# Should we increase average income, or the poor's income to reduce infant and child mortality?

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April 28, 2020

## Abstract

This article examines whether increasing the income of the poor - measured as the income of the lowest quintile - is more beneficial in reducing infant and child mortality rates compared with increases in average income. Given the global importance in reducing infant mortality, the value of this research is important to academics, policy makers and practitioners alike. Using a sample of 86 countries from 1995-2014 inclusive, our preferred estimation strategy uses an instrumental variable fixed effects estimator. Our results propose that the elasticity of the income of the lowest quintile never exceeds that of average income. Therefore, if reducing infant and child mortality is a key policy goal, then boosting average income may be preferable to raising incomes at the lower end of the distribution. Given these findings, we open a gateway for new literature to add to this unexplored area of research in the income and health relationship.

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# 1 Introduction

In September 2000, the United Nations (UN) adopted a broad set of targets known as the Millennium Development Goals (MDGs). As improving health outcomes was part of these aims, it has been vital for governments to conduct the correct policy to accomplish these objectives. As the MDGs concluded in 2015, the UN reported that whilst substantial improvements have been made, most targets were not reached, UN (2015). For example, the ambitious goal of reducing child mortality by two-thirds was not fulfilled, however, child mortality rates did fall by approximately a half.

To achieve these objectives, numerous social policies were pursued by governments, including redistributing income to the poor. Therefore, this article focuses on the role of income in promoting positive health outcomes. Specifically, it compares whether an increase in the income of the poor, measured by the income of the lowest quintile, is more beneficial in reducing infant and child mortality rates, compared to increases in average income. As the role of the income of the bottom quintile on improving health outcomes remains relatively unexamined, this study addresses one of the outstanding questions in the income-health nexus, which should assist practitioners to reach future progress targets.

We measure the income of the poor as the income of the lowest quintile as this is the first-best measure available in comparison to alternate measures, for example, the proportion of individuals living below the poverty line, or the poverty gap. Our selected variable has the benefit of being abundant over time and across countries in comparison to other metrics, and permits for closer comparisons to be made with increases in average income. Furthermore, unlike measures such as the headcount ratio of poverty which is absolute, our relative measure encompasses a distributional element of poverty and has been widely used in studies such as Dollar & Kraay (2002), Guillaumont Jeanneney and Kpodar (2011) and Rewilak (2018).

Previous research suggests that increasing average income improves health outcomes and this policy has been readily pursued (Friedman and Schady, 2013; Isenman, 1980; Jamison et al., 2016). On the other hand, little attention has been devoted to testing whether increasing the income of the lowest quintile (the income of the poor) is associated with equivalent improvements in health status. This is surprising, as Preston (1975), shows that the relationship between income and health is concave. Theoretically, this implies that the effect on health should be greater in magnitude for an increase in income at the bottom of the income distribution, compared with a like for like increase in average income.

A potential reason for this research gap, is that Dollar and Kraay (2002), find that the income of the lowest quintile grows proportionately with average incomes. It could naively be assumed that these effects transfer to health outcomes. For example, an increase in the income of the bottom quintile should have an analogous effect on health, as a corresponding increase in average income. On the other hand, evidence suggests that once the income of the individuals at the bottom of the income distribution increases, so does their consumption of demerit goods such as alcohol and tobacco (Ettner, 1996; Pierani and Tiezzi, 2009). This may impede the ability of individuals whose income is in the lowest quintile to improve their health levels, and any increase in their income may have a smaller effect on health outcomes, compared with an increase in average income, although this is just one of many possible explanations.

Due to this ambiguity, it motivates this empirical study. We examine how both average and the income of the bottom quintile, are related to our chosen health measure, infant and child mortality rates. We choose to study infant and child mortality rates because these variables respond quickly to changes in their determinants, are not as heavily trended as alternative measures such as life expectancy, and because improvements in infant and child survival are key policy goals.

Using a fixed effects instrumental variable estimator, the results propose that in reducing infant and child mortality rates, an increase in the income of the bottom quintile never exceeds a corresponding increase in average income. This is an important contribution to the literature and a crucial finding for policy makers. As targeting the poor is difficult and costly, politicians are hesitant to transfer income to the poorest in society. The findings from this research support the view that politicians are correct in their reluctance to transfer income, if its sole policy purpose it to improve health outcomes in society. Our findings propose that rather than redistributing income, policy makers should focus on raising average income if they want to maximize reductions in infant and child mortality.

The relationship between income and health is well documented by Preston (1975) who shows that richer countries have higher life expectancy. Moreover, higher incomes are associated with lower infant and child mortality rates (Baird et al., 2011; O'Hare, 2013; Pritchett and Summer, 1996). On average, a 1 per cent increase in average income is found to reduce infant/child mortality by 0.3 per cent. Furthermore, Friedman and Schady, (2013) show that a 1 per cent reduction in average income may increase infant mortality by 0.34 deaths per 1,000 births. The distribution of income may also dictate a population's health status, and it acknowledged that higher levels of income inequality are detrimental to improving health outcomes. Using the Gini coefficient as a measure of income inequality, Babones (2008) shows that it is associated with an increase in both infant and child mortality rates. However, this finding is not necessarily robust as Chung and Muntaner (2006) find that the Gini coefficient becomes insignificant in their specifications upon the inclusion of various policy indicators. Moreover, Cutler et al. (2006) highlight the importance of the distribution of income within countries. The authors find that life expectancy is 25 per cent lower for households at the bottom of the income distribution compared with those at the top.

The income of the lowest quintile combines increases in GDP and the distributional element of income in one measure (Dollar and Kraay, 2002). To our knowledge, only one study has examined the relationship between infant/child mortality and the income of the lowest quintile. This study by Waldmann (1992), finds that a 1 per cent increase in the income of the bottom quintile may reduce infant mortality between 0.5-0.7 per cent, but once including policy variables into the specification, this result vanishes.

Hence, Waldmann's initial results propose that the elasticity of the lowest quintile's income exceeds the elasticity of average income. However, once controlling for policy variables, the elasticity of the income of the poor becomes zero, contradicting this initial finding. As Waldmann did not compare his findings with the impact of average income, it motivates this research, as we ask, which of the two elasticities is greater, if any? By answering this question we aim to guide practitioners to use the correct policy, in order for the greatest gains in infant/child mortality to be realized.

