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Short communication

Spillovers between siblings and from offspring to parents are understudied: A review and future directions for research

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ABSTRACT

Background: While a large literature has highlighted the protective effects of human capital on an individual's health and to some extent their offspring's health, little evidence is available on the positive spillover benefits of human capital for other family members. We conducted a scoping review of the evidence and identify future directions for research.

Methods: We systematically searched the public health and economics literature on spillover effects from human capital, as indicated by educational attainment, to the health and/or survival of family members. We assessed (i) downward spillover effects (from parents and/or grandparents to offspring), (ii) horizontal spillover effects (from partners, spouses, and/or siblings), and (iii) upward spillover effects (from offspring to their parents and/or grandparents). We assessed the frequency of studies, their study designs, findings, and identified priority areas to inform future research on spillover effects of human capital.

Findings: A total of 567 studies met our selection criteria. 286 studies assessed downward spillovers, 22 studies assessed horizontal spillovers, and five studies assessed upward spillovers. Studies on horizontal and upward spillovers found universally positive associations between additional education and better health in family members. The majority of studies used cross-sectional and longitudinal study designs as opposed to (quasi-)experimental designs. Further research is needed on horizontal and upward spillovers and research in low-resource settings, in addition to understanding what level of education matters the most, as well as mechanisms.

Conclusions: Although positive spillovers of human capital between siblings and from offspring to parents are likely, they have been understudied. Estimates of the returns to human capital that exclude these benefits may be too low.

Supporting human capital is almost universally recognized as a critical societal responsibility. While the benefits of additional resources for individuals are well documented, relatively little is known about the extent to which these benefits are shared by other household members.

The effect of human capital in individuals on the health of their family members seems mostly protective for several reasons. Given the strong positive relationship between additional education and increased income (Mincer, 1958; Psacharopoulos, 1994; Schultz, 2004), investing in education could thus be an effective strategy for individuals to improve the living conditions of their family members. Parents with additional education have the opportunity for better employment and higher income, and thus the amount of income they can invest in their offspring increases (Blau, 1999; Cutler and Lleras-Muney, 2006; Hill and Duncan, 1987). Conversely, more highly educated offspring can recompense their parents for investments received in childhood (Chou, 2008; Clay and Jane, 1993; Frankenberg et al., 2002; Lillard and Willis, 1997). Families may function as social institutions, particularly in settings with limited public welfare systems, in order to smooth consumption across the life cycle (Lillard and Willis, 1997) (see Panel S1 in the Supplementary Materials for an overview of motives for wealth transfers).

More education may also lead to increased communication to

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family members regarding health knowledge and skills acquired at or after school, positively affecting health behavior (Berkman et al., 2000; Cutler and Lleras-Muney, 2010; Field and de la Roca, 2005; Rowa-Dewar et al., 2014). Individuals with additional education or health knowledge have been shown to promote physical activity (Berniell et al., 2013), affect language skills (Kuziemko, 2014), and increase the uptake of Internet adoption (Belo et al., 2016) among their family members. For example, students acquainted with the Internet may signal its usefulness at home. Individuals may also be exposed to a wide range of beliefs and norms at school, such as norms against domestic violence and violence towards women (Rende, 2014). People with additional education may also be more familiar with modern society (Glewwe, 1999), which may make them more receptive to modern medicine (Aslam and Kingdon, 2012; Frost et al., 2005). Finally, additional education may open access to careers in the health sector, allowing the provision of direct care for family members (Bauman et al., 2006; Evans and Becker, 2009; McGarry, 1998).

The pathways of spillovers of human capital to family members also likely differ according to the setting under study, epidemiological profile, and cultural factors such as the status and position of family members (Sung, 2004). In less developed settings, individuals with more education can teach family members about basic health literacy. In developed settings, college-educated individuals can help their family members navigate the complex web of health insurance bureaucracies or help them set up long-term care arrangements (Friedman and Mare, 2014). Spillovers between human capital and health also likely differ by gender (Alsan, 2016; Mazzonna, 2014), as does the level of education of both the 'index case' (i.e., the parent in the case of parent-to-child spillovers) and the 'recipient' of spillovers (i.e. the child in the case of parent-to-child spillovers) (Sabater and Graham, 2016a; Zimmer et al., 2007). Additional education among recipients, for example, may make them more receptive to possible transfers of health knowledge or skills from family members (Aslam and Kingdon, 2012; Frost et al., 2005; Glewwe, 1999).

