



Can universal pre-kindergarten programs improve population health and longevity? Mechanisms, evidence, and policy implications



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ABSTRACT

Recent research has found that children who attended pre-kindergarten programs in childhood were more likely to be healthy as adults. One intuitive way of improving population health and longevity may therefore be to invest in pre-kindergarten programs. However, much of the research linking pre-kindergarten programs to health is very recent and has not been synthesized. In this paper, I review the mechanisms linking pre-kindergarten programs in childhood to adult longevity, and the experimental evidence backing up these linkages. I conclude with a critical exploration of whether investments in pre-kindergarten programs could also serve as investments in public health.

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1. Introduction

Children with fewer opportunities to obtain a high-quality education face a cascade of socio-economic challenges throughout their lives, and these challenges are thought to ultimately increase their risk of premature death (Ross and Wu, 1995). As one example of these lifelong challenges, those who do not obtain an education credential will find it extremely difficult to find a quality job that offers high pay, a safe work environment, provides health insurance, and affords a life in a low-crime neighborhood (Grossman, 1997; Kawachi et al., 2010; Ross and Wu, 1995). While it receives relatively little attention in the media, the overall health burden associated with lower educational attainment is larger in the US than it is for obesity (Muennig et al., 2010). Moreover, the adverse health effects of having less educational attainment are increasing over time (Olshansky et al., 2012). One intuitive approach to addressing this growing mortality disparity is to improve schooling in ways that reduce a youth's chances of dropping out of school (Woolf et al., 2007).

Of all schooling enhancements that increase both educational attainment and health, pre-kindergarten programs perhaps hold the most promise. Pre-kindergarten programs have both been shown to improve high school graduation rates and to improve health in ways that are highly likely to reduce premature death in adulthood (Campbell et al., 2014; Currie, 2001; Muennig et al., 2009; Palfrey et al., 2005; Reynolds et al., 2001; Schweinhart et al., 2005). In theory, pre-kindergarten programs could reduce

the growing health disparities by educational attainment in the US, and therefore serve as a powerful policy lever for improving public health (Woolf et al., 2007). However, neither the evidence base nor the theoretical models linking pre-kindergarten programs in childhood to health and longevity in adulthood have been fully synthesized.

In this paper, I ask whether investments in pre-school programs can also serve as public health investments. Broadly speaking, the task is to simply link children's exposure to pre-kindergarten to their health in adulthood using strong (e.g., experimental or quasi-experimental) studies. If the effect seems real and reasonably large, then we can conclude that the answer is probably yes. I therefore begin this paper with a review of the literature linking exposure to pre-kindergarten programs in childhood to health in adulthood.

However, it is extremely helpful to the reader to also have a sense of *how* prekindergarten programs accomplish this feat. One very important clue in this sleuth work is get a sense of what it is that those who are not exposed to pre-kindergarten programs are dying from. For instance, if lung cancer were much more likely in those who did not attend pre-kindergarten programs, then we might suspect that smoking is a major risk factor for poor health outcomes. Working backwards, we would then want to show that smoking is more common in non-attendees. Finally, we would wish to speculate as to what it is about not attending a pre-kindergarten program that would put one at higher risk of smoking. Cognitively enhanced children in a pre-kindergarten program may be "promoted" into a peer group that is less likely to smoke. Likewise, it could be that non-attendees are less likely to obtain a high school diploma, and are therefore more likely to work in lower wage jobs where more people smoke. Alternatively, it could be that non-

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attendees have less health knowledge. While all of these possibilities are speculative, it does help the reader get a “big picture” sense of how pre-school programs work. Without this big picture (which I attempt to draw), the mechanisms remain abstract in the minds of policymakers and researchers alike.

I conclude by then drawing from the evidence base evaluating *whether* pre-kindergarten programs produce adult health and longevity and my speculations as to *why* this might be to then ask if it is reasonable to conclude that investments in pre-school programs can also serve as public health investments.

2. Evidence that pre-kindergarten will improve adult health

Most of the research linking educational attainment or cognitive ability to premature death was historically built from correlational studies. Therefore, some researchers have questioned whether the differences in mortality by educational attainment arise from the underlying innate psychological, sociological, and demographic characteristics of those youth who do poorly in school, rather than to schooling and parenting (Fuchs, 2004). For example, it is possible that people who finished their education are also more likely to be forward looking, and thus less likely to smoke or engage in other health risks that lead to premature death (Fuchs, 2004). Thus, such researchers argue that the difference in longevity between high school graduates and high school dropouts has nothing to do with exposure to the educational system, but is rather merely a spurious correlation.

