

Family Investment Responses to Childhood Health Conditions: Intrafamily Allocation of Resources

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Work in progress *

This Draft: May 2, 2013

Abstract

The onset of a health condition during childhood impairs children's skill formation. In fact, a number of studies in the economics literature have investigated the long-lasting effects of poor health during childhood on later-in-life outcomes. However, this evidence ignores how parents respond to the presence of an ill child. Do their investments reinforce the poor health condition? Do they compensate, or behave neutrally? If parents change their investment behaviors, the relationship between early health and later outcomes may not be completely causal but could be confounded with family investment responses. To address this question, I used within-sibling variation in the incidence of a health condition to control for selection from unobserved household heterogeneity. I find that parents reinforce mental conditions while they behave neutrally if a child has a physical condition. Indeed, parents invest on average 0.16 standard deviations less in children with mental health conditions relative to their healthy siblings, using a measure of family investment that includes time and resources. These results shed light on the importance of involving the family as part of policies that target children with serious health conditions.

Keywords: health conditions, household behavior, family investments, intra-family allocation, capabilities, sibling estimator

JEL codes: D13, J13, I14

*I'm very grateful to Dan Black, Kerwin Charles, Amy Claessens, Robert Lalonde, and Alicia Menendez for their guidance, support and feedback in this project. I thank Pietro Biroli, Joshua Goodman, Nikolas Mittag, Alejandro Ome, Javaeria Qureshi, Patti Ritter and seminar participants at the Harris School Labor Economics Working group, Center of Human Potential workshop, CESifo Economic Studies Conference, LatinAmerica Economic Association (LACEA), and Association of Public Policy and Management (APPAM) conferences for helpful comments. I acknowledge the Irving Harris Fellowship, and the Center for Human Potential Pre-dissertation fellowship for financial support. All errors are my own. Email:mrosales@uchicago.edu

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1 Introduction

Evidence of the exceeding importance of early childhood experiences on the development of human capabilities is growing. The consensus in economic and health literature is that poor health during the early years of life weakens human capital formation. Health is both a type of human capital and a contributor to other forms of human capital (Becker, 2007). Parenting and family investments are other determinants of children’s capabilities (Cunha and Heckman, 2007, 2008). A large number of studies in the economics literature have shown evidence of the effects of poor health in childhood on adult outcomes (see Almond and Currie (2011) for an inventory). However, the severity of the health impairment can be lessened or exacerbated by the way parents invest in their unhealthy child. Parents can invest more, less, or the same in the ill child relative to a healthy one. Therefore, the effect of poor health in childhood on later outcomes may not be completely causal but could be confounded by the family investment responses.

The goal of this study is to understand how families choose to invest in response to the onset of a child’s health condition. After the onset of a health-limiting condition, family investments can reinforce, or compensate for child health conditions, or they can remain unchanged relative to healthy siblings. The theoretical framework of intrahousehold allocation decisions from Becker and Tomes (1976) and Behrman et al. (1982) predict ambiguous responses. According to Becker and Tomes’s model, family investment decisions depend on the relationship between endowments and cost of investments, and thus are driven by efficiency. If a health-limiting condition in a child implies a lower return on investments, then investing in the unhealthy child becomes less profitable, and so parents will adopt a reinforcing strategy. Behrman et al. integrate parental attitudes about inequality in this model. If parents care about sibling equality in earnings, they would invest more in the ill child and adopt a compensating strategy.¹ The existing ambiguity in how families invest in

¹In Becker and Tomes (1976) model, altruistic parents also care about equity and use transfers or bequests to achieve equal distribution of wealth across offspring.

the unhealthy child creates an empirical question.

To investigate parental investment responses to childhood health conditions, I used data from the children of the National Longitudinal Survey of Youth (CNLSY79). Family investments were assessed through an aggregate measure that captures parental stimulation and support both related to time and resources (HOME score). Child health conditions were measured through maternal self-report of any conditions that limits child engagement in any age-related activity or that requires medication and/or doctor visits.

To estimate the effect of having a health-limiting condition on family investments, I used within-sibling variation in the incidence of health conditions. Because childhood illnesses do not occur randomly, I compared investment allocations across siblings to address the endogeneity concerns. In addition, the model controlled for a wide range of family background characteristics and prenatal choices (e.g., whether the mother smoked or drank during pregnancy) and children's characteristics. The effect of having a health condition on investments is identified under the assumption that within a family, the occurrence of an illness is exogenous to investments once controlling for several family and child variables.

The results show that parents reinforce the occurrence of an illness. On average, the effect of ever having a health condition on parental investments is -0.083 standard deviations (SDs) on the HOME (Home Observation for Measurement of the Environment) score summary index.

Furthermore, family investment responses can vary depending on the degree of impairment of the particular health condition. Therefore, I explored differential responses by type of condition: mental or physical. The estimates suggest that children who have a mental illness receive on average 0.16 SDs less investment than their healthy siblings. This magnitude is approximately 60% of the black and white gap in HOME investments (0.26 SDs) and comparable to the investments gap between mothers with some college and mothers with less than college (0.17 SDs)². On the contrary, when children have a physical condition,

²These gaps were calculated for the CNLSY sample. However, I need to think about if this is a good way to give a sense of magnitude for my findings

parental investments do not differ across siblings.

The remainder of the paper is organized as follows. The next section reviews the literature on family investments and health in childhood. Section 3 presents a theoretical model. Section 4 describes the data. Section 5 presents the empirical strategy and section 6 analyses the results. Section 7 shows some robustness checks. Section 8 presents some extensions and section 10 concludes this paper.

2 Literature Review on Family Investments and Health in Childhood

There is a consensus in the literature that poor childhood health has long-lasting effects on adulthood outcomes (See [Almond and Currie \(2010\)](#) for an inventory). When children are born prematurely or when they experience chronic physical or mental health conditions in early childhood, they are more likely to have lower cognitive functioning, lower educational attainments, poorer health, and lower socioeconomic status as adults(see e.g., [Behrman and Rosenzweig 2004](#); [Case et al. 2005](#); [Currie and Hyson 1999](#); [Currie and Stabile 2004](#); [Currie et al. 2008](#); [Salm and Schunk 2008](#) for an example of this literature). However, if parents respond to poor health by changing their investment decisions, these lasting effects of health impairments could combine both the direct effect of health conditions and the behavioral family responses. In practice, evidence of how parents react to the onset of health-limiting conditions in children can help policymakers to improve policies that target children with disabilities.

