Journal of Health Economics 49 (2016) 120–135

Contents lists available at ScienceDirect

Journal of Health Economics

journal homepage: www.elsevier.com/locate/econbase

Cost savings of developmental screenings: Evidence from a nationwide program

Martin Halla [a,b,c], Gerald J. Pruckner [c,d,*], Thomas Schober [c,d]

[a] University of Innsbruck, Austria
[b] IZA, Institute for the Study of Labor, Bonn, Germany
[c] Christian Doppler Laboratory – Aging, Health and the Labor Market, Linz, Austria
[d] Johannes Kepler University of Linz, Austria

ARTICLE INFO

Article history:
Received 4 September 2015
Received in revised form 13 June 2016
Accepted 28 June 2016
Available online 4 July 2016

JEL classification:
I12
J13
I18
H51
H75

Keywords:
Early intervention
Child development
Developmental disorder
Developmental screening
Healthcare cost

ABSTRACT

Early intervention is considered the optimal response to developmental disorders in children. We evaluate a nationwide developmental screening program for preschoolers in Austria and the resulting interventions. Identification of treatment effects is determined by a birthday cutoff-based discontinuity in the eligibility for a financial incentive to participate in the screening. Assigned preschoolers are 14.5 percentage points more likely to participate in the program. For participants with high socio-economic status (SES), we find little evidence for interventions and consistently no effect on healthcare costs in the long run. For low SES preschoolers, we find evidence for substantial interventions, but only weak evidence for cost savings in the long run.

1. Introduction

A growing body of literature across different academic disciplines traces the origins of life-cycle well-being to the very early stages of life (Currie and Rossin-Slater, 2015). One important aspect is early-life health. A variety of policies, such as prenatal care, family leave, nurse home visiting, or early childhood center-based interventions, have the potential to improve health conditions at different stages of early childhood. In this study, we are concerned with medical care interventions for preschoolers with respect to developmental disorders. We are particularly interested in the identification of affected preschoolers, a step that predates any diagnosis or treatment.

An estimated 14 percent of all children in the US have some form of developmental disorder (Boyle et al., 2011). There is widespread agreement among medical specialists and policymakers that early identification of developmental disorders in children is essential for optimal intervention.[1] Developmental disorders, or delayed development, can be caused by specific medical conditions and may indicate an increased risk of other medical complications, as well as emotional and behavioral disorders. Early identification of developmental problems enables further evaluation, diagnosis, and treatment (Chakrabarti and Fombonne, 2001).

Successful intervention improves the well-being of families with affected children. If affected families have predominantly lower socioeconomic status (SES), such early intervention can be perceived as socially fair, since it helps to reduce (health) inequalities. The economic efficiency-based argument for early intervention rests on the simple comparison between the costs of intervention (today) and the costs of non-intervention (later). Proponents typically assume

[1] This view is in line with a growing body of literature pointing to the importance of early childhood in building the foundations for lifelong health. David J. Barker (see, e.g., Barker, 1995) developed the argument that the prenatal environment affects health conditions in adulthood, including heart disease and diabetes. Equivalent reasoning is documented in the literature on human capital, in which substantial benefit from early interventions arises because human capital formation is dynamic in nature (Cunha and Heckman, 2007; Almond and Currie, 2011).

* Corresponding author. Department of Economics, Johannes Kepler University of Linz, Altenberger Straße 69, A-4040 Linz, Austria.
E-mail address: gerald.pruckner@jku.at (G.J. Pruckner).

http://dx.doi.org/10.1016/j.jhealeco.2016.06.011
0167-6296/

that early intervention is more cost-effective than later remediation (Conti and Heckman, 2013).

While these theoretical arguments make a compelling case for early intervention, they do not provide guidance on how to implement intervention. In practice, a crucial point is the identification of developmental disorders that predate any diagnosis or treatment. Typically, developmental screening programs are used. For instance, the *American Academy of Pediatrics* officially recommends that a standardized developmental screening tests should be administered regularly at the ages of 9, 18, and 30 months.[2] Depending on age, these screening tests inspect the development of motor skills and coordination, visual and hearing abilities, communication and language skills, and cognitive abilities. Ideally, screening identifies all developmental disorders in these dimensions and initiates a comprehensive and purposeful response.

Thus far, the literature has not provided rigorous evaluation of physician-based developmental screenings for preschoolers. This is especially surprising given the extensive recommendations made by professional organizations and government agencies. Moyer and Butler (2004) conduct a systematic review of the literature for any pediatrician-based developmental screening and conclude that methodologically sound randomized controlled trials (RCTs) of developmental screenings do not exist. A more recent systematic review focusing on vision screening (Chou et al., 2011) concludes that there is no RCT that compares the effect of screening with non-screening.[3] Cadman et al. (1987) is the only exception we are aware of. Based on an RCT, the authors evaluate the effectiveness of a screening program for 4- to 5-year-old children, which includes general health interviews, and hearing and vision tests administered by public health nurses. They could not detect any effect of the intervention on developmental attainment or school performance 3 years after the screening.[4]

Even if it seems obvious that early intervention is desirable and most likely efficient, the literature has paid insufficient attention to the identification of developmental disorders and associated costs. In this study, we are interested in not only the intervention, but also the screening process that precedes any intervention. Depending on the context, the costs of identifying developmental disorders may vary strongly.

