



Article

Early-life conditions and child development: Evidence from a violent conflict

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ARTICLE INFO

JEL classification:

J24
J13
D79
I20
O15

Keywords:

Human capital formation
Early-life shocks
Violence
Children
Development

ABSTRACT

This paper investigates how the exposure to violent conflicts in utero and in early and late childhood affect human capital formation. I focus on a wide range of child development outcomes, including novel cognitive and non-cognitive indicators. Using monthly and municipality-level variation in the timing and severity of massacres in Colombia from 1999 to 2007, I show that children exposed to terrorist attacks in utero and in childhood achieve lower height-for-age (0.09 SD) and cognitive outcomes (PPVT falls by 0.18SD and math reasoning and general knowledge fall by 0.16SD), and that these results are robust to controlling for mother fixed-effects. The timing of these exposures matters and differs by type of skill. In terms of parental investments, I find some evidence that parents reinforce the negative effects of violence by increasing their frequency of physical aggression.

1. Introduction

It is well established that prenatal events have life-long consequences (Barker, 1992; Cunha & Heckman, 2007; Almond & Currie, 2011). Moreover, events that happen in the postnatal period also matter for future outcomes and its effects can often be large (Almond, Currie & Duque, 2016). This paper examines the effects of a worldwide public health concern that affects in-utero, early, and late childhood conditions on children's development: Exposure to violence (i.e., wars, armed conflicts, urban crime). More than 1.5 billion people live in countries affected by repeated cycles of violence (World Bank, 2013), many of which are children (Grantham-McGregor et al., 2007).

Recent research has shown the large damage on education and health outcomes from early-life violence (Camacho, 2008; Akresh, Lucchetti, & Thirumurthy, 2012; Minoiu & Shemyakina, 2012; Brown, 2014; Valente, 2011; Leon, 2012). I contribute to this literature in two dimensions. First, how does violence affect other domains of human capital beside education and health (i.e., cognitive and non-cognitive skills)? Identifying such effects is important both because measures of human capital (physical, cognitive, and non-cognitive indicators) can explain a large percentage of the variation in later-life educational attainment and wages (Heckman, Stixrud, & Urzua, 2006) and to understand mechanisms behind previous effects found for

educational attainment and health. Second, to what extent do the effects of violence at different developmental stages differ? In particular, I analyze the effects of violence in each trimester of pregnancy and in two distinct post-birth developmental stages, early (ages 0–3) and late (ages 3+) childhood, following the large evidence of critical and sensitive periods in human development (Gluckman & Hanson, 2005; Knudsen, Heckman, Cameron, & Shonkoff, 2009). Moreover, do impacts on the particular type of skill considered (e.g., health vs. cognitive outcomes) differ by the developmental timing of the shock? Identifying the timing of exposures is important to facilitate investigation of the mechanisms through which conditions affect later outcomes (Conti & Heckman, 2014).

To study these questions, I analyze survey microdata on 13,400 children collected in 2007 to evaluate a large social program in Colombia: a home-based childcare program called *Hogares Comunitarios de Bienestar (HCB)*. HCB serves a million low-income children below age 7 with the goal to promote their health and cognitive and socio-emotional development by providing childcare, nutrition (50–70% of the daily allowance), and psychosocial stimulation. The HCB evaluation survey provides rich measures on child development that are not available in other national surveys, as well as it includes detailed information on parental investments that allow me to explore novel dimensions of the potential effects of violence. Most

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<http://dx.doi.org/10.1016/j.ssmph.2016.09.012>

Received 17 May 2016; Received in revised form 26 September 2016; Accepted 29 September 2016

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importantly, these data contain information on each child's year and month of birth, as well as household migration history, which allows me to identify with some precision a child's violence exposure in early-life. The data also include a subsample of siblings that I use to estimate models that account for a mother's time-invariant characteristic, which might be correlated with both the probability of residing in an area with high violence and with accumulating low levels of human capital. The mother fixed-effects models thus provide robust evidence on the effect of violence on children.

I measure violence shocks using the occurrence and severity of massacres at the monthly-municipality levels during Colombia's armed conflict, from 1999 to 2007 (period for which the microdata are available). Massacres are defined as the intentional killing of four or more people in a specific time and place, by another person or group. These events distinguish from other measures of violence (e.g., homicides), in their high levels of cruelty and visibility of violence, and in the huge levels of stress and anxiety that they cause. As discussed in more detail in the background section, these terrorist attacks were a common practice employed by violent groups during the most intense years of the conflict. From 1999–2007, more than 1000 massacres occurred in half of all municipalities, ranging from 4 to more than 25 victims killed in each episode. While the occurrence of massacres in a given municipality was not random—armed groups could have targeted specific populations or, in some cases, could have announced their terrorist plans—, the identification strategy relies on the fact that the timing within and across municipalities is uncorrelated with changes in other factors affecting human capital investments and with a child or family unobserved characteristics. I provide some evidence that supports this identifying assumption by showing that: (i) changes in the intensity of violence are not associated with changes in socioeconomic conditions at the local level measured by income or unemployment rate; and (ii), that the intensity of massacres at the municipality-monthly levels depicts little serial correlation.

