A STUDY OF THE RELATIONSHIP BETWEEN

MATERNAL EDUCATION AND THE RISK
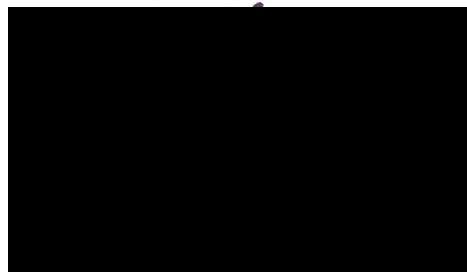
OF UNDER-FIVE MORTALITY IN COLOMBIA

by

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Abstract

Objectives

This paper assesses the extent to which maternal education is associated with under-five mortality in Colombia. Analysis of timing of child death provides insight as to which ages of death are most affected by maternal education.

Methods

The 2010 Demographic and Health Survey for Colombia provided a dataset exceeding 17,000 children and infants. Binary logistic regression measures the crude and adjusted relationship between maternal education and child mortality. Nested models control for wealth, urban-rural residence, cesarean delivery, and age at first marriage.

Results

Key findings are that children of women with primary education experience a crude odds ratio of survival of 2.3 (95% CI: 1.1, 4.5) compared to the referent group of children of women with no education. Children of women with secondary education have 3.3 odds of survival (95% CI: 1.6, 6.6) and children of women with higher education have 3.6 (95% CI: 1.7, 7.7) odds of survival compared to children of women with no education. A strong association between education and child survival is sustained with the introduction of controls, reducing the adjusted odds (AOR) for children of mothers with primary education to 2.2 (95% CI: 1.1, 4.3), for children of mothers with secondary education to 2.8 (95% CI: 1.4, 5.8) and to 2.6 (95% CI: 1.1, 6.2) for children of women with higher education.

Conclusions

In Colombia, maternal education has a clear association with levels of child mortality and age of death, both of which decrease with more advanced levels of maternal education. Resources aiming to decrease child mortality should be dedicated in part to increasing levels of education among mothers. Effective child health services should be scaled up and targeted to women with lower levels of education and higher ages of death.

Keywords: *Child mortality, child death, under-five death, under-five mortality, maternal education, primary education, MDG 2, universal primary education, secondary education*

Introduction

The striking association between maternal education and child and infant mortality has been described as "one of the most consistent and powerful findings in public health." [1] Education is a fundamental human right, a key to economic growth, and is strongly related to the health of individuals, their offspring and their communities. The primary importance of both education and child survival to the international agenda is evidenced in many conventions, meetings, and goals, including the Millennium Development Goals (MDG), which aim to achieve universal primary education (MDG 2) and reduce child mortality (MDG 4) by 2015. This paper examines the connection between the two by quantifying the extent to which maternal education is associated with under-five mortality in Colombia.

As more research has addressed these topics in recent decades due in part to the widespread coverage of the Millennium Development Goals, considerable resources have been devoted to expand access to primary education among women and to reduce deaths of children under five, primarily as isolated strategies. Disparities exist between countries and genders. For example, the global mean number of years of education has increased from 4.7 to 8.3 for men since 1970. Women have experienced a greater rate of increase in spite of disparities; the mean years of education among women has increased from 3.5 to 7.1 years. [1] In 2009, women in 17 countries had a mean educational attainment of less than 2 years, while men had a mean educational attainment of less than two years in only two countries. In 2010, Colombia's females had a mean of 6.3 years of education, which is equivalent to completing primary school but dropping out during the first year of secondary school; males had a mean of 5.6 years of education. [2] The Deputy Permanent Representative of Colombia to the United Nations suggests that the higher rate of education among Colombian women

may be due to the higher rate of engagement in remunerated labor among men.[3] Compared to 6.6% of girls, 14.1% of male children aged 5 - 14 work in Colombia. Of those, 3.4% of males only work; they do not attend school.[4] Of working male children, 47.4% are unpaid family workers, 36.2 are paid employees, 16% are helpers without remuneration, and .5% are domestic workers, according to the International Labour Office (ILO).[4]

The global under-five mortality rate, which measures the probability of dying between birth and age 5 per 1,000 live births if subject to current age-specific mortality rates, was 48 deaths per 1000 live births in 2012.[3] The highest burden of global under-five mortality is located in Sub-Saharan Africa, which represents an increasingly larger share of global under-five mortality, while the Americas, Europe, and the Western Pacific experienced a decline in child mortality of over 60% between 1990 and 2012. The regional under-five mortality rate for Latin America was 19 deaths per 1000 births in 2012.[5] Many attribute these successes to the widespread adoption of the MDGs. According to UNICEF, global deaths for children under five have almost halved since 1990.[6]

Colombia's MDG target for the under-five mortality rate is 12 deaths per 1000 births.[5] Significant progress has been made; Colombia's under-five mortality rate has declined from 34 per 1000 live births in 1990 to 18 in 2012, and the infant mortality rate, which measures the probability of death between birth and age 1 if subject to current age-specific mortality rates, dropped from 28 to 15.[6] Recent success in the reduction of child mortality in Latin America can be attributed to "high impact, low cost primary care-massive inoculation programs, oral re-hydration therapy, breast feeding and health checks conducted on healthy children- along with sustained socio-economic and demographic changes, increase in coverage of basic services, especially safe drinking water and sanitation, increase

of the education level of the population, and decrease in fertility." [7] In 2008, 61% of under-five deaths in Colombia were neonatal deaths, and over 50% of those were attributable to prematurity and congenital anomalies (birth defects). Pneumonia (10%), injury (5%), and diarrhea (4%) account for 19% of under-five deaths, while the remaining 20% is attributed to "other." [4] (See Figure 1)