In economics, two theoretical models of intrahousehold allocation decisions predict ambiguous responses of parental investments to child endowments. On one hand, according to [Becker and Tomes \(1976\)](#), family investment decisions depend on the relationship between endowments and cost of investments. The occurrence of a negative health shock decreases the health capital of a child. Because the negative health condition increases the cost of

investments, poor health status in a child may imply a lower return to human capital investments. If human capital and a child's health complement each other, the lower health endowment of the unhealthy child makes less profitable to invest in his human capital. As a consequence, parents will make fewer human capital investments in the unhealthy children and more in the healthier ones. Becker and Tomes called this phenomenon a reinforcement strategy. According to this model, parents' investment behaviors are driven by efficiency concerns. However, altruistic parents will try to equalize the distribution of wealth among their children by giving more transfers (bequests) to the unhealthy child.

On the other hand, [Behrman et al. \(1982\)](#) integrate parental concern for child inequality in earnings to the Becker and Tomes model. Behrman and colleagues' model, known as the "preference model, is based on the fact that parents affect their children's well-being through the resources they invest in human capital. According to the authors, parents care about earnings differential across their offspring. A negative health shock alters the environment, information, and preferences of parents and children and, therefore, their investment decisions. If parents are averse to sibling inequality in earnings, a negative health shock will result in parents investing more in the unhealthy child and less in the healthy siblings. This model implies that parental investments are substitutes for health capital. Behrman et al. named this phenomenon compensating investment strategy.

Empirical evidence The evidence regarding how parents respond to negative health shocks among their children is mixed. There is no consensus on whether parents are driven by efficiency, as postulated by [Becker and Tomes \(1976\)](#), or if they are motivated by concerns about sibling inequality, as argued by [Behrman et al. \(1982\)](#). According to the growing literature, parents' investment responses depend on the type of investments (health-oriented versus education-oriented), as well as their socioeconomic status (disadvantaged versus more advantaged).

Previous studies have mainly focused on family responses to specific measures of health

endowments, such as birth weight (Datar et al., 2010; Hsin, 2007; Rosenzweig and Zhang, 2009) , and most have found evidence in favor of Becker and Tomes’s (1976) efficiency arguments. Using U.S. data and siblings or twins fixed-effects techniques to address the endogeneity of birth weight, these papers found that parents invest less in low-birth-weight children in terms of breast-feeding, well-baby doctor visits, immunizations, preschool enrollment, education expenditures, and parental time. These findings suggest that parents behave in a reinforcing manner, as predicted by Becker and Tomes.

Hsin (2007) used data from U.S. siblings and found that the family investment responses vary depending on the level of education of the mother. Mothers with less education spend less time with their low-birth-weight child compared to a healthy one. Thus, less-educated mothers take a reinforcing strategy in terms of time investments. In contrast, more-educated mothers act in a compensating manner and invest more time in the low-birth-weight child.

To the best of my knowledge, just one study has analyzed the effect of childhood health conditions on parental investments (Conti et al., 2010). The authors studied whether early health shocks (measured by the presence of serious disease between 0 and 3 years) affected parental investments and child’s later outcomes using a sample of twins in China. They found that parents invest more in the ill twin in terms of medical expenditures. In other words, parents adopt a compensating strategy when choosing health investments. However, parents make less educational investments in the unhealthy twin. Therefore, in terms of education expenditures, parents reinforce the health conditions. Conti et al. (2010) also explored time investments and found that parents spend the same amount of time on both the ill and healthy twin.

In summary, the evidence is mixed regarding how parents’ investments respond to negative health shocks in their children. There is no consensus on whether parents are driven by efficiency, or if they are motivated by concerns on sibling inequality. This paper contributes to this growing literature by studying childhood health-limiting conditions of several types (mental disabilities and physical diseases) in a developed country (the United States); and

by analyzing a measure of investments, that includes time and resource behavior, which has never been analyzed before in this context.

3 Conceptual framework

Theoretical model section to be developed

4 Data

I used data from the CNLSY79, which survey all children born to female respondents of the National Longitudinal Survey of Youth 1979. This data set contains information on both child health conditions and parental investments from 1986 to 2008. Unlike many longitudinal studies that survey just a cohort of children, the CNLSY79 interviewed all siblings a key feature for my identification strategy, which uses variation in siblings' health conditions and family investments. These children were interviewed biannually.

The CNSLY79 contains information on 11,495 children born to 4,929 mothers. Of these children, 10,389 provided accurate information on health-limiting conditions in any of the waves and between ages 0 and 14.³ Because child's health status is not randomly assigned across families, I used within-family variation in the occurrence of health-limiting conditions across siblings (family fixed-effect model). I further restricted the sample to mothers with at least two children surveyed between 1986 and 2008. This led to a sample of 9,476 children born to 3,565 mothers.

To measure family investments, I used the Home Observation for Measurement of the Environment (HOME), an instrument that measures for each child the quality of cognitive stimulation and emotional support investments provided by the family (CNLSY79 User Guide 2008). The version administered is a short version of the original inventory designed

³Some of the children have misleading reports regarding health conditions in the sense that a limiting condition was reported, but it did not include its type, which is important information in my study.

by Caldwell and Bradley (1984, 1992). It combines both maternal reports and interviewed observations, and some items are age specific. Responses to the individual items were aggregated by the CNLSY79 in a total HOME score, which is constructed through the aggregation of individual item responses. In addition, the data include scores for the cognitive stimulation and emotional support sub-scales (table 1). The cognitive stimulation subscale consists of learning investments to children such as reading, going to the museum, hobbies encouragement, helping the child to learn numbers, shapes, etc. The emotional support subscale measures nurturing investments like talking to the child, spanking, caressing, kissing or hugging, etc. The scores are standardized based on internal norms according to child's age. Since 1994, the inventory has been applied to children up to 14 years old; thus, my analysis considered children between ages 0 and 14.