While all of these pathways suggest that differential investment in an individual's human capital may be a key driver of health inequalities (Berkman et al., 2000; Berkman and Kawachi, 2000; Delaruelle et al., 2015; Galea et al., 2011; Kaufman and Cooper, 1999; Krieger, 2001; Marmot, 2003), relatively little evidence is available on the empirical relationship between human capital and the health of family members. The purpose of this review was to systematically search the evidence on education-to-health spillovers to better understand the current scope of empirical studies and to provide a narrative integration of the existing evidence. Our review thus differs from evidence mapping (since it integrates evidence), but also from a systematic review or meta-analysis (since we do not provide an exhaustive evaluation of the quality of the evidence). Scoping reviews such as the current study aim to map the existing literature and identify gaps to inform future research (Arksey and O'Malley, 2005). Specifically, we assess which directions of spillovers were considered to establish the relative frequency of the literature on spillovers; which study designs, samples, and settings are included; their main findings; and we discuss implications for research to improve our understanding of the societal benefits of human capital.

1. Methods

We performed a scoping review of the public health and economics literature. Our aim was to identify empirical publications that assess spillover effects from education in individuals to the health of family members, regardless of study design. We used educational attainment as an indicator of human capital and chose a search algorithm that would return studies focused on educational status and the health of family members (see Supplementary Materials for detailed search strategy). Our search returned 2406 unique records catalogued in PubMed and EconLit between 1968 and 2016. We selected records for final review that met the following criteria. We excluded articles that were not in English, unrelated to humans, or those that were systematic reviews, case studies, commentaries, or historical articles; in total, 770 articles were excluded based on these criteria. Third, we rejected articles that did not examine effects on health outcomes. We defined health outcomes broadly to include mortality, morbidity, and diagnostic markers, for both mental and physical health. Based on this criterion, we excluded a further 1059 articles.

Next, we reviewed the articles to determine their study designs, study samples, exposures and outcomes, and main findings. We assessed (i) downward spillovers (from parents and/or grandparents to offspring), (ii) horizontal spillovers (from partners, spouses, and/or siblings), and/or (iii) upward spillovers (from offspring to their parents and/or grandparents). For papers that assessed upward spillovers, we additionally used Google Scholar to broaden our search since this literature only developed in the past few years and we would have likely missed recent papers using PubMed or EconLit alone.

2. Results

We identified 286 studies that assessed downward spillovers, 22 studies assessing horizontal spillovers, and five studies assessing upward spillovers. Fig. 1 displays the total number of articles from our database by year; Fig. 2 displays results by relationships assessed. The number of articles on spillovers was close to zero pre-1990 but has grown rapidly since then. The literature on horizontal and upward spillovers, in particular, only developed very recently.

2.1. Downward spillovers: study design, sample, setting, findings

Downward spillovers of formal education have been rather well documented. The vast majority of studies on downward spillovers assessed the relationship between parental education and offspring health (al-Mazrou et al., 1991; Apouey and Geoffard, 2016; Ardila et al., 2005; Aslam and Kingdon, 2012; Desai and Alva, 1998; Koziel et al., 2000; Kvaavik et al., 2012; Schady, 2011; Semba

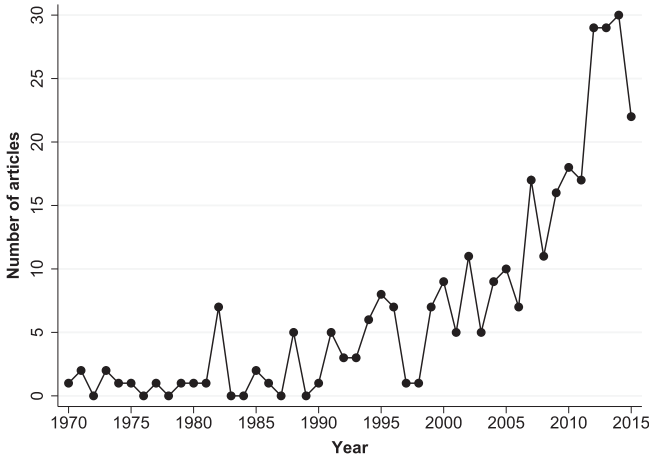

Fig. 1. Number of articles assessing spillovers using PubMed and EconLit.
Displayed are the total number of articles assessing spillovers, by year. We searched PubMed and Econlit for empirical publications that assess spillover effects from an individual's education to the health of their family members.