Figure 1: Categorization of causes of under-five deaths [4]
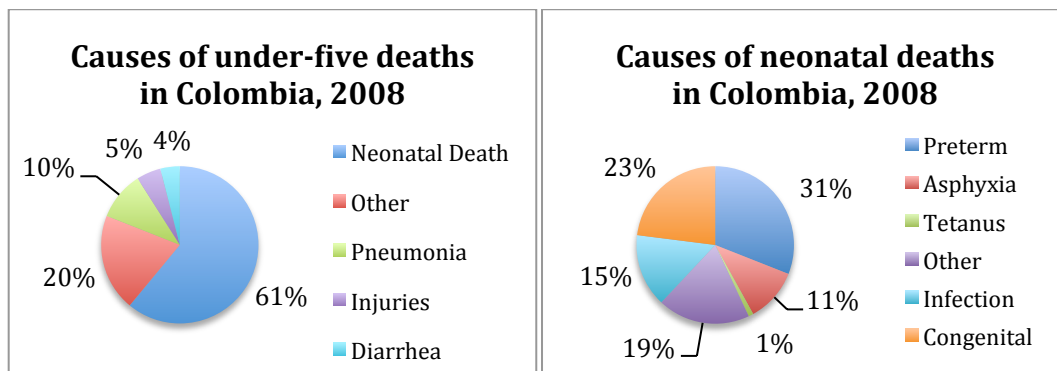
It is widely accepted that the children who are most likely to die before age five are those born in rural areas, poor households, or those born to a mother denied basic education. [8] In a meta-analysis of a wide variety of sources of demographic data dating from the 1970s-1980s, Cleland and van Ginneken found that each one-year increase in maternal education corresponds to a decline in under-five mortality of 7-9%. [9] They credit half of the "education-mortality relationship" to economic advantages correlated with education. [9] Hobcraft found that children of mothers with seven or more years of education have .52 the odds of dying before age 2 compared with the children of uneducated mothers in his 1993 analysis of 25 Demographic and Health Surveys from the Americas, Africa, and Asia. [10] In a systematic analysis of child mortality in 175 countries between 1970 and 2009, Gakidou et al. attribute about half of the global reduction in child mortality since 1970 to improvement

in educational attainment of women of reproductive age. [1] Controls were limited to economic growth (change in gross domestic product) and HIV seroprevalence in their study.

The varying strength of association of maternal education with neonatal mortality versus infant mortality has been addressed in several papers in recent decades. Bicego and Boerma found that post-neonatal mortality risk is approximately twice as sensitive to the effects of maternal education as neonatal risk is, when controlling for the household's economic condition. [11] They hypothesize that maternal education increasingly conditions behaviors as the child ages and as household decisions regarding susceptibility and exposure to disease become more impactful for risk of death. The authors found strong education effects on postneonatal risk, undernutrition, and non-use of health services, acknowledging that these are linked with household economic condition. A prospective cohort study in Pelotas, Brazil found that the relationship was unclear for perinatal mortality, but held strong for infant mortality. [12] In addition, the Pelotas study found important educational background associated differences regarding specific causes of death, especially infectious disease. Effects of education were stronger for late outcomes such as hospital admissions, post-neonatal mortality, and nutritional status than for earlier outcomes associated with biological characteristics (perinatal mortality and birth weight). The most significant finding was the clear, direct association between maternal education and three nutritional indices (mean length-for-age, weight-for-age, and weight-for-length), particularly after the first month of life.

Since Rosenzweig and Schultz' 1982 paper, "Child Mortality and Fertility in Colombia: Individual and Community Effects," [13] there seems to be only one paper studying maternal education and child mortality in Colombia. That 2013 paper, by Andrés Palacio,

uses the Integrated Public Use Microdata series to assess variation in child mortality by location in Colombia. [14] This paper will use the most current data source available, the 2010 Demographic and Health Survey, to provide information about the current situation of the child survival – maternal education association in Colombia.

While the maternal education – child survival association has been highly investigated and the association repeatedly affirmed, consensus on the key pathways has not been reached. Individual-level effects related to wealth, [9,11] health system utilization and access, home childcare practices, [9,12] reproductive behaviors, [5] and empowerment and independence are among the most commonly proposed mediators for the advantage in child survival afforded by maternal education. [9,12,13] Some researchers suggest that the association is diminished with the introduction of statistical controls for socioeconomic status or geographic area of residence, because maternal education acts as a proxy for these. [12,15,16] This paper will test whether the maternal education – child mortality relationship holds when controlling for wealth, urban/rural residence, cesarean delivery, and age at first marriage in the Colombian context.

Figure 2 shows a conceptual framework that describes the hypothesized mediators of the association between maternal education and risk of child death. This framework is guided by Mosley and Chen's Proximate Determinants for Child Survival conceptual model. [17] Modifications are primarily based on the limitations related to the source of data, the Demographic and Health Survey. Information about how each of these is measured will be presented in the materials and methods section of this paper.