Furthermore, the CNLSY79 gathers information on the presence of health conditions that limit childhood activities, such as going to school or playing and/or that require special equipment, medicine, or regular doctor visits. It also specifies the type of the health conditions. Twenty-five percent of the children in my sample had a health-limiting condition in any year between 1986 and 2008 (table 2). The most prevalent conditions were asthma, learning disabilities, and allergies.⁴ The information in the dataset allowed me to explore whether family investments responses vary according to the type of condition, physical or mental.⁵ Alternatively, I also divided the conditions according to the type of manifestation. Episodic conditions refer to those conditions with recurrent symptoms but their occurrence and duration are difficult to predict. Non episodic conditions refer to those illnesses that manifest in a fairly manner. This distinction may be important because the type of illness'

⁴Note that other conditions also account for a large percentage. However, many of them correspond to children who reported more than one condition.

⁵Mental conditions correspond to those published in the Diagnosis and Statistical Manual of Mental Disorders IV (DSM IV).

manifestation influence how parents could react (Feng (2006)).⁶

Figure 1 summarizes the pattern of reported health problems, conditional on ever reporting a condition. Almost one-half of the parents with a child who had an illness reported the health condition just once during the period of study, which is puzzling. There are several potential explanations for this. First, these cases could be instances of misreporting; mothers may not have later reported a condition that was still present. Second, the reports could be false-negative episodes. Third, the conditions might have been highly treatable and were no longer issues after treatment. The first two potential scenarios are examples of measurement error. However, the information in the data used for the analysis does not allow me to identify these possibilities.⁷ Therefore, the empirical strategy to identify the effect of health conditions on parental investments considered separately the effect of having conditions reported once versus conditions reported twice or more times.

Family fixed-effect models rely on within-family variation, and in this sample there was substantial within-family variability in health status and parental investments across siblings (see table 3). Nineteen percent of the families had at least one child who had a health condition that they reported just once between 1986 and 2008 and at least one healthy child. Twenty-four percent of the mothers in the sample had at least one child who had a health condition reported more than once and at least one healthy child. Regarding parental investments, the variation in the total HOME score within the family across time was very similar to the between-family variation.

⁶Episodic conditions are allergic conditions, asthma, ear infections, epilepsy, and respiratory disorders. Nonepisodic limitations are learning disabilities, minimal brain dysfunction, speech impairments, hearing difficulties, blindness, emotional disorders, orthopedic handicaps, mental retardation, heart trouble, chronic nervousness, blood disorders, and hyperkinesis/hyperactivity. This classification was taken from Feng (2006) which studied parental labor participation responses to childhood health conditions

⁷For instance, it would be ideal to have information from doctors' reports. However, for the best of my knowledge, I did not find a dataset that combines administrative and doctors reports with family investments.

5 Empirical Strategy

The analysis of how parents choose to invest in response to childhood health condition cannot be performed using simple comparisons between healthy and ill children because health conditions do not randomly occur across children and families. Families with sick children have heterogeneous characteristics. For instance, these families tend to be more disadvantaged, larger in size, and headed by unmarried parents (Stronhschein, 2002; Van Cleave et al., 2010). Therefore, a selection problem arises if the presence of unobserved characteristics is correlated with both investments and health conditions.

Ignoring this threat will result in biased estimates of the effects of childhood health conditions on family investments. For instance, if parents reinforce a childhood health condition and disadvantaged families are more likely to have an ill child, then ordinary least-squares (OLS) parameters will be overestimated. If, on the contrary, parents exhibit a compensating behavior, OLS coefficients will be underestimated. The bias will reverse if more advantaged parents are more likely to have (or detect) that a child is ill. However, it is not clear that a specific type of family is more prone to have ill children. Thus, the potential bias comes from a combination of several sources.

To deal with the selection problem, I relied on family fixed-effects models, which compare parental investments among children who have ever been ill and children who have never been ill within a given family. This technique uses variation in health status among siblings over time. Thus, it controls for unobserved family characteristics that are time invariant and common to all children in the family. As noted, I controlled for a wide range of family background characteristics and prenatal choices (e.g., whether the mother smoked or drank during pregnancy) and children’s characteristics. The estimated model is

$$I_{i,j,t,a} = \gamma Ever\ Ill_{i,j,t,a} + X_{i,j,t,a}\beta + \alpha_t + \eta_a + \mu_j + \varepsilon_{i,j,t,a} \quad (1)$$

where: i , j , a , and t denote child, family, age, and survey year, respectively. I represent

the investment outcomes, which correspond to the total HOME score, cognitive stimulation investments and emotional support investments. $Ever_Ill_{i,j,t,a} = 1$ if child i has a health condition at year t or had it in the past. Control variables (X) include child sociodemographics, maternal pregnancy characteristics, and household characteristics.⁸ Family fixed-effect model uses the change over time in the likelihood of ever having a health condition within a family as the source of variation to identify the parameter of interest.

In this model, the causal relationship between childhood health conditions and family investments is identified under the assumption that the differences in the occurrence of an illness across siblings are exogenous to investments. In other words, among siblings, whether a child is affected by a health condition is exogenous to investments after controlling for several background characteristics. The fixed-effect model also deals with measurement error in the health status so long as it is family specific and time invariant.

Potential caveats to the validity of this approach come from the possibility that the child-timespecific error term is correlated with the health status. Therefore, this model does not control for the possibility that children within families differ in unobservable ways. For instance, if parents treat offspring differently in some unobserved way that is not controlled for and is correlated with the likelihood of having a health-limiting condition, then fixed-effects estimates will be biased. Another potential threat is family time varying or child-specific measurement error in health status. In this case, using fixed effects could bias the coefficients toward zero.