The inclusion of policy variables into a regression examining the relationship between income and health is important. This is because as Waldmann (1992) and Chung and Muntaner

(2006) find the effect of their variable of interest vanishes upon the inclusion of these covariates. A number of policy variables are found to explain variation in infant and child mortality, and as some have grown in importance, others have waned over time. As our focus is specifically on income, we do not discuss all these variables in turn, or provide an exhaustive list. However, we direct the reader to Hanmer et al. (2003) and Frost and Pratt (2014), who both provide excellent and extensive reviews of the literature. Nevertheless, we use these two studies to identify the important policy variables and break them down into three subgroups. These are health policy variables, educational variables and other types of health promoting expenditure that may impact health outcomes. In addition, there are often unobservable, time-invariant, country specific characteristics that determine cross-country health status. Controlling for these effects is vital and provides assurance that our results are not plagued by omitted variable bias.

The literature proposes the following metrics to measure health services. The quantity of health personnel per capita - usually physicians, nurses, midwives or skilled health staff, government health expenditure as a percentage of GDP and the number of hospital beds per capita or other facility based measures. As expected, increases in the majority of these variables are associated with improvements in health status. For example, increases in public health expenditure are shown to reduce mortality rates (Anyanwu and Erhijakpor, 2009; Farahani et al., 2011), although Filmer and Pritchett (1999) find an insignificant impact in their work. Likewise, past empirical studies (Austin and Noble, 2014; Cesur et al., 2017; Hanmer et al., 2003; Liebert and Mader, 2016) show that increases in health staff per capita are associated with reductions in infant mortality. Specifically, an additional physician per 1,000 people may reduce infant mortality by up to 23 per cent. Vaccinations against Tuberculosis, DPT and measles are further health based policies that may impact infant and child survival rates. As French (2016) shows, by increasing the immunisation rate for measles by a percentage point, child mortality may fall by 0.1 per cent. These types of health inputs including malaria tablets are vital in certain parts of the world such as sub-Saharan Africa. This region in particular suffers from copious communicable and infectious diseases, where prioritising health policy is essential to reduce infant and child mortality rates. Indeed, Hall and Fauci (2009) state that malaria accounts for one million deaths per year, with many of these occurring in children aged under five.

Educational policy is proven to influence health outcomes. Increases in literacy and primary school enrolment rates are shown to reduce infant mortality (Isenman, 1980; Pritchett and Summers, 1996). A large volume of literature focuses on the importance of increasing maternal education (Filmer and Pritchett, 1999; Singh, 1984; Subbarao and Raney, 1995) where research proposes that typically, an additional year of female schooling is said to reduce infant mortality by 10 per cent. Furthermore, the role of education has not waned in importance over time where Grepina and Bharadwajb (2015) show that increased maternal education is effective in reducing child mortality. However, the impact of a father's education should not be underestimated for child survival. In many developing countries, typically if a mother has little to no education, the chances of a father being uneducated is also high, particularly in rural areas, (Bhalotra, 2010). As the author shows, paternal education matters for child survival, and despite the marginal effect of an increase in paternal education being smaller than that of a mothers, it still assists in reducing infant and child mortality rates. Further advocating the need to focus on overall education, Hanmer et al. (2003) show that increases in both male and female enrolment rates are beneficial to improving health outcomes.

Welfare enhancing expenditure, known as pro poor spending, may improve health outcomes. For example, government spending on water and sanitation, in addition to expenditure on education and health, may improves infant and child mortality rates, Gomanee et al. (2005). Undeniably, pro poor expenditure is shown to explain why mortality rates have fallen in recent times (Cutler et al. 2006). In east Asia, Kenny (2008) cites that it was improvements in these basic services that contributed to the improvement of health levels in this region. A good proxy for pro poor spending is final government expenditure, as this usually encompasses overseas development assistance (ODA), which usually relax a government's budget constraint.

In summary, this manuscript investigates whether the income of the lowest quintile may reduce infant and child mortality. Using a sample of countries worldwide from 1995-2014, it finds that both average income and the income of the lowest quintile may reduce infant and child mortality rates. However, the main contribution from the study is that the elasticity of the income of the bottom quintile never exceeds that of average income.

## 2 Empirical Strategy

To model the relationship between income and health a fixed effects estimator is used. Equations 1 and 2 outline the specification, where the dependent variable is denoted as $(M)$ and our variables of interest are $(Y)$ and $(Y^p)$. Due to the very high collinearity between average income and the income of the lowest quintile, we do not include both variables simultaneously into a regression equation. Matrix $(X)$ contains our covariates that are the policy variables, $(\alpha_i)$ represents our country specific effects, $(\delta_t)$ time fixed effects and our error term is denoted $(\epsilon)$. The subscripts $(i)$ index for countries and $(t)$ indexes for time. As we anticipate that the country specific term $(\alpha_i)$ is correlated with our explanatory variables, a pooled ordinary least squares estimator or a random effects estimator - to account for the panel structure of the data - would be inconsistent. Hence, we proceed with the fixed effects approach.

$$M_{i,t} = \alpha_i + \beta_1 Y_{i,t} + \beta_2 X_{i,t} + \delta_t + \epsilon_{i,t} \tag{1}$$

$$M_{i,t} = \alpha_i + \beta_1 Y^p_{i,t} + \beta_2 X_{i,t} + \delta_t + \epsilon_{i,t} \tag{2}$$

As many of the countries in our sample are from developing countries, numerous policies would be in place to increase their welfare. As certain policy, or even technological advancement may jointly drive reductions in infant mortality and increases in income, in further specifications, to identify the coefficient on income we use an instrumental variables estimator. We instrument both average income and the income of the bottom quintile using an indicator of mobile money prevalence. This is measured as the total number of new mobile operators entering a country averaged over each time period. In the final time period for this variable only, the raw data conjoins entrants in 2014 and 2015, hence, this data point is a six-year average. As many of the world's poor lack access to formal finance, substitute products such as M-Pesa in Kenya have become increasingly abundant. These products have permitted the poor to accumulate wealth via a mobile phone, providing them with both safe storage and liquidity, Omwansa and Sullivan (2012). This in turn has allowed them to save and increase their income, both for consumption, and to permit investment for physical and human capital (Abiona and Koppensteiner, 2018). Upon accumulating a certain amount of wealth, a record of transactions and moving up the income distribution, these previously poor individuals would then become candidates for formal finance and no longer need informal products. Therefore, as a second instrument we use the squared term of mobile money prevalence. The correlations between mobile money and average income is -0.15, and the income of the lowest quintile is -0.18. As expected, the richer a country, the less it will rely on mobile money. As our instrument is used to explain variation in income and not its distribution, we feel it is appropriate for both our variables of interest. Moreover, as our sample contains many of the world's poorest countries, it further advocates its use as an instrument for both average and the income of the bottom quintile. Indeed, if our sample contained rich, developed nations, then mobile money may not constitute a good instrument for these nations. In the first stage, in addition to the mobile money instruments, all the covariates from the second stage are included in the first stage. In all the regressions, the standard errors are robust to autocorrelation and heteroskedasticity.

