gains from female education: a cross-national study. Econ. Dev. Cult. Change 44 (1), 105–128.
Sundström, Aksel, Paxton, Pamela, Wang, Yi-ting, Lindberg, Staffan I., 2017. Women's political empowerment: a New global index, 1900-2012. World Dev. 94, 321–355.
Swiss, Liam, Fallon, Kathleen, Burgos, Giovani, 2012. Reaching a critical mass: women's political representation and child health in developing countries. Soc. Forces 91, 531–558.
Taye, Bekele, Abeje, Gedefaw, Mekonen, Alemetsehaye, 2015. Factors associated with compliance of prenatal iron folate supplementation among women in mecha district, western amhara: a cross-sectional study. Pan Afr. Med. J. 20 (1).
Tester, Aaron William, 2020. Deforestation in the global south: assessing the uneven environmental improvements 1993 – 2013. Socio. Perspect. 63 (5), 764–785.
United Nations Children's Fund (UNICEF), 2020. Levels and Trends in Child Mortality: Report 2020. UNICEF, New York.
United Nations Educational, Scientific and Cultural Organization (UNESCO), 2019. From Access to Empowerment: UNESCO Strategy for Gender Equality in and through Education 2019-2015. UNESCO, Paris, France.
Verick, Sher, 2014. Female labor force participation in developing countries. IZA World Lab. 87, 1–10.
Vikram, Kriti, Vanneman, Reeve, Desai, Sonalde, 2012. Linkages between maternal education and childhood immunization in India. Soc. Sci. Med. 75 (2), 331–339.
Viterna, Jocelyn, Robertson, Cassandra, 2015. New directions for the sociology of development. Annu. Rev. Sociol. 41, 243–269.
Wallerstein, Immanuel, 1974. The Modern World-System I: Capitalist Agriculture and the Origins of the European World-Economy in the Sixteenth Century. Academic Press, Inc, New York.
Wang, Yi-ting, Mechkova, Valeriya, Andersson, Frida, 2019. Does democracy enhance health? New empirical evidence 1900–2012. Polit. Res. Q. 72 (3), 554–569.
Wickrama, K.A.S., Lorenz, Frederick O., 2002. Women's status, fertility decline, and women's health in developing countries: direct and indirect influences of social status on health. Rural Sociol. 67 (2), 255–277.
Wigley, Simon, Akkoyunlu-Wigley, Arzu, 2011. The impact of regime-type on health: does redistribution explain everything? World Polit. 63 (4), 647–677.
World Bank, 2011. World Development Report 2012: Gender Equality and Development. World Bank, Washington, DC.
World Bank, 2019. World Development Indicators. Available at: https://datacatalog.worldbank.org/dataset/world-development-indicators.
World Bank, 2021. Women, Business, and the Law. Available at: https://wbl.worldbank.org/en/wbl.
World Health Organization (WHO), 2016. Global Report on Urban Health: Equitable, Healthier Cities for Sustainable Development. WHO, Geneva, Switzerland.
Yebyo, Henock, Alemayehu, Mussie, Kahsay, Alemayehu, 2015. Why do women deliver at home? Multilevel modeling of Ethiopian national demographic and health survey data. PLoS One 10 (4), e0124718.