Moreover, an additional caveat is that family fixed-effect models rule out the presence of spillovers from the unhealthy child to other siblings because this technique uses within-family variation. Indeed, after the onset of a child health condition, parents can react by also changing the overall family investment levels, which may under- or overestimate the effect

⁸Specifically, it includes gender, birth order, dummy of low birth weight, gestational age, whether the mother smoked or drank during pregnancy, dummies for the mother's age at birth, whether child is covered by Medicaid, whether child has health insurance, race, maternal education level, maternal locus of control in 1979, maternal self-esteem in 1980, maternal ability (AFQT) in 1981, and dummies for child age and survey years.

of having an illness. For instance, if parents behave in a reinforcing manner and they also decrease overall family investments, the fixed-effect estimate of the effect of having a health condition on parental investments would be underestimated.

6 Results

6.1 Effects of ever having a health condition on home investments

This section presents the estimates of the effect of ever having a serious health condition on three family investments outcomes: total HOME score, cognitive stimulation, and emotional support. In table 5, each column presents the estimates of a version of the model equation as a different set of covariates are added to the model in order to underline the importance of controlling for observed and unobserved child and family characteristics.

The OLS estimates (table 5, columns 13) show that after controlling for observable child and family characteristics, the effect of a child ever having a serious condition on family investments was statistically insignificant for the three family investments outcomes. Specification 1 shows the OLS estimates of the unconditional mean difference in family investments between children with a health condition and healthy children (controlling for year and age, unobservable characteristics that affect the pattern of investments). Total HOME and cognitive stimulation investments were on average not statistically different between children who had a serious condition and their healthy counterparts. In terms of emotional support, ill children received 0.06 SDs fewer investments, on average. Specification 2 additionally controls for observed characteristics of children. The estimated effect of ever having a serious illness on family investments is now statistically significant for the total HOME score and it is equal to -.05 SDs. Specification 3 adds as controls family characteristics that are both time varying (income, if receiving welfare, marital status, number of children, mother's annual hours of work, and whether the mother has a health limitation) and time invariant (mother's education level, body mass index, cognitive ability (AFQT), locus of control, and

self-esteem).⁹ When controlling for observable characteristics of both children and family, the differences disappeared between the HOME investments in children who had a serious illness and healthy children.

In contrast to the OLS estimates, when family unobserved characteristics are accounted for, the results suggest that parents' investments reinforce children's health conditions, which suggests that they are driven by efficiency concerns. Columns 4, 5, and 6 in table 5 present the estimates from specifications that include family fixed effects and progressively add observed characteristics of children and families. In general, the effect of ever having a health condition on family investments is -0.044 SDs for total HOME score, and -0.037 for both cognitive stimulation and emotional support investments (see column 6, preferred specification). These results show that families invest less in an ill child compared to healthy siblings. In other words, parents reinforce the presence of health-limiting conditions.

Parent investment responses may differ according to the type of health condition in terms of nature of the illness (mental vs. physical) or its type of manifestation (episodic vs. nonepisodic). Table 6 shows that family investments reinforce mental health conditions given that, on average, parents invest less in children who have a mental health problem. In contrast, parental investments strategies are neutral for children with physical illnesses. Parents allocate 0.16 SDs less total HOME investments to children who had mental health conditions. The effect of ever having a mental health condition on cognitive stimulation and emotional support investments are -0.154 and -0.113 SDs on average, respectively.

When health conditions are divided into episodic and nonepisodic conditions, results corroborate the heterogeneous investment responses (table 7). Parents invest less in children who had a nonepisodic health condition, while they behave neutrally if the child had an episodic condition. On average, parents reduce total HOME investments in children with a nonepisodic condition by 0.10 SDs; cognitive stimulation investments are reduced by 0.103 SDs, and emotional support by 0.065 SDs.

⁹The last four characteristics come from the mother's interview data from the NLSY79. Body mass index was measured in 1985, AFQT in 1981, self-esteem in 1980, and locus of control in 1979.

6.2 Heterogeneous treatment

6.2.1 Report patterns

As shown above, conditional on ever having a health condition, almost half of children reported a condition just once between 1986 and 2008 (figure 1). This potential evidence of measurement error is a concern, because it may be correlated with unobserved characteristics that also affected the investments. To address the confounding effect of measurement error, I estimated a version of the model equation that separates the effect of having a health condition reported once versus having a health condition reported two or more times. Table 8 presents the results of this specification for all the illnesses and according to the type of conditions. The estimates suggest that the effect of ever having a health condition is negative and statistically significant for those children who reported a health condition more than once in the panel. On average, ill children with a condition reported at least twice received 0.083 SDs less total HOME investments. In contrast, the effect is statistically insignificant for those children with conditions reported just once, which confirms the potential measurement error in the health status variable. In fact, these estimates are also larger than those that pool together the children with one report and two or more reports, whose estimates in the previous specifications were attenuated.

When the health conditions are grouped according to the nature of the disability (table 8, middle panel), parents invest less in the children with mental health conditions independently of the number of reports. However, the effects are much larger for the children with mental health conditions reported more than once. Children with a mental illness that was reported more than once received on average 0.22 SDs less total HOME investments, 0.26 SDs less cognitive stimulation investments, and 0.13 SDs less emotional support than their healthy siblings (table 7, middle panel).

Similarly, when the conditions are separated by type of manifestation, parents invest less in children who had a nonepisodic condition that was reported more than once (table 8, lower

panel). The effects are -0.19, -0.21 and -0.09 SDs on total HOME, cognitive stimulation, and emotional support investments, respectively.

6.2.2 Child characteristics

I further explored whether parents respond differently to the onset of health conditions depending on the gender or birth order of the child. Each column in tables 9 and 10 corresponds to the version of the model equation that separates the frequency of reports (as in 8). Table 9 presents the estimations by gender of the ill child. Results for parental investment responses in terms of cognitive stimulation do not show gender-specific effects. Parents invest less in cognitive stimulation of the ill child regardless of his or her gender. However, column 3 shows that girls who had a mental condition reported at least twice received on average less parental investments in emotional support than their healthy siblings. The negative effect of ever having a mental condition (reported at least twice) on emotional support is approximately -0.3 SDs for female children; while the results for males are not statistically significant (p value for the equality of these coefficients is .04). The results are very similar when the health-limiting conditions are examined by type of manifestations, given that female children who had a nonepisodic condition received less investment in terms of emotional support than their healthy siblings.