We believe that mobile money will only impact infant or child mortality via the income channel. This is because to purchase health inputs, both preventative and for treatment, or other forms of human capital, such as schooling, the required method of payment is via income. Mobile money therefore facilitates this transaction via its medium of exchange, and store of value. In particular, the store of value element of mobile money may prevent expenditure on non-monetary assets as shown by Rosenzweig and Wolpin, (1993), improving household liquidity, enabling for instantaneous consumption on health when required.

We do acknowledge that the chosen instrumental variable strategy may face some limitations. First, the instrument is trended, as when the time series progresses, so do the number of new mobile money operators. Second, access to mobile money may proxy for network effects that may assist upon receiving a negative health shock. This may violate the validity of the instrument. As a result, in our sensitivity analysis, we adopt two alternative instrumental variables to examine the robustness of our results.

Our second strategy, instruments income using the economic characteristics of migrants' preferred destination countries. This follows the empirical strategy of Amuedo-Dorantes and Pozo (2011). Whilst the authors examine unemployment rates in the destination of Mexican migrants in various US states, we alter this approach. In our sample, unemployment data is incomplete, which would lead to a reduction in total observations and because unemployment definitions differ across borders. Therefore, we use the destination country's income and growth rate as a suitable proxy, as Okun's Law proposes an inverse relationship with unemployment and national output. We anticipate that a higher income level in a destination country would correspond to a higher level of income in the home country, which would be transmitted by migrants' remittances. Given that the majority of countries in our sample are developing and have high outward migration rates, we feel this is a sensible approach to use to test the robustness of our previous findings.

The data is from the World Development Indicators (2017) with the exception of mobile

*Table 1. Summary statistics*

| Variable | Mean | Standard Deviation | Minimum Value | Maximum Value |
|---|---|---|---|---|
| Infant Mortality | 3.37 | 0.86 | 1.15 | 4.92 |
| Child Mortality | 3.64 | 0.97 | 1.32 | 5.41 |
| Average Income | 8.54 | 1.00 | 6.23 | 10.66 |
| Income Of The Lowest Quintile | 5.61 | 1.00 | 3.36 | 8.01 |
| Primary School Enrolment Rate | 102.06 | 16.85 | 41.85 | 165.65 |
| Number Of Physicians | 1.40 | 1.45 | 0.01 | 6.17 |
| Health Spending | 2.94 | 1.42 | 0.35 | 7.04 |
| Military Spending | 1.71 | 1.04 | 0.00 | 6.37 |
| Prevalence Of HIV/AIDS | 2.12 | 4.55 | 0.10 | 26.14 |
| DPT Immunisation | 84.67 | 14.67 | 26.20 | 99.00 |
| Government Spending | 14.40 | 6.12 | 4.59 | 80.91 |
| Mobile Money | 0.10 | 0.23 | 0.00 | 1.83 |
| Migrant Destination GDP | 10.46 | 0.38 | 9.43 | 11.08 |
| Migrant Destination Growth | 2.44 | 1.75 | -1.08 | 6.86 |

Infant mortality, child mortality, average income and the income of the lowest quintile, and migrant destination GDP enter as their natural logarithms. Primary school enrolment is a gross enrolment rate measured in percentages. The number of physicians is per 1,000 individuals. Health and military spending are percentages of GDP as is government spending. Government spending is to GDP and strips away spending on military and health. The prevalence of HIV/Aids is the percentage of the population aged 15-49 who are HIV positive or have Aids. DPT immunisation is measured as the percentage of those aged 12-23 months who have been immunized against DPT. Mobile money is measured as the total number of new mobile operators entering a country averaged over each time period.

money prevalence which is available from the GSMA Mobile Money Tracker (2016). The summary statistics are provided in Table 1.

We initially downloaded data for all the countries listed in the World Development Indicators from 1995-2014, however, due to data limitations, the number of countries falls to 86.

This is because data on the income of the lowest quintile is scarce, although is far more abundant than alternative variables that may measure the income of the poor. Once all the control variables are included into the specification the number of observations in the panel falls to approximately 220. Nevertheless, we still encompass a good geographic spread, omitting the most economically developed nations, with approximately a third of our sample comprising of sub-Saharan African countries and a full country list is available in the Appendix. The data is averaged into four non-overlapping five year averages. This avoids the sample being dominated by countries with richer reporting histories following Hanmer et al. (2003). It also smooths out the macroeconomic time series and examining the data, it still provides a high degree of within country variation. To overcome sample bias, Babones (2008) interpolates his data to create an annual time series. This approach was considered, but due to the number of gaps in the time series for certain variables, our approach was preferred. Ideally, a longer dataset would have been desirable, but due to data limitations with certain indicators this was not possible.

Our dependent variables are infant and child mortality rates. Infant mortality is defined as the number of infant deaths before age one per 1,000 live births. The child mortality rate includes the number of child deaths before the age of five. Both variables are logged in the specification. Our variables of interest, average income and the income of the bottom quintile enter the specifications as their natural logarithms. The income of the lowest quintile is calculated as the income share of the lowest 20 per cent of the population, multiplied by GDP per capita at constant purchasing power rates. This corresponds to the Dollar and Kraay (2002) measure.

We select seven covariates in our specifications and their inclusion is dictated by previous empirical research, (Aquino et al., 2009; Austin and Noble, 2014; Cutler et al. 2006; Gomanee et al., 2005; Hanmer et al., 2003). We use the gross primary school enrolment ratio to measure the stock of human capital in the economy. In alternative specifications we replace this variable with the secondary school enrolment rate and with the Barro Lee measure of total years of schooling, but prefer the primary school enrolment measure as data is most abundant and less correlated with the other control variables. The additional covariates used are the proportion of physicians per 1,000 individuals, public health expenditure to GDP, government military expenditure to GDP, the percentage of individuals with HIV/Aids from the population aged between 15-49, the rate of immunisation of DPT for children aged between 12-24 months, and all remaining government expenditure to GDP. We would expect that the education and health variables to have a negative impact on infant and child mortality. We also anticipate that a higher rate of DPT immunisation and government spending to have negative impact on infant and child mortality. We posit that military expenditure and HIV/Aids prevalence to have positive coefficients in the regressions.

A number of alternative variables were considered. For example, the number of hospital beds per capita, and the number of births attended by skilled health staff, both used in prior studies, (Austin and Noble, 2014; Cesur et al., 2017). For an indicator to be selected, it required the variable's data to be abundant and for it to be widely used in previous research. For example, a covariate to measure malaria prevalence was omitted despite its importance (Noble and Austin, 2016), as data was only available from 2000 onwards, with limited coverage, leading to a dramatic reduction in sample size. Nevertheless, as malaria is usually confined to certain worldwide regions, we anticipate that the country specific effects should capture this variable.

