



Labor market consequences of growing up with a sibling with type 1-diabetes



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ABSTRACT

Economic research on child health and future labor market outcomes has mainly focused on children with impaired health themselves, and only recently begun to assess spillover effects for siblings. Yet, the challenge to accommodate a family's routines within the requirements of a complex and time-consuming disease is most likely to spillover on siblings. While the burden of ill health and managing a disease may have adverse effects, living with a disease may still give families useful experiences and skills that favor future labor market outcomes. Therefore, the potential labor market impacts of growing up with a sick sibling could be both positive and negative. This study investigates differences in the progression of annual labor earnings between siblings of children with type 1-diabetes and population controls. The data is based on detailed Swedish longitudinal registers, covering annual labor earnings in the years 1990–2010 for 764 siblings of 764 children with diabetes and 5506 population controls born in 1962–1971, and follow individuals between ages 19–48. The results indicate that brothers of children with type 1-diabetes have lower earnings growth than controls, while sisters' earnings growth appears unaffected. Consequently, spillovers from one family member to another might differ within a family.

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1. Introduction

Existing evidence shows that childhood health affects adult labor market outcomes (see, e.g., [Almond and Mazumder, 2013](#); [Currie, 2009](#); [Currie and Almond, 2011](#)). Only recently has economic research started to investigate whether or not health shocks in early life affect outcomes, not only for the sick child, but also for other members of the family. A few economic studies on educational outcomes confirm the existence of spillovers between siblings. While [Breining et al. \(2015\)](#) show positive spillovers from early-life medical interventions, [Breining \(2014\)](#) shows negative influence of ADHD on siblings' educational outcomes in ninth grade. Similarly, [Fletcher et al. \(2012\)](#) report that having a sibling with developmental disability or externalizing behavior is associated with lower math and language test scores. In addition, a related literature report negative long-run educational and labor market impacts of childhood peers (see, e.g., [Carrell et al., 2016](#)). Building on the framework developed by [Bolin et al. \(2002\)](#) and [Jacobson \(2000\)](#), who model the family as a health-producing unit

and assume interrelatedness in the health of all family members, this paper contributes to this recent strand of literature by investigating the earnings of siblings growing up with a brother or sister with type 1-diabetes.

Type 1-diabetes (hereafter referred to as diabetes) is a disease with a sudden onset and well-documented consequences on everyday life and future health. Parents describe onset as a time of crisis, as learning the child's daily management routines and accommodating family routines to the requirements imposed by the disease generally poses a great challenge to the entire family ([Wennick and Hallström, 2006](#)). Managing the diabetes is complex and time-consuming, involving several daily insulin injections and blood glucose check-ups, exercise, and dietary restrictions. The imposed focus on a healthier lifestyle with daily routines could have positive effects, fostering children to become more responsible adults. Moreover, caring for a child with diabetes imposes a host of long-term stressors (e.g., fear of hypoglycemia and increased insecurity about future health) ([Sparud-Lundin et al., 2013](#)). Therefore, the time and effort needed to manage the disease and the stress and insecurities that follows are likely to affect the entire family, even though some children with diabetes are relatively healthy during long periods.

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Several studies find that childhood onset of diabetes has adverse educational and labor market consequences for the affected individual (see, e.g., [Dahlquist et al., 2007](#); [Fletcher and Richards, 2012](#); [Lundborg et al., 2014](#); [Minor, 2011, 2013](#); [Persson et al., 2013](#); [Steen Carlsson et al., 2010](#)). Moreover, child health shocks have been shown to strain family resources (e.g., by reducing parents' working hours ([Kvist et al., 2013](#))), change intra-household resource allocation (e.g., parents compensate for or reinforce differences in child endowments ([Almond and Mazumder, 2013](#); [Currie and Almond, 2011](#))), and affect the quality of interaction among family members ([Heckman and Mosso, 2014](#)).

Many families of children with diabetes spend time and effort to restore and maintain the child's health. This could cause the family to redefine its preferences towards, for example, a healthier lifestyle, but reduce the family resources available for other activities. Such changes may in turn affect the sick child's skill formation and labor market performance later in life. If this is the case, not only the sick child, but also its siblings, could be affected. If parents spend less time helping with homework due to changes in their time constraints, this may have negative consequences for the human capital formation of both the child with diabetes and his or her siblings. Alternatively, if, in caring for a child with diabetes, parents become more health- and family-oriented, parent-child interactions may improve and the children may learn skills (such as responsibility and foresightedness) that favor future labor market outcomes. Consequently, potential diabetes-related spillover effects on siblings may run through several channels and could either undermine or improve future labor market outcomes. The resulting impact on earnings is, therefore, an empirical question.