We evaluate a nationwide developmental screening program of preschoolers and subsequent medical interventions in Austria. Austria is a high-income country with a Bismarckian healthcare system offering a prenatal and early postnatal healthcare program that is free of charge and fully financially incentivized. In a subsequent developmental screening program, parents are offered examinations for their children, inter alia, at the ages of 24, 36, and 48 months. Parents may consult any contracted pediatrician or general practitioner (GP) who executes a predefined age-specific developmental screening procedure. This comprises physical examinations, assessment of a child's mental development, and identification of behavioral problems. In case of any abnormal results, the doctor will either schedule a follow-up appointment or refer the child to other professionals. The developmental screening itself and any follow-up appointment are fully covered by statutory health insurance.

In 2000, one provincial government (Upper Austria) introduced a financial incentive to promote developmental screening participation. Irrespective of their household income, families are offered €185 if their child participates in all three screenings, including some stipulated vaccinations. The only eligibility criterion is that the child was born on January 1, 2000 or later. We exploit this sharp birthday cutoff-based discontinuity in the eligibility to obtain exogenous variation in participation. We find that assigned preschoolers are – irrespective of their SES – 14.5 percentage points more likely to be screened.

To assess the cost savings potential of this screening program, we use high-quality administrative data. These provide information on the scope of intervention and long-term healthcare costs. The scope of intervention is quantified by short-run healthcare expenditure for follow-up treatments by the screening doctors and referrals to other specialists. If screening participation increases the likelihood of identifying a disorder, we expect an increase in short-run follow-up expenditure, compared to the counter-factual situation of non-participation. The assessment of the program's cost-saving potential depends on whether and to what extent the savings in the long run exceed the increase in expenditure due to early intervention. We observe the healthcare spending for preschoolers up to 11 years of age. Since we do not observe any direct measures of preschoolers' well-being, we cannot provide a comprehensive welfare-based cost–benefit analysis. The program may generate quality of life increases that are possible through early intervention only and not later spending.[5]

Based on a fuzzy *regression discontinuity design* (RDD), we find that the program is clearly *not* effective for preschoolers with higher SES, who comprise about 75 percent of the total preschooler population. For this group, we obtain a consistent picture with little evidence for interventions (the only exception is follow-up examinations by ophthalmologists), and consequently there is no effect on healthcare costs in the long run. For low SES preschoolers, who comprise about 25 percent of the total preschooler population, the interpretation is less clear. While we find clear evidence for interventions with follow-up examinations by several medical specialists, there is only weak evidence for cost savings in the long run. As an alternative interpretation, we consider the increase in healthcare expenditure in the short run not as an intervention addressing developmental disorders, but as supply-induced over-treatment resulting from profit-maximizing screening doctors. An additional estimation analysis focusing on "referred" follow-up examinations, without any financial benefit for the screening doctors, provides evidence that at least part of the increase in short-run healthcare expenditure is due to justified interventions.

These results have to be interpreted in the context of the Austrian healthcare system. There are financial incentives for health screenings up to the second year of life and participation rates are high (see Section 3.1.1). Moreover, parents can always consult medical specialists independently of participation in the program and free of charge. We consider our results representative of a European welfare state, for which we conclude that general physician-based

[2] See Council on Children With Disabilities, Section on Developmental Behavioral Pediatrics, Bright Futures Steering Committee and Medical Home Initiatives for Children With Special Needs Project Advisory Committee (2006) and reaffirmation for this policy in the American Academy of Pediatrics (2010).

[3] Williams et al. (2002) compare more intensive and less intensive screening. They focus on the detection and early treatment of amblyopia. The control group was assigned to a single intensive orthoptic screening at 37 months of age. The treatment group was screened five times (at 8, 12, 18, 25, and 37 months of age). The main result is that amblyopia was significantly less prevalent among the treatment group at the age of 7.5 years.

[4] In contrast to screening activities in the physician's office, there is substantial evidence on the effectiveness of home visit programs and more comprehensive center-based preschool interventions. Both types of interventions typically focus on children at risk because of low parental income or other adverse social circumstances and often comprise a developmental screening component. Meta-analyses confirm the effectiveness of home visit programs (Avellar and Supplee, 2013; Peacock et al., 2013; Sweet and Appelbaum, 2004) and center-based preschool interventions (Duncan and Magnuson, 2013) for improving the outcomes of participating families along several dimensions, including children's long-run health outcomes (Campbell et al., 2014; Carneiro and Ginja, 2014).

[5] For example, the prescription of glasses for children with visual impairment in due time generates health benefits, irrespective of short- and long-run out-of-pocket healthcare costs.