Table 10 shows results that separate the sample of ill children between firstborn versus those born later. Parents appeared to invest less in later-born children with a mental condition reported at least twice, while they did not change their behavior if the ill child was their firstborn. However, the investment differences are not statistically significant when measured by the total HOME score and emotional support. In contrast, cognitive stimulation investments do differ. In fact, parents invest approximately 0.32 SDs less in later-born children with mental conditions reported at least twice; compared with their healthy siblings. On the other hand, if the firstborn child had a mental condition reported at least twice, parental investment responses are smaller. This effect is -0.13 SDs (see column 2; P value for the

equality of these coefficients is .06). These results are in line with findings the economic literature that show a large negative effect of birth order on the human capital of children (Devereux et al., 2005).

7 Robustness checks

7.1 Do families invest differentially prior to the onset of the condition?

The main threat to the validity of the model in 1 is the presence of sibling unobserved heterogeneity. In other words, a potential concern is that parents may treat children differently in some unobserved way that is not controlled for and is correlated with both the onset of a condition and investments. To explore this caveat, I estimated a model that defines the variable of interest as the lead of the first report of a health condition. If investments are not statistically different between the ill child and healthy sibling prior to the onset of the health condition, then this may point to no threat to the sibling invariance assumption. In contrast, if parents change their investments' behavior prior to reporting the condition, then this may point to a threat of reverse causality. However, this does not necessarily imply this sort of bias because parents may anticipate the formal diagnosis of an illness.

The evidence presented in table 11 suggests that parents do not differentially treat their children prior to the onset of a child's health condition. These estimations restrict the sample to the children who have observations at least one period before the first report of an illness. Note that this restriction may change the distribution of the prevalence of health conditions given that illnesses present since birth are ignored. The results indicate that parents do not change their investments strategy in the years before the onset of a health condition. The coefficient of the lead is not statistically different from zero in any of the specification of the health status (over all conditions and by type). Therefore, this result suggests no evidence of reverse causality.

7.2 Child fixed effects

To provide additional suggestive evidence against the concern of sibling unobserved heterogeneity, I exploit the fact that the CNLSY is a longitudinal dataset that has repeated data on each child. Ideally, a child fixed effect model would be preferable to a family fixed effect model. However, it requires enough within child variation on the health status variable in order to identify the parameter of interest. In these dataset, there is small within child variation on the presence of a health-limiting condition. A large fraction of children do not have data prior to the onset of a health problem. But still there are some children that have some variation in health status. The advantage of a child fixed effect model is that it controls for children unobserved heterogeneity. The estimated model is the following:

$$I_{i,j,t,a} = \gamma Ever_Ill_{i,j,t,a} + X_{i,j,t,a}\beta + \alpha_t + \eta_a + \tau_i + \epsilon_{i,j,t,a} \quad (2)$$

Table 12 shows the estimates from this model. The results point to the same direction that parents reinforce mental health conditions. The point estimates are smaller and more imprecise since the standard error are large. This evidence is not surprising since the child fixed effect model is relying in much less variation¹⁰. However I can not reject that the magnitudes are the same compare to the family fixed effect model shown in table 7.

7.3 Alternative measure of mental conditions

To validate the finding that parental investments reinforce mental conditions, I construct an alternative measure of mental health problems. First, I use the Behavioral Problem Index (BPI) which is constructed by the NLSY using 28 items from child behavior scales including Achenbach Behavior Problems Checklist. These questions are maternal report about specific behaviors displayed by children age four and over in the past three months. Using the overall Behavior Problems scale, I construct a dummy variable, *d_behavior_prob*, that indicates the

¹⁰Indeed, regarding within child variation on mental health, just 6 % of the children have variation

presence of a behavior problem if the age standardized index falls in the top 95 % percentile.¹¹ Thus, the version of 1 estimated is:

$$I_{i,j,t,a} = \gamma d_behavior_prob_{i,j,t,a} + X_{i,j,t,a}\beta + \alpha_t + \eta_a + \mu_j + \varepsilon_{i,j,t,a} \quad (3)$$

Table 13 present the results from this specification that defines the treatment of interest as a dummy for the presence of a behavior problem. The estimates indicate that children with behavior problems received on average 0.16 standard deviations less total home investments, 0.12 less cognitive stimulation investments and 0.14 less emotional support investments.

8 Extensions

8.1 Disentangling mental conditions

Because the mental conditions variable grouped several mental disorders, here I estimate a model that explores the effects of specific mental problems on family investments. The "ever having a mental condition" variable is replaced by three variables: ever having a learning disability, ever having an attention deficit hyperactivity problem and ever having other mental conditions (mental retardation, emotional disorders, speech impairment and chronic nervousness). This more disaggregated classification was constructed based on the incidence of conditions presented in table 2. Further disaggregation is challenging since it will demand significant variation in the data.

Table 14 shows the results for this estimation. For the sake of simplicity, the estimates presented correspond to the total home score as the outcome of interest. The first three columns present the effect of each of the three mental conditions measures on the total home score and the last column shows the estimates of a model that include all the mental conditions indicators simultaneously.¹² Children who ever had a learning disability received

¹¹The pair wise correlation between the dummy for presence of behavioral problems and ever having a mental condition is 0.21 and it is statistically significant

¹²To keep the table readable, the results focus on total home score

0.15 SDs less total home investments than their healthy siblings. Similarly, ever having an attention/hyperactivity disorder decreased family investments by 0.14 SDs. The effect of ever having other mental conditions appears to be slightly higher: 0.22 SDs. However, comorbidity of mental conditions is very common. For example, in the sample of this study, around 50% of the children with a learning disability also report other mental conditions. Therefore, it is not surprising that when the three indicators of mental health conditions are included, the parameters of the model are estimated with less precision. As shown in column 3 of table 14, children who ever had other mental health problems received 0.22 SDs less home investments conditional on the presence of learning disabilities and attention problems as well as on family and child time varying characteristics.

As mentioned before, a child fixed effect model may be preferable to a family fixed effect model since it controls for child unobserved heterogeneity constant overtime. Table 15 displays the effects of specific mental conditions on home investments for child fixed effect models. The results suggest that ever having other mental problems (mental retardation, emotional disorders, speech impairment and chronic nervousness) decreased total home investments by 0.19 SDs and emotional support investments by 0.24 SDs. Thus, the negative impact of other mental health condition on family investments is robust to the inclusion of child fixed effects.