The spillover effects on siblings' outcomes may differ substantially between individuals. [Heckman et al. \(2006\)](#) argue that human capabilities (i.e., health, cognitive skills, and non-cognitive skills) are closely related and that behaviors and abilities have both a genetic and an acquired character. Therefore, unobservable individual-specific factors might affect both health behaviors and the capability of incorporating a sibling's diabetes into everyday life. These individual-specific factors may have both moderating and mediating effects on sibling outcomes. As moderators they may indicate heterogeneous effects across individuals with certain individual-specific characteristics. For example, inherited ability and/or preferences are likely to moderate sibling spillovers by influencing *if* and *how much* the individual's behavior is affected by having a sibling with diabetes.

On the other hand, child and adolescent abilities and preferences may themselves be influenced by having a sick sibling, thereby mediating the spillover effects of the diabetes. If the individual-specific factors are mediators, education and family formation are also likely to be affected by the sibling's diabetes, as cognitive and non-cognitive ability directly affects schooling, fertility, and other aspects of social and economic life ([Heckman et al., 2006](#)). Assessing observable mediator variables related to education and family formation may give us a clue to whether unobservable abilities contribute to the mechanisms of the potential sibling spillover effects. Individual-specific factors (e.g., inherited preferences favoring a healthy lifestyle) may also be important confounders, influencing the development of diabetes, which is a multifactorial disease, triggered by a partially unknown combination of environmental and genetic factors ([Daneman, 2006](#)). Therefore, we cannot rule out the possibility that individual-specific factors are correlated with both the presence of a diabetic sibling and future labor market outcomes.

Using detailed Swedish longitudinal registers, covering the years 1990–2010, I examine the progression of annual earnings for

individuals with a sibling that was diagnosed with diabetes in age 6–15. Following the earnings trajectories of individuals aged 19–48 during this time period (hence born in 1962–1971), I take an exploratory approach to assess the potential influence of both unobservable individual-specific factors and mediator variables related to education and family formation.

Psychological research in diabetes and child health suggests that siblings of chronically ill children have contradictory feelings towards their sick brother or sister: a strong sense of responsibility (e.g., acting as protector and caregiver); resentment (e.g., being jealous of the sick sibling receiving extra attention); exaggerated sibling rivalry (e.g., fighting for parents' attention); and social and emotional isolation (e.g., being afraid to increase their parents' worries and evoke their anger by showing negative feelings for, or fail to protect, their sick sibling) ([Wennick and Huus, 2012](#); [O'Brien et al., 2009](#)).

[Hollidge \(2001\)](#) finds that such feelings may interfere with psychological development and contribute to feelings of low self-esteem, anxiety and/or depressive and psychosomatic symptoms. However, similar studies focusing solely on siblings of children with diabetes are scarce and their results are inconclusive ([Gendelman et al., 2009](#); [Luyckx et al., 2010](#); [Sleeman et al., 2010](#)). Whereas some studies find increased risk of maladjustment ([Adams et al., 1991](#)), others find that siblings of children with diabetes function psychologically as well, or even better, than siblings of non-diabetic children ([Hollidge, 2001](#); [Jackson et al., 2008](#); [Sleeman et al., 2010](#)).

Despite the conflicting results, this literature suggests that boys and girls may respond differently when their sibling falls ill ([Gendelman et al., 2009](#); [Hollidge, 2001](#); [O'Brien et al., 2009](#)). Girls tend to show more internalizing symptoms (e.g., depression, withdrawal), while boys show more externalizing ones (e.g., hyperactivity, aggression). It is possible that these gender differences affect labor market responses to growing up with diabetes, as externalizing behaviors have been connected to adverse educational ([McLeod and Kaiser, 2004](#); [Miech et al., 1999](#)) and labor market ([Gregg and Machin, 2000](#)) outcomes, whereas internalizing strategies appear to have less of an impact on future outcomes ([McLeod and Kaiser, 2004](#); [Miech et al., 1999](#)).

2. Data

This study uses data from the Swedish Childhood Diabetes Register (SCDR), which has recorded incident cases of diabetes in children aged 0–14.9 years in Sweden since 1977 (see, e.g., [Dahlquist et al., 1982](#)). The SCDR data is collected in accordance with the Declaration of Helsinki. Informed consent was given by all parents of registered children. Present research on the database was approved by the Regional Research Ethics Board in Umeå (Dnr 071-69M). The Swedish Childhood Diabetes Study Group has added data to the SCDR as follows: for each individual, Statistics Sweden identified parents and siblings from the Multi-Generation Register and matched four non-diabetic controls from the Total Population Register to each individual with diabetes by age and municipality of residence at the time of diagnosis. Statistics Sweden also connected the population controls to their parents and added background characteristics and yearly earnings data for 1990–2010, for each individual from the Longitudinal Integration Database for Health Insurance and Labour Market Studies ([Statistics Sweden, 2011](#)).

The SCDR comprises 2551 non-diabetic siblings of children who were born in 1962–1971 and diagnosed with diabetes between 1977 and 1986. I excluded 527 siblings born before 1962 and 846 siblings born after 1971 to prevent differing age distributions of affecting the results. The reason behind the differing age

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