From a health policy perspective, it is a critically important distinction. If better-educated people predominantly live longer because of their underlying characteristics, then investments in effective schooling programs will not work. Because there is no practical way to control for confounders like underlying personality characteristics in prospective longitudinal studies, the only definitive way to understand whether investments in early childhood education will reduce mortality differences by educational attainment is via randomized controlled trials (RCTs), or at least quasi-experimental approaches (Kawachi et al., 2010; Levin and Belfield, 2007; Lleras-Muney, 2005).

In addition to spurious correlation, we must consider factors that schooling can do little to influence. For one, while one's intelligence quotient (IQ) gains can happen as late as adolescence, IQ is relatively stable after age 8 or so (Kolb and Whishaw, 2009; Ramsden et al., 2011). (The standard measure for “intelligence” or “cognitive ability” in the literature is one's IQ, but it should be recognized that this is an imperfect measure of intelligence.) Therefore, if it cognitive ability more broadly that matters for adult health, compulsory education will have less impact on premature death because it tends to impact educational attainment later in life.

In addition to the timing of schooling, schooling interventions will likely meet different levels of success depending upon the socio-economic characteristics of the students they serve. For instance, poverty is widely believed to exerting its adverse effects on human health even before conception. Throughout their development, children living in poverty are more likely to be exposed to toxins (such as lead), physical abuse, sexual abuse, poor nutrition, and psychological stress (Adler and Ostrove, 1999; Chen et al., 2002). Classroom programs will do little to address these threats to mental health, physical health, and cognitive development.

In fact, many of the programs reviewed here also coupled pre-kindergarten programs with parent education programs that may account for some or even all of the health effects I report here. Therefore, it is difficult to disentangle the impacts of pre-

kindergarten programs on cognition, on non-cognitive outcomes, or on family effects.

On the other hand, children from poor families are generally starting from a much lower baseline for IQ and health than children from more privileged families. Therefore, children from poor families can realize much greater improvements than better off children even if they do not reach their full biological potential.

Fortunately, none of these theoretical concerns matter if solid experimental studies are available that show that a particular education program in childhood produces health in adulthood.

2.1. Pre-kindergarten programs and health

Pre-kindergarten programs have been evaluated using RCTs (Campbell et al., 2014; Muennig et al., 2011a,b; Muennig et al., 2009), at least one regression discontinuity analysis (Ludwig and Miller, 2007), and case-control studies (Palfrey et al., 2005; Reynolds et al., 2001). These all show an impact on behavioral risk factors for health or actual measures of health. Because some of the participants in the control groups received some treatment in regular community pre-kindergarten programs, the effect sizes I present below may be larger than they appear.

One caveat that I should mention up front is that the health outcomes differ between the studies I discuss here. These include behavioral risk factors (e.g., smoking), self-rated health status, various diseases or conditions, and mortality. Therefore, we must assume that when one is sick, rates himself or herself in poor health, or engages in behavioral risks such as smoking that the end result—even if not measured directly in these studies—is premature death. There is strong evidence that these are fair assumptions (Schnittker and Bacak, 2014).

2.1.1. The Perry Preschool Program (PPP)

Initiated in 1962, PPP randomized 123 3- or 4-year-old severely disadvantaged African American children to either receive no intervention or to receive a 2-year program of 2.5 h of interactive instruction daily coupled with 1.5-h weekly home visits. Treated students realized stark social and economic benefits by age 40. The baseline IQ of the participants was 78 (Schweinhart et al., 2005). It remained at this level in the control group but improved to normal levels within a few years in the treated group. If one accounts for the net reductions in incarceration, increased earnings, decreased welfare utilization, and health benefits, the treated group appeared to realize economic gains over his or her lifetime by upwards of 1 million dollars per student, depending on how the analysis and projections are estimated (Heckman et al., 2010; Nores et al., 2005). Many of these gains were realized from important public health outcomes: reduced crime and incarceration (Golembeski and Fullilove, 2005). Because both engagement in crime and incarceration are highly predictive of longevity, one would expect mortality reductions over the lifetime of children who were exposed to PPP.

Two separate teams of researchers re-evaluated PPP to explore whether it might have also produced health impacts. The most complete and recent of these studies entailed an additional wave of data collection that includes laboratory testing of participants who are now in their 50s. The results, which were generated by a team similar to those who recently re-evaluated ABC (Campbell et al., 2014), were embargoed at the time of publication (personal communication, Larry Schweinhart).

A different study by Muennig et al. (2009) used a sensitive method of detecting joint impacts across multiple health and behavioral risk factor outcome measures. This approach is called “seemingly unrelated regression (Zellner, 1962).” In that study, in which I participated, we found that treated children realized statistically significant reductions in unhealthy behaviors by age 40—a

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