8.2 Quantifying the importance of the investments responses to childhood mental conditions

The motivation of this study is that the large evidence of the negative consequences of poor health early in life on later outcomes combines the causal effect and the parental investment responses. I have found that parental home investments reinforce mental health conditions in childhood. However, how important is this effect to explain the gap in cognitive attainment between health and unhealthy children? I argue that ignoring the role of family investment responses can lead to a noticeable overstatement of the causal effect of poor childhood mental

health.

To study the magnitude of parental investment responses to childhood health conditions, I exploit several measures of cognitive skills in the CNLSY79: the Peabody Picture Vocabulary Test (PPVT) for children aged 3 and above and the reading and math Peabody Individual Achievement Test (PIAT). On one hand, home investments and specifically the HOME battery are key determinants of children’s cognitive attainment. On the other hand, there is evidence in economics and child development which show that performance on these tests are highly predictable of later outcomes like educational attainment and earnings. I estimate the following equations:

$$T_{i,j,t,a} = \gamma_1 Ever_mental_{i,j,t,a} + \gamma_2 Ever_physical_{i,j,t,a} + \alpha_1 Home_inv_{i,j,t-1,a-1} + X_{i,j,t,a}\beta + \alpha_t + \eta_a + \mu_j + \varepsilon_{i,j,t,a}$$

$$T_{i,j,t,a} = \gamma_1 Ever_mental_{i,j,t,a} + \gamma_2 Ever_physical_{i,j,t,a} + \alpha_1 Home_inv_{i,j,t-1,a-1} + \alpha_2 Home_inv_{i,j,t-1,a-1} * Ever_mental_{i,j,t,a} + \alpha_2 Home_inv_{i,j,t-1,a-1} * Ever_physical_{i,j,t,a} + X_{i,j,t,a}\beta + \alpha_t + \eta_a + \mu_j + \varepsilon_{i,j,t,a}$$

where $T_{i,j,t,a}$ represent the standardized test score of children i , born in family j , measured at survey year t and at age a . $Home_inv_{i,j,t-1,a-1}$ represent the lagged HOME investment score. The parameter α_1 captures the effect of increasing previous period HOME investments by 1 SD on current test scores and the parameters α_2 and α_e capture whether the returns to home investments are different for children with mental or physical conditions compared to healthy children respectively.

First, I regress the test scores on the indicators of mental and physical conditions as well as on child and family characteristics and family fixed effects (table 16). As expected, children

with mental health conditions performed worse in all the cognitive measures used. The effect sizes are between -0.60 SDs and -0.50 SDs (column 1). Regarding physical conditions, the effects on tests scores are much smaller, around -0.08 SDS. Next, the total HOME score in the past wave is added to the model. The estimates of the effects of health conditions remains practically the same (column 2). Finally, I add an interaction between the lagged HOME score and the health conditions indicators (column 3). Now, the negative effect of ever having a mental conditions decreases between 0.06 and 0.12 SDs. However, the estimates of the coefficients of the interaction suggests that increasing home investments on the children who had a mental condition can undo part of severe damages of health impairments. Indeed, improving total home investments by 1 SD on children with mental problems increases their test scores between 0.2 and 0.1 SDs. Regarding physical conditions, for the case of vocabulary and reading, increasing home investments by 1 SD improves scores between 0.07 and 0.11 SDs. These results suggests that interventions that improve home investments for children with mental health conditions can help to lessen the negative consequences of health shocks.

9 Conclusions

In this study, I examined whether parents choose to invest differentially in their children in response to the onset of a child's health condition. The results indicate that parents invest less in the children with health-limiting conditions, which suggest they adopt a reinforcing strategy and are driven by efficiency concerns. On average, parents allocate 0.083 SDs less HOME investments in children with health conditions reported at least twice relative to their healthy siblings. These results are consistent with [Datar et al. \(2010\)](#) findings who examined parental responses to children's birth weight; and with the evidence provided by [Conti et al. \(2010\)](#) who also explored parental responses to health shocks in terms of educational expenditures.

I further find that parental investment responses depend on the type of condition. When

the health conditions are separated according to their nature, parents invest 0.16 SDs less in children with a mental condition reported at least twice relative to their healthy siblings, while parents exhibited neutral behavior toward children with physical conditions. Similarly, the effect of ever having a nonepisodic condition on parental investments is -0.10 SDs, while parents did not behave differently when the child had an episodic illness.

This paper expands the literature on the effects of childhood health on later-in-life outcomes by studying the behavioral parental investment responses to serious health conditions. These results highlight the importance of involving the family as part of policies that target children with serious diseases, since parents can exacerbate the negative consequences of some types of health conditions. Therefore, these policies can play a key role in informing parents on better ways to invest/stimulate in their ill children in order to mitigate the negative long-lasting effects of health conditions.

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10 Figures and Tables

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Table 1: The NLSY-C HOME items by age and subscale