A further criterion used to exclude additional variables was when the correlations between them and the selected covariates were considered to be very high, for example, female education. To avoid running into multicollinearity issues, in preliminary analysis, we examined the correlations between all the explanatory variables and selected those with the lowest correlations whilst still encompassing a wide range of explanatory variables. The correlations of the included indicators are presented in Table 2. To ensure our selected variables were valid, in preliminary analysis we ran ordinary least squares regressions and examined the variance inflation factor (VIF) of our chosen indicators. The highest VIF was 2.21, lower than the threshold of 10 (Hair et al., 2006; Myers, 1990) and the average VIF was 1.64.

A further method we implemented to select our covariates was via general to specific modelling and by using an approach known as extreme bounds analysis (EBA). In our sensitivity analysis, we altered the conditioning set of variables and a subset of our robustness tests are presented in the Appendix. In all the modified specifications, both reported and unreported, our results remained consistent with the findings reported in the results section.

*Table 2. Correlations between covariates*

| | Average Income | Income Of The Lowest Quintile | Primary School Enrolment Rate | Number Of Physicians | Health Spending | Military Spending | Prevalence Of HIV/AIDS | DPT Immunisation | Government Spending | Mobile Money |
|---|---|---|---|---|---|---|---|---|---|---|
| Average Income | 1.00 | | | | | | | | | |
| Income Of The Lowest Quintile | 0.92 | 1.00 | | | | | | | | |
| Human Capital | 0.29 | 0.18 | 1.00 | | | | | | | |
| Number Of Physicians | 0.57 | 0.65 | 0.11 | 1.00 | | | | | | |
| Health Spending | 0.49 | 0.40 | 0.24 | 0.41 | 1.00 | | | | | |
| Military Spending | 0.07 | 0.13 | -0.12 | 0.10 | -0.18 | 1.00 | | | | |
| Prevalence Of HIV/AIDS | -0.15 | -0.24 | 0.00 | -0.32 | 0.05 | 0.00 | 1.00 | | | |
| DPT Immunisation | 0.51 | 0.51 | 0.44 | 0.40 | 0.35 | 0.00 | -0.16 | 1.00 | | |
| Government Spending | 0.05 | 0.03 | 0.06 | 0.13 | 0.47 | 0.10 | 0.23 | 0.16 | 1.00 | |
| Mobile Money | -0.15 | -0.18 | 0.09 | -0.17 | -0.14 | -0.09 | 0.07 | 0.05 | 0.10 | 1.00 |

## Results and Discussion

In this section, we present our main results in Tables 3 - 5. In the tables, columns 1-4 estimates the impact of income on infant mortality, whereas columns 5-8 estimate the impact of income on child mortality. Table 3 estimates the relationship using a fixed effects estimator and Tables 4 and 5 use instrumental variables to identify the coefficient on income. As the two dependent variables, infant and child mortality are entered as natural logarithms, as are both income variables, the results may be interpreted as elasticities.

In the first column of Table 3 we estimate a univariate regression examining the impact of

*Table 3. Fixed effects regressions estimating the role of income on infant/child mortality*

| Dependent Variable | Infant Mortality | Infant Mortality | Infant Mortality | Infant Mortality | Child Mortality | Child Mortality | Child Mortality | Child Mortality |
|---|---|---|---|---|---|---|---|---|
| GDP Per Capita | -0.391*** (-4.61) | | -0.375*** (-4.38) | | -0.380*** (-4.61) | | -0.380*** (-4.50) | |
| Income Of The Lowest Quintile | | -0.171*** (-3.55) | | -0.158*** (-3.26) | | -0.168*** (-3.37) | | -0.169*** (-3.25) |
| Human Capital | | | 0.000 (0.27) | 0.000 (0.28) | | | -0.000 (-0.23) | -0.000 (-0.30) |
| Number Of Physicians | | | 0.001 (0.03) | 0.009 (0.20) | | | 0.014 (0.33) | 0.021 (0.47) |
| Health Spending | | | 0.019 (0.88) | 0.027 (1.06) | | | 0.026 (1.14) | 0.033 (1.26) |
| Military Spending | | | -0.007 (-0.47) | -0.019 (-1.11) | | | -0.006 (-0.39) | -0.018 (-1.01) |
| Prevalence Of HIV/Aids | | | 0.020* (1.71) | 0.022* (1.64) | | | 0.028** (2.38) | 0.030** (2.28) |
| DPT Immunisation | | | 0.001 (0.65) | 0.001 (1.00) | | | -0.001 (-0.41) | -0.000 (-0.02) |
| Government Spending | | | -0.001 (-0.47) | -0.001 (-0.38) | | | -0.001 (-0.26) | -0.001 (-0.24) |
| Coefficient Equality | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| R-Squared | 0.89 | 0.87 | 0.90 | 0.88 | 0.89 | 0.87 | 0.90 | 0.88 |
| Observations | 236 | 236 | 236 | 236 | 236 | 236 | 236 | 236 |

Each column represents a different fixed effects regression. T-statistics are reported in parentheses where (*),(**), and (***) denote statistical significance levels at the (10),(5), and (1)% levels. The row titled coefficient equality reports the p-value associated with the test that average income = the income of the bottom quintile. Time dummies are included in the regression but unreported for brevity.

average income on infant mortality. An increase in income, is negatively associated with infant mortality, and the coefficient is statistically significant at the 1 per cent level. The following column estimates a univariate regression replacing average income, with the income of the lowest quintile. The income of the bottom quintile enters with a magnitude smaller than average income but remains statistically significant at the 1 per cent level.

The following two columns add several control variables into the specification to see whether the results change. In both regressions, average income and the income of the lowest quintile retain their statistical significance at the 1 per cent level although their magnitudes fall slightly. From the control variables, an increase in HIV/Aids prevalence is associated with infant mortality, albeit at the 10 per cent significance level.

The next four columns re-estimate the previous four specifications with child mortality as the dependent variable. Columns 5 and 6 show that both the magnitude on average income, and the income of the bottom quintile, are statistically significant at the 1 per cent level. Both magnitudes slightly fall in these two columns when the dependent variable is child mortality, in comparison to infant mortality in the first two columns. When including the covariates, the pattern from columns 3 and 4 repeats itself with regards to the two income variables, however, both variables exceed the magnitudes found when the dependent variable was infant mortality. The control variables are very similar to columns 3 and 4, although the prevalence of HIV/Aids becomes a significant covariate at the 5 per cent level with its expected positive sign.