Using models that control for a variety of individual-level characteristics, as well as geographic and temporal fixed-effects, I show that children exposed to violence in-utero and in childhood experience a decline in their physical and cognitive development. This finding is confirmed using the mother fixed-effects specification. In particular, a one standard deviation (SD) increase in violence in late pregnancy reduce height-for-age Z-scores (HAZ) by 0.09 SD and cognitive test scores by at least 0.16 SD. I also find negative but statistically insignificant effects on socio-emotional outcomes. Moreover, results show that violence is negatively associated with birth weight, an important input in the production of human capital. This impact is driven by exposure during the first trimester of pregnancy. Together, these results and the timing in which these exposures occur may suggest that stress is a relevant mechanism through which violence affects children.

Given the size and persistence of the effects of violence, I then ask an additional question: Do and how do parents respond to these shocks? To my knowledge, this is the first study that investigates the link between violence and parental responses. Family investments are important determinants of human capital (Cunha & Heckman, 2007; Aizer & Cunha, 2014) and parental responses can play a key role in compensating or reinforcing the effects of a shock (Almond & Currie, 2011; Almond & Mazumder, 2013). At present, well-identified empirical evidence on this question is scarce.

I examine the association between violence and parenting, a key human capital investment. Results show little evidence that parents respond to the negative effects of violence on children by providing more nurturing care. In fact, I find that parental responses become harsher as violence increases (the frequency of personal care routines falls and physical aggression increases). As is discussed further below, these findings are consistent with the idea that parents reinforce the negative effects of the shock (Almond & Mazumder, 2013).

2. Background

2.1. The effects of violence on human capital

Previous research has shown the negative effects of early-life violence exposure on health, education, and labor-market prospects. Studies investigating prenatal violence exposure have found declines in birth weight (Brown, 2014; Camacho, 2008; Mansour & Rees, 2012; Valente, 2011) while those focusing on before-age-6 exposures have found a decrease in educational attainment, wages, and adult height (Chamarbagwala & Morán, 2011; Leon, 2012; Galdo, 2013). Relevant to my study, existing literature has found that war exposure during the first years of life reduces child HAZ by 0.2–0.5 SD (Bundervoet, Verwimp, & Akresh, 2009; Akresh et al., 2012; Minoiu & Shemyakina, 2012).

To my knowledge, only two studies have explored how violence affects other dimensions of human capital. Rodriguez and Sánchez (2013) found that a 1 SD increase in the intensity of Colombia's conflict reduced test scores by 0.86 SD for children aged 11–18, a group much older than those analyzed here. Sharkey, Tirado-Strayer, Papachristos, and Raver (2012) found that being exposed to a neighborhood homicide in Chicago, worsened 4-year-old's behavior and academic skills, as well as attention, impulse control, and test scores by over a 0.3 SD. While these are large effects, the fact that it uses data from a developed country makes it difficult to compare estimates to those in developing countries. Moreover, these estimates represent short-term impacts and do not reflect lasting effects.

2.2. The timing of exposure and potential mechanisms

Violence is a major source of stress that can affect a family's resources and behavior (e.g., access to food). During pregnancy, stress and nutritional deprivation can affect fetal and newborn health and cognition through changes in the immune and behavioral systems (Barker, 1992; Denckel-Schetter, 2011; Gluckman & Hanson, 2005). The medical literature suggests that the timing of these alterations matter for a child's physical and cognitive development. Since the number of neurons is mostly determined by mid-gestation, both nutritional deprivation and stress in the first half of pregnancy may be particularly harmful for cognitive development. Fetal exposure to excess cortisol—the hormones responsible for regulating fetal maturation—may lead to impaired brain and spinal cord development, thereby diminishing the mental and motor skills of infants (Huizink, Robles de Medina, Mulder, Visser, & Buitelaar, 2003), and is associated with lower schooling and verbal IQ scores, and high chances of experiencing chronic health conditions at age 7 (Aizer, Stroud, & Buka, 2012) and later in life (Thompson, 2012). On the other hand, child height can be particularly sensitive to nutritional deprivation in the second half of pregnancy—the period in which the mother gains more weight (Stein & Lumey, 2000)—, as well as conditions during the first years of life (e.g., nutrition, infectious diseases) (Victora & de Onis, 2010).

During childhood, stress may compromise the family environment by affecting parental mental health and family relationships (Campbell, 1991; Repetti, Taylor, & Seema, 2002). Households can also modify their behavior in order to prevent victimization (e.g., mothers may refrain from letting their child leave the home or play outside). Sharkey et al. (2012) found that local violence is positively associated with higher parental distress, suggesting that parental responses may be a likely pathway by which violence affects children. Neurobiologists have shown that a strong and positive attachment in infancy promotes brain growth and healthy development (Schore, 2001). Thus, if violence disrupts the home environment, it may affect the child through changes in mother–child interaction.

Lastly, in terms of the supply-side mechanisms, Leon (2012) found that attacks against teachers decreased educational attainment; Rodriguez and Sánchez (2013) found that negative economic shocks

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