Items	Age Assessed			
	0-2 yrs	3-5 yrs	6-9 yrs	10-14 yrs
Mother self-report				
Child gets out of house 4 times a week or more	C	-	-	-
Child has 3 children's books (10 for ages 3-9 yrs; 20 for ages 10-14 yrs)**	C	C	C	C
Mother reads to child 3 times a week or more***	C	C	C	-
Child taken to grocery store (once/week or 2-3 times a month)	C	C	-	-
Child has one or more cuddly, soft or role-playing toys	C	-	-	-
Child has one or more push or pull toys	C	-	-	-
Mother believes parents should usually or always spend time teaching kids	C	-	-	-
Child eats meal with both mother and father(-figure) once a day or more	E	E	E	E
Mom often talks with child while working	E	-	-	-
Mom reports no more than 1 spank during past week	E	E	E	-
Family subscribes to at least one magazine	-	C	-	-
Child has use of record/CD player and at least 5 records/CDs/tapes	-	C	-	-
Child helped to learn numbers at home	-	C	-	-
Child helped to learn alphabet at home	-	C	-	-
Child helped to learn colors at home	-	C	-	-
Child helped to learn shapes and sizes at home	-	C	-	-
Child has some choice in foods for breakfast and lunch	-	E	-	-
TV is on in home less than 5 hours per day	-	E	-	-
Non-harsh discipline if child hits (or swears/speaks in anger ages 72mos+)	-	E	E	E
Child taken to museum in past year	-	C	C	C
Child expected to make his/her bed	-	-	E	E
Child expected to clean his/her room	-	-	E	E
Child expected to clean up after spills	-	-	E	-
Child expected to bathe him/herself	-	-	E	-
Child expected to pick up after himself/herself	-	-	E	E
Child expected to keep shared living areas clean and straight	-	-	-	E
Child expected to do routine chores such as lawn, help w/ dinner, dishes	-	-	-	E
Child expected to help manage his/her own time	-	-	-	E
Musical instrument in home child can use (see #20)	-	-	C	C
Family gets a daily newspaper	-	-	C	C
Child reads several times a week for enjoyment	-	-	C	C
Family encourages child to start and do hobbies	-	-	C	C
Child receives lessons or belongs to sports/music/art/dance/drama org	-	-	C	C
Child taken to musical or drama performance in past year	-	-	C	C
Family visits with family or friends 2-3 times a month	-	-	E	E
Child spends time with father(-figure) 4 times a week	-	-	E	E
Child spends time with father(-figure) in outdoor activities once a week	-	-	E	E
When watching TV, parent discusses program with child	-	-	C	C
Interviewer observations				
Mom spontaneously vocalize to/conversed with child at least twice	E	E	E	E
Mom responded verbally to child	E	-	-	-
Mom showed physical affection to child	E	E	-	-
Mom did not spank child	E	E	-	-
Mom did not interfere/restrict child more than 3 times	E	-	-	-
Mom provided appropriate toys/activities to child	C	-	-	-
Mom kept child in view	E	-	-	-
Play environment is safe (home or building for ages 36 mos +)	C	C	C	C
Mom encouraged child to contribute to conversation	-	E	E	E
Mom answered child's questions or requests verbally	-	E	E	E
Mom introduced interviewer to child by name	-	E	E	E
Mom's voice conveyed positive feeling about child	-	E	E	E
Home is not dark	-	C	C	C
Home is reasonably clean	-	C	C	C
Home is minimally cluttered	-	C	C	C

Notes: C denotes that the item is part of the cognitive stimulation subscale, E that is part of the emotional support

Table 2: Descriptive statistics of children's health-limiting conditions

	Mean (%)	SD	Obs
All health conditions	24.5	0.43	9,476
Asthma	7.9	0.27	9,476
Allergies	4.7	0.21	9,476
Learning disability	4.6	0.21	9,476
Min. brain dysfunction	2.5	0.16	9,476
Hyperactivity	2.0	0.14	9,476
Respiratory disorder	1.9	0.14	9,476
Speech impairment	1.5	0.12	9,476
Orthopedic handicap	1.5	0.12	9,476
Chronic ear problem	1.3	0.11	9,476
Emotional Disorder	1.1	0.11	9,476
Heart trouble	0.9	0.10	9,476
Epilepsy	0.9	0.09	9,476
Hearing difficulty	0.8	0.09	9,476
Blindness	0.7	0.08	9,476
Mental retardation	0.6	0.08	9,476
Blood disorder	0.3	0.05	9,476
Chronic nervous	0.2	0.05	9,476
Other	8.2	0.27	9,476

Table 3: Within-family variation in health status and parental investments

Variables	Families %	Standard. Deviation	
		Between families	Within families
Binary: health status			
None ever had a health-limiting condition	56.45		
At least one sibling with a condition reported once	19.34		
At least one sibling with a chronic condition (reported twice or more)	23.61		
All children ever ill	0.60		
HOME score index			
Total score		11.745	10.917
Cognitive stimulation		11.588	11.129
Emotional support		10.723	12.275

Note: The HOME score is internally normed within age groups and standardized to a mean of 100 and standard deviation of 15 (CNLSY User guide, 2008). HOME, Home Observation for Measurement of the Environment

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Table 4: Descriptive statistics of children.

Variable	Median	Mean	SD	Obs
Sex	1.00	0.51	0.50	27,602
Birth order	2.00	2.04	1.10	27,602
low birth weight	0.00	0.08	0.27	27,602
Gestational age	39.00	38.60	2.14	27,602
Mother drank during pregnancy	0.00	0.45	0.50	27,602
Mother smoked during pregnancy	0.00	0.30	0.46	27,602
Bresfed	0.00	0.48	0.50	27,602
Family income in 1990 USD	28.94	39.94	63.82	27,602
Married	1.00	0.66	0.47	27,602
Number of children	2.00	2.61	1.11	27,602
Have medicaid	0.00	0.22	0.41	27,602
Have health insurance	1.00	0.72	0.45	27,602
In welfare	0.00	0.24	0.43	27,602
Urban	1.00	0.79	0.41	27,602
Mother has a health limitation	0.00	0.09	0.29	27,602
Annual hours worked by mother	1,160.00	1,139.09	987.07	27,602
White	1.00	0.51	0.50	27,602
Mother has some college	0.00	0.44	0.50	27,602
Mother's BMI, 1985	22.46	23.42	4.45	27,602
Mother's intelligence (AFQT)	-0.12	0.05	1.00	27,602
Maternal Self-Esteem (1980)	-0.19	0.02	0.98	27,602
Mother less locus of control, 1979	0.04	-0.02	0.99	27,602
Maternal age at birth	25.00	25.45	5.22	27,602
Ever have a health condition	0.00	0.17	0.37	27,602
Ever have a non-episodic condition	0.00	0.07	0.25	27,168
Ever have a episodic condition	0.00	0.09	0.29	27,133
Ever have a mental condition	0.00	0.04	0.20	27,135
Ever have a physical condition	0.00	0.11	0.32	27,170
Total HOME score	99.30	97.22	15.96	27,602
Cognitive stimulation score	99.80	97.37	15.90	26,245
Emotional support score	100.50	97.97	15.93	24,865

Note: Data from the CNLSY79. The sample include children in families with more than one child and who had valid heath conditions data. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment. Obs, Chidren-years observations. SD, standard deviations

Table 5: Effect of having a health condition on parental investments.