In the fixed effects specifications, the magnitude of average income is similar to values found by Filmer and Pritchett (1996). However, the coefficient on the income of the bottom quintile differs to the findings by Waldmann (1992). However, this is not a concern, as the values from Table 3 lie in-between those found by Waldmann when the author includes policy variables into the empirical specification and when he doesn't. This provides confidence in our findings and modelling techniques. In addition, when formally testing whether or not the coefficients on average income equals the income of the lowest quintile, the results reject the null hypothesis that the coefficients are equal. Therefore, it does provide evidence that the coefficent on average income is larger than of the income of the bottom quintile in our benchmark regressions.

In Table 4 we estimate the relationship between income and health using an instrumental variable fixed effects estimator. The fixed effects estimator may control for any omitted

*Table 4. IV Fixed effects regressions estimating the role of income on infant/child mortality*

| Dependent Variable | Infant Mortality | Infant Mortality | Infant Mortality | Infant Mortality | Child Mortality | Child Mortality | Child Mortality | Child Mortality |
|---|---|---|---|---|---|---|---|---|
| GDP Per Capita | -1.610*** (-12.65) | | -1.575*** (-9.88) | | -1.849*** (-11.54) | | -1.797*** (-9.10) | |
| Income Of The Lowest Quintile | | -1.225*** (-11.97) | | -1.113*** (-9.03) | | -1.382*** (-10.18) | | -1.255*** (-8.25) |
| Human Capital | | | -0.001 (-0.33) | -0.004* (-1.73) | | | -0.002 (-0.61) | -0.005** (-2.02) |
| Number Of Physicians | | | -0.081 (-1.07) | -0.146 (-1.63) | | | -0.077 (-0.95) | -0.151 (-1.57) |
| Health Spending | | | 0.028 (0.80) | 0.031 (0.82) | | | 0.047 (1.12) | 0.049 (1.06) |
| Military Spending | | | 0.028 (0.62) | -0.005 (-0.14) | | | 0.029 (0.51) | -0.008 (-0.18) |
| Prevalence Of HIV/Aids | | | 0.020* (1.71) | 0.040** (2.15) | | | 0.030** (2.38) | 0.051** (2.48) |
| DPT Immunisation | | | 0.001 (0.43) | 0.002 (0.87) | | | 0.000 (0.09) | 0.002 (0.58) |
| Government Spending | | | -0.005 (-1.52) | -0.007** (-2.36) | | | -0.005 (-1.44) | -0.008** (-2.31) |
| Coefficient Equality | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| R Squared | 0.50 | 0.32 | 0.54 | 0.42 | 0.40 | 0.13 | 0.46 | 0.37 |
| Observations | 222 | 222 | 222 | 222 | 222 | 222 | 222 | 222 |
| First Stage Estimates | | | | | | | | |
| Mobile Money | 0.741*** (6.73) | 1.083*** (6.34) | 0.585*** (4.64) | 0.897*** (4.72) | 0.741*** (6.73) | 1.083*** (6.34) | 0.585*** (4.64) | 0.897*** (4.72) |
| Mobile Money Squared | -0.316*** (-3.09) | -0.497*** (-3.23) | -0.232*** (-2.40) | -0.390*** (-2.56) | -0.316*** (-3.09) | -0.497*** (-3.23) | -0.232*** (-2.40) | -0.390*** (-2.56) |
| First Stage F | 34.1 | 28.9 | 16.8 | 16.1 | 34.1 | 28.9 | 16.8 | 16.1 |
| Hansen | 0.98 | 0.12 | 0.98 | 0.26 | 0.94 | 0.10 | 0.97 | 0.25 |

Each column represents a different instrumental variable fixed effects regression. T-statistics are reported in parentheses where (*),(**), and (***) denote statistical significance levels at the (10),(5), and (1)% levels. The row titled coefficient equality reports the p-value associated with the test that average income = the income of the bottom quintile. The lower panel reports the first stage estimates but for brevity only migrant destination country coefficients are reported. The first stage F-statistic is reported as is the p-value for the Hansen J-Statistic. Time dummies are not included in the model.

variables that are time-invariant, for example, a country's tropical location, which may result in high infant mortality rates and low income. To overcome any concerns that time-varying factors are simultaneously driving changes in income and infant/child mortality, we instrument income using the prevalence of mobile money operators within a country.

Our regressions follow the same pattern as in Table 3 where the first two columns examine the univariate impact of income on infant mortality. Our findings from Table 3 are confirmed, as both average income, and the income of the lowest quintile are statistically significant at the 1 per cent level. Moreover, the coefficient of average income exceeds that of the bottom quintile's income. In the first stage the mobile money instruments are statistically significant at the 1 per cent level and exhibit the inverted U-shape as predicted. The first stage F-statistic exceeds the traditional value of 10 and the Hansen test does not reject the null hypothesis, that the overidentifying restrictions are valid.

The following two columns add the covariates into the specification. The findings are consistent with the previous table, as both variables remain statistically significant, the magnitude of income falls upon the inclusion of the control variables, and the coefficient on average income exceeds that of the income of the lowest quintile. A number of control variables are statistically significant in columns 3 and 4. These include; government consumption, HIV/Aids prevalence and our measure of human capital. In the regression's first stage, the F-Statistic falls in value, but still exceeds 10, and in both regressions we cannot reject the null hypothesis that the instruments are valid, with p-values of the Hansen test exceeding 0.1.

In the following four columns of Table 4 we estimate the impact of income on child mortality. The univariate regressions show that both average income and the income of the bottom quintile are statistically significant at the 1 per cent level, and increase in magnitude in comparison to columns 1 and 2. This follows the pattern found in Table 3. In both regressions, the instruments are strong with first stage F-Statistics exceeding 10 and the null hypothesis that the overidentifying restrictions are valid is not rejected.

The final two columns add the matrix of control variables into the empirical specification. Consistent with the previous findings, the magnitude of average income still exceeds that of the income of the bottom quintile and both variables are statistically significant at the 1 per cent level. In columns 7 and 8, the magnitude of both income variables exceed those when the dependent variable was infant mortality. Examining the control variables, human capital and government spending are negatively associated with child mortality whereas HIV/Aids prevalence is positively related to child mortality as expected. All three variables are statistically significant at the 5 per cent level and all three variables have larger magnitudes than in the corresponding regressions in columns 3 and 4. As in all the previous columns, the two instruments are statistically significant at the 1 per cent level, and exhibit the predicted signs. The first stage F-statistics suggest that the specification does not suffer from a weak instruments problem and the p-value of the Hansen J-Statistic exceeds 0.1 in both cases.

As our instrumental variable is trended, when included alongside time dummies, the instruments become weak, therefore Table 4 reports results without using time dummies. The omission of these inflates the coefficients for both average income and the income of the lowest quintile. However, when testing the hypothesis that the two coefficients are equal, the row titled coefficient equality strongly rejects the null hypothesis, with p-values of 0.00. This implies, that the coefficient attributed to average income is larger than that of the income of the bottom quintile, confirming the findings in Table 3.