	OLS			Family-fixed effects		
	(1)	(2)	(3)	(4)	(5)	(6)
Total HOME score						
Ever ill	-0.048 (0.031)	-0.050* (0.027)	-0.015 (0.021)	-0.061*** (0.018)	-0.052*** (0.018)	-0.044** (0.017)
Male		-0.097*** (0.019)	-0.10*** (0.015)		-0.085*** (0.012)	-0.087*** (0.012)
Birth order		-0.24*** (0.014)	-0.064*** (0.010)		-0.068*** (0.013)	-0.052*** (0.013)
Number of observations				27,602		
Families (N)				3,007		
Cognitive stimulation						
Ever ill	-0.023 (0.030)	-0.025 (0.027)	0.0010 (0.023)	-0.054*** (0.018)	-0.042** (0.018)	-0.037** (0.018)
Male		-0.11*** (0.019)	-0.11*** (0.016)		-0.10*** (0.012)	-0.10*** (0.012)
Birth order		-0.24*** (0.014)	-0.078*** (0.011)		-0.090*** (0.013)	-0.080*** (0.013)
Number of observations				26,245		
Families (N)				2,979		
Emotional support						
Ever ill	-0.063** (0.028)	-0.063** (0.027)	-0.027 (0.022)	-0.049** (0.020)	-0.046** (0.021)	-0.037* (0.020)
Male		-0.044** (0.019)	-0.046*** (0.015)		-0.034** (0.014)	-0.036*** (0.014)
Birth order		-0.16*** (0.013)	-0.029** (0.012)		-0.032** (0.016)	-0.013 (0.016)
Number of observations				24,865		
Families (N)				2,976		
Year and age dummies	X	X	X	X	X	X
Child characteristics		X	X		X	X
Family characteristics			X			X

Notes: Dependent variable standardized: mean, 0; standard deviation, 1. Each column includes survey years and age dummies plus the covariates indicated in the bottom rows. Child control characteristics are low birth weight, gestational age, mother smoking and drinking during pregnancy, breast-fed, receiving Medicaid and having health insurance. Family characteristics include: Income, receiving welfare, marital status, number of children, mother's annual hours of work, if mother has a health limitation, mother's years of schooling, BMI, AFQT, locus of control and self-esteem. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment; N: number of families.

* $P < .10$, ** $P < .05$, *** $P < .01$. Standard errors in parentheses are clustered at the family level.

Table 6: Effect of having a mental versus a physical health condition on parental investments.

	OLS			Family fixed effects		
	(1)	(2)	(3)	(4)	(5)	(6)
Total HOME score						
Ever a mental cond.	-0.39*** (0.056)	-0.33*** (0.050)	-0.24*** (0.041)	-0.19*** (0.036)	-0.17*** (0.036)	-0.16*** (0.035)
Ever a physical cond.	0.034 (0.036)	0.036 (0.032)	0.062** (0.025)	-0.016 (0.021)	-0.0093 (0.021)	-0.0038 (0.020)
Male		-0.091*** (0.019)	-0.097*** (0.015)		-0.085*** (0.012)	-0.086*** (0.012)
Birth order		-0.24*** (0.014)	-0.064*** (0.010)		-0.067*** (0.014)	-0.051*** (0.013)
Number of observations				27,075		
Families (N)				3,007		
Cognitive stimulation						
Ever a mental cond.	-0.38*** (0.054)	-0.32*** (0.051)	-0.24*** (0.047)	-0.18*** (0.037)	-0.16*** (0.038)	-0.15*** (0.037)
Ever a physical cond.	0.060* (0.035)	0.061* (0.032)	0.078*** (0.027)	-0.012 (0.022)	-0.0038 (0.021)	-0.0014 (0.021)
Male		-0.10*** (0.019)	-0.11*** (0.016)		-0.100*** (0.012)	-0.099*** (0.012)
Birth order		-0.24*** (0.014)	-0.077*** (0.011)		-0.089*** (0.013)	-0.080*** (0.013)
Number of observations				25,751		
Families (N)				2,979		
Emotional support						
Ever a mental cond.	-0.27*** (0.055)	-0.22*** (0.051)	-0.14*** (0.041)	-0.13*** (0.040)	-0.12*** (0.040)	-0.11*** (0.039)
Ever a physical cond.	-0.0074 (0.033)	-0.0049 (0.031)	0.023 (0.025)	-0.015 (0.024)	-0.013 (0.024)	-0.0042 (0.024)
Male		-0.041** (0.019)	-0.044*** (0.015)		-0.033** (0.014)	-0.036*** (0.014)
Birth order		-0.16*** (0.013)	-0.029** (0.012)		-0.031* (0.016)	-0.012 (0.016)
Number of observations				24,404		
Families (N)				2,974		
Year and age dummies	X	X	X	X	X	X
Child characteristics		X	X		X	X
Family characteristics			X			X

Notes: Dependent variable standardized: mean, 0; standard deviation, 1. Each column includes survey years and age dummies plus the covariates indicated in the bottom rows. Child control characteristics are low birth weight, gestational age, mother smoking and drinking during pregnancy, breast-fed, receiving Medicaid and having health insurance. Family characteristics include: Income, receiving welfare, marital status, number of children, mother's annual hours of work, if mother has a health limitation, mother's years of schooling, BMI, AFQT, locus of control and self-esteem. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment; N: number of families.

* $P < .10$, ** $P < .05$, *** $P < .01$. Standard errors in parentheses are clustered at the family level.

Table 7: Effect of having an episodic versus nonepisodic health condition on parental investments.

	OLS			Family fixed effects		
	(1)	(2)	(3)	(4)	(5)	(6)
Total HOME score						
Ever a mental cond.	-0.39*** (0.056)	-0.33*** (0.050)	-0.24*** (0.041)	-0.19*** (0.036)	-0.17*** (0.036)	-0.16*** (0.035)
Ever a physical cond.