As the time series progresses, the number of mobile money operators increases. This implies that our selected instrumental variable in Table 4 is trended. This may cause some concerns as it may be capturing alternative time-varying factors that are driving infant mortality reduction. One solution is to control for time fixed effects, however, this removes all variation from the instrument. To overcome this issue and to test the sensitivity of the findings, we alter our instrument set.

We instrument both average income and that of the bottom quintile using the growth rate and income level of a country that contains the most migrants from country $(i)$. This follows Amuedo-Dorantes and Pozo (2011), who suggest that when the economic conditions of a migrant's destination country deteriorate, remittances fall, and therefore home country income may fall.

Table 5 shows that even when changing the instrument set, and including time dummies in the empirical specification, the typical pattern of results holds, that the coefficient on average

*Table 5. Alternative IV-Fixed effects regressions estimating the role of income on infant/child mortality*

| Dependent Variable | Infant Mortality | Infant Mortality | Infant Mortality | Infant Mortality | Child Mortality | Child Mortality | Child Mortality | Child Mortality |
|---|---|---|---|---|---|---|---|---|
| GDP Per Capita | -0.515*** (-4.76) | | -0.520*** (-4.14) | | -0.473*** (-4.36) | | -0.509*** (-3.97) | |
| Income Of The Lowest Quintile | | -0.457*** (-3.79) | | -0.502*** (-3.21) | | -0.414*** (-3.50) | | -0.490*** (-3.10) |
| Secondary Schooling | | | 0.000 (0.05) | -0.001 (-0.66) | | | -0.001 (-0.40) | -0.002 (-1.03) |
| Number Of Physicians | | | -0.019 (-0.41) | -0.063 (-1.01) | | | 0.000 (0.01) | -0.040 (-0.70) |
| Health Spending | | | 0.011 (0.57) | 0.005 (0.18) | | | 0.020 (0.95) | 0.015 (0.55) |
| Military Spending | | | 0.000 (0.01) | -0.009 (-0.53) | | | -0.000 (-0.00) | -0.009 (-0.54) |
| Prevalence Of HIV/Aids | | | 0.021** (2.21) | 0.031*** (3.11) | | | 0.029*** (2.80) | 0.038*** (3.60) |
| DPT Immunisation | | | 0.001 (0.42) | 0.001 (0.51) | | | -0.001 (-0.57) | -0.001 (-0.28) |
| Government Spending | | | -0.001 (-0.65) | -0.003 (-1.19) | | | -0.001 (-0.39) | -0.002 (-0.92) |
| Coefficient Equality | | 0.63 | | 0.91 | | 0.62 | | 0.90 |
| R-Squared | 0.89 | 0.83 | 0.89 | 0.83 | 0.89 | 0.85 | 0.89 | 0.84 |
| Observations | 222 | 222 | 222 | 222 | 222 | 222 | 222 | 222 |
| First Stage Estimates | | | | | | | | |
| Migrant Destination Growth | 0.010* (1.86) | 0.023** (2.18) | 0.010 (1.59) | 0.020* (1.91) | 0.010* (1.86) | 0.023** (2.18) | 0.010 (1.59) | 0.020* (1.91) |
| Migrant Destination GDP | 0.892*** (6.43) | 0.868*** (5.12) | 0.908*** (6.35) | 0.791*** (3.83) | 0.892*** (6.43) | 0.868*** (5.12) | 0.908*** (6.35) | 0.791*** (3.83) |
| First Stage F | 61.9 | 25.2 | 45.9 | 16.1 | 61.9 | 25.2 | 45.9 | 16.1 |
| Hansen | 0.65 | 0.25 | 0.53 | 0.22 | 0.97 | 0.41 | 0.73 | 0.29 |

Each column represents a different instrumental variable fixed effects regression. T-statistics are reported in parentheses where (*),(**), and (***) denote statistical significance levels at the (10),(5), and (1)% levels. The row titled coefficient equality reports the p-value associated with the test that average income = the income of the bottom quintile. The lower panel reports the first stage estimates but for brevity only migrant destination country coefficients are reported. The first stage F-statistic is reported as is the p-value for the Hansen J-Statistic. Time dummies are included in the model.

income, exceeds that of the income of the lowest quintile. However, in comparison to Table 4, the coefficients are far more subdued and the coefficients for average income, and the income of the bottom quintile, are much closer to each other in terms of magnitude. Column 1 reports that an increase in average income may reduce infant mortality by approximately 0.52 per cent whereas a corresponding increase in the income of the bottom quintile, may yield a reduction in infant mortality by 0.45 per cent. Upon the inclusion of covariates, both magnitudes increase, although the former coefficient only marginally, whilst a a 1 per cent increase in the lowest quintile's income may now reduce infant mortality by 0.5 per cent. In all four columns the variables are statistically significant at the 1 per cent level. When examining the p-value of the equality of coefficients between average income and the income of the lowest quintile, the results propose that the coefficients are not significantly different from one another. This is in comparison to the findings in Tables 3 and 4, however, we cannot claim that an increase in income for the lowest quintile yields a greater benefit in infant and child mortality reduction in comparison to an increase in average income.

In the following four columns, the traditional pattern witnessed in Tables 3 and 4 breaks down. The magnitude for average income still exceeds that of the income of the lowest quintile in the four columns, but the corresponding coefficients in each column are larger when the dependent variable is infant mortality than child mortality. In column 5 a 1 per cent increase in average income is associated with a reduction in child mortality by 0.47 per cent, and in column 6, a 1 per cent increase in the income of the bottom quintile may reduce child mortality by 0.41 per cent. In the final two columns, the results propose that a a unit increase in average income may reduce child mortality by 0.51 per cent, but the income of the lowest quintile may only reduce child mortality by 0.49 per cent. Furthermore, upon the inclusion of time dummies, and altering the instrument set, the magnitudes for the income variables in columns 5-8 are dramatically lower than those found in Table 4. Once more, when examining the equality of the coefficients, we can not reject the null hypothesis that the coefficients are equal. As in the previous four columns, these findings offer a slightly differing conclusion to those in the previous two results tables.

Examining the remaining variables, the only significant covariate in all specifications is the prevalence of HIV/Aids which enters with its expected positive sign. The instrument diagnostics are reported in the bottom panel of Table 5 and we see that across the eight columns, in the majority of cases they are both statistically significant. Both instruments also exhibit their expected signs. The First-Stage F-Statistics are well above the target value of 10 ensuring we do not suffer from a weak instrument problem, and the Hansen P-value exceeds 0.1 in all eight columns comfortably. Overall, in our first piece of sensitivity analysis, we find evidence to support our claims that increases in both average income and the income of the bottom quintile may reduce infant and child mortality.

To test whether our findings are sensitive to changes in the specification, we included two further variables into the regression, the percentage of the population that lives in urban areas and the total fertility rate. Both variables were highly correlated with the other covariates, hence, not included in the preferred model. Table 7 in the Appendix presents the results. The findings show that the coefficient on average income still exceeds that of the income of the lowest quintile, and both variables are statistically significant at the 1 per cent level.

The traditional measure of human capital in an economy, is the secondary school enrolment rate, or the Barro-Lee variable, total years of schooling. In this article we preferred the primary school enrolment rate as it less correlated to the other control variables and provided us with more observations. Nevertheless, Table 8 in the Appendix shows the fixed effects regressions when we change our schooling measure. Notice how the number of observations fall, in particular when the Barro-Lee measure of schooling is used. Despite this dramatic fall in sample size, it is still observed that average income has a larger coefficient than the income of the lowest quintile throughout the Table.

In a final unreported robustness test we replaced the period dummies with a solitary time dummy for the period 2005-2009, as the financial crisis of 2007-08 may have had a detrimental effect on infant mortality across all countries. The crisis dummy is positive and significant as expected, however, both the coefficients on income and the income of the bottom quintile remain statistically significant at the 1 per cent level.

The results show that both increases in average income and the income of the bottom quintile are strongly and negatively associated with infant and child mortality rates. This reaffirms the strong positive relationship between income and health status. In contrast to Waldmann (1992), this manuscript finds that the lowest quintile's income is found to have a significant impact in reducing infant and child mortality rates, even upon the inclusion of a number of policy variables into the econometric specification.

However, the key contribution of this article is that the coefficient on the income of the bottom quintile never exceeds that of average income. The evidence overwhelmingly supports this finding, as the results are robust to changes in the empirical specification and estimation method.

This is an important discovery to the academic literature and policy makers alike. If policy makers focus on raising average incomes to promote health outcomes, they should witness at least the same benefits then by focusing on increasing the income of the lowest quintile. In addition, policy makers would save on the costs of targeting the poor which is often expensive and difficult. If a government still wants to redistribute income, a possible strategy it may pursue to overcome these problems is to provide cash conditional transfers. This should ensure that any increases in income are being spent on health promotion. However, these policy recommendations should be interpreted with caution, as that the mechanisms and hence the policy implications may be vague and imprecise when adopting cross-country studies.

This work also underpins the findings of Dollar and Kraay (2002) whose policy advice is to focus on raising average income. As Dollar and Kraay (2002) propose that a 1 per cent increase in average income, corresponds to a 1 per cent increase in the bottom quintile's income, the findings from this study further propagates the policy advice of promoting increases in average income. Overall, this study shows that income has a beneficial role to play in the reduction of infant and child mortality. Regardless, if the improvement in average income or for the income of the lowest quintile, the results suggest that there should be improvements in health outcomes.

# Conclusion

This article tests whether increases in average income, or the income of the lowest quintile, are most beneficial in reducing infant and child mortality rates. Increases in average income have shown to be important in promoting health status, where previous empirical studies have found that a 1 per cent increase in average income may decrease mortality rates by 0.3 per cent. However, little attention has been devoted to examining whether this effect is homogeneous across the income distribution. For example, does increasing the income of the poor by 1 per cent yield the same findings? Theoretically, the elasticity could be greater or smaller.

Our results support the theories of Ettner (1996) and Pierani and Tiezzi (2009) and the magnitude we find for average income is comparable to previous studies (Filmer and Pritchett, 1996). Specifically, there are no additional benefits accrued in reducing infant and child mortality by providing a poor individual with an extra unit of income compared to an average individual. This contradicts the hypothesis presented by Preston (1975) that the relationship between income and health is concave, although Preston examined life expectancy as his health measure. However, our results show that compared to Waldmann (1992), the only other study to our knowledge, examining the relationship between the lowest quintile's income and child mortality, upon the inclusion of policy variables into a regression, that increasing the income of the bottom quintile may still improve health outcomes.

Our findings are important to policy makers. As targeting the poor is expensive, the benefits should exceed the costs, which are usually high in terms of resources. The findings from this manuscript show that in addition to these costs, the elasticity of the income of the bottom quintile does not exceed that of average income. Therefore, policy makers are correct to be hesitant to transfer income to the poor, and should focus on raising average income if their main policy objective is to improve health outcomes in society. That being said, there still are positive returns to health outcomes if income is redistributed to the poor. Nevertheless, we still urge caution upon our policy advice as the mechanisms using cross-country studies are not always entirely exact.

Despite finding that both average income and the income of the lowest quintile may reduce infant and child mortality, there are some limitations to this research. First, one could argue that not all time-varying indicators have been entered into the regression specification. However, if many of these variables had been included into the regression, it may have led to econometric problems as many pre-identified variables used in infant and child mortality studies are strongly associated with one another. We believe our approach overcomes this limitation by the inclusion of country fixed effects in our modelling and our general to specific modelling approach. Second, one could always argue that the instruments are not exogenous and that they are weak. In this manuscript, the statistics provide evidence that our instruments are both strong and valid. Finally, a longer dataset and one that carries on to the present day would have strengthened this work. Unfortunately, due to data limitations, the maximum duration of the sample is 20 years.

This is still a long time frame and uses contemporary data to ensure the study is up-to-date.

This research shows the importance of increasing income if reducing infant and child mortality is a key policy goal. Furthermore, this article has provided a platform to stimulate further research and potentially examine how the poor's consumption habits change when provided an extra unit of income, vis-a-vis an individual higher up in the income distribution, in relation to health spending.

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# Appendix

*Table 6. Country list*

| Country Name | Country Name | Country Name |
|---|---|---|
| Angola | Ghana | Nigeria |
| Argentina | Greece | Pakistan |
| Armenia | Guatemala | Panama |
| Australia | Guinea | Papua New Guinea |
| Azerbaijan | Guyana | Paraguay |
| Bangladesh | Honduras | Peru |
| Belarus | Indonesia | Philippines |
| Belize | Iran, Islamic Rep. | Rwanda |
| Benin | Italy | Senegal |
| Bolivia | Jamaica | Sierra Leone |
| Botswana | Kazakhstan | South Africa |
| Brazil | Kenya | Spain |
| Burkina Faso | Kyrgyz Republic | Sri Lanka |
| Burundi | Latvia | Sudan |
| Cabo Verde | Liberia | Swaziland |
| Cambodia | Madagascar | Tajikistan |
| Cameroon | Malawi | Tanzania |
| Central African Republic | Malaysia | Thailand |
| Chad | Mali | Togo |
| Chile | Mauritania | Tunisia |
| Colombia | Mexico | Uganda |
| Congo, Dem. Rep. | Moldova | Ukraine |
| Costa Rica | Mongolia | Uruguay |
| Cote d'Ivoire | Morocco | Uzbekistan |
| Dominican Republic | Mozambique | Venezuela, RB |
| Ecuador | Namibia | Vietnam |
| El Salvador | Nepal | Zambia |
| Gambia, The | Nicaragua | Zimbabwe |
| Georgia | Niger | |

*Table 7. Sensitivity analysis: Additional covariates*

| Dependent Variable | Infant Mortality | Infant Mortality | Infant Mortality | Infant Mortality | Child Mortality | Child Mortality | Child Mortality | Child Mortality |
|---|---|---|---|---|---|---|---|---|
| GDP Per Capita | -0.353*** (-3.94) | -0.384*** (-4.21) | | | -0.358*** (-4.05) | -0.406*** (-4.25) | | |
| Income Of The Lowest Quintile | | | -0.147*** (-3.04) | -0.151*** (-3.20) | | | -0.159*** (-3.02) | -0.167*** (-3.19) |
| Human Capital | 0.000 (0.24) | 0.000 (0.30) | 0.000 (0.23) | 0.000 (0.20) | -0.000 (-0.26) | -0.000 (-0.18) | -0.001 (-0.35) | -0.001 (-0.32) |
| Number Of Physicians | 0.001 (0.02) | -0.001 (-0.01) | 0.007 (0.17) | 0.013 (0.29) | 0.014 (0.34) | 0.009 (0.20) | 0.019 (0.44) | 0.022 (0.50) |
| Health Spending | 0.017 (0.81) | 0.018 (0.85) | 0.024 (0.93) | 0.027 (1.08) | 0.025 (1.07) | 0.025 (1.08) | 0.031 (1.14) | 0.034 (1.27) |
| Military Spending | -0.007 (-0.44) | -0.008 (-0.52) | -0.018 (-1.04) | -0.016 (-0.91) | -0.006 (-0.36) | -0.009 (-0.52) | -0.017 (-0.94) | -0.017 (-0.92) |
| Prevalance Of HIV/Aids | 0.021* (1.87) | 0.020* (1.71) | 0.023* (1.84) | 0.022* (1.68) | 0.029** (2.52) | 0.028** (2.40) | 0.031** (2.47) | 0.030** (2.31) |
| DPT Immunisation | 0.001 (0.45) | 0.001 (0.71) | 0.001 (0.73) | 0.001 (0.60) | -0.001 (-0.58) | -0.000 (-0.11) | -0.000 (-0.28) | -0.000 (-0.13) |
| Government Spending | -0.000 (-0.26) | -0.001 (-0.40) | -0.000 (-0.17) | -0.001 (-0.46) | -0.000 (-0.08) | -0.000 (-0.13) | -0.000 (-0.05) | -0.001 (-0.27) |
| Urban Population | 0.008 (1.27) | | 0.010* (1.78) | | 0.007 (1.16) | | 0.010 (1.64) | |
| Fertility Rate | | 0.015 (0.28) | | -0.043 (-0.73) | | 0.044 (0.74) | | -0.018 (-0.28) |
| Coefficient Equality | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| R-Squared | 0.90 | 0.89 | 0.88 | 0.88 | 0.89 | 0.90 | 0.89 | 0.88 |
| Observations | 236 | 236 | 236 | 236 | 236 | 236 | 236 | 236 |

Each column represents a different fixed effects regression. T-statistics are reported in parentheses where (*),(**), and (***) denote statistical significance levels at the (10),(5), and (1)% levels. The row titled coefficient equality reports the p-value associated with the test that average income = the income of the bottom quintile. Time dummies are included in the regression but unreported for brevity.

*Table 8. Sensitivity analysis: Different schooling measures*

| Dependent Variable | Infant Mortality | Infant Mortality | Infant Mortality | Infant Mortality | Child Mortality | Child Mortality | Child Mortality | Child Mortality |
|---|---|---|---|---|---|---|---|---|
| GDP Per Capita | -0.467*** (-5.16) | | -0.432*** (-4.22) | | -0.454*** (-4.90) | | -0.416*** (-3.95) | |
| Income Of The Lowest Quintile | | -0.166*** (-2.98) | | -0.176** (-2.64) | | -0.163*** (-2.77) | | -0.162** (-2.26) |
| Secondary Schooling | -0.001 (-0.47) | -0.001 (-0.47) | | | -0.001 (-0.66) | -0.001 (-0.66) | | |
| Number Of Physicians | -0.011 (-0.24) | 0.007 (0.15) | -0.004 (-0.08) | 0.006 (0.13) | 0.005 (0.12) | 0.023 (0.51) | 0.005 (0.11) | 0.015 (0.33) |
| Health Spending | 0.008 (0.38) | 0.022 (0.84) | -0.018 (-0.63) | -0.009 (-0.27) | 0.018 (0.78) | 0.032 (1.13) | -0.015 (-0.48) | -0.005 (-0.15) |
| Military Spending | -0.009 (-0.67) | -0.021 (-1.25) | 0.010 (0.55) | -0.003 (-0.17) | -0.011 (-0.69) | -0.023 (-1.28) | 0.014 (0.70) | 0.001 (0.04) |
| Prevalance Of HIV/Aids | 0.019* (1.82) | 0.020 (1.53) | -0.008 (-0.24) | -0.014 (-0.41) | 0.027** (2.62) | 0.029** (2.19) | 0.018 (0.48) | 0.012 (0.31) |
| DPT Immunisation | 0.002 (1.52) | 0.002* (1.77) | 0.001 (0.46) | 0.001 (0.70) | 0.000 (0.01) | 0.001 (0.40) | -0.001 (-0.66) | -0.001 (-0.39) |
| Government Spending | -0.001 (-0.44) | -0.001 (-0.41) | -0.002 (-0.78) | -0.004 (-1.17) | -0.000 (-0.24) | -0.001 (-0.26) | -0.000 (-0.13) | -0.002 (-0.51) |
| Barro Lee Schooling | | | -0.032 (-0.94) | -0.045 (-1.08) | | | -0.057 (-1.52) | -0.069 (-1.64) |
| Coefficient Equality | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| R-Squared | 0.90 | 0.88 | 0.90 | 0.88 | 0.90 | 0.88 | 0.90 | 0.88 |
| Observations | 214 | 214 | 144 | 144 | 214 | 214 | 144 | 144 |

Each column represents a different fixed effects regression. T-statistics are reported in parentheses where (*),(**), and (***) denote statistical significance levels at the (10),(5), and (1)% levels. The row titled coefficient equality reports the p-value associated with the test that average income = the income of the bottom quintile. Time dummies are included in the regression but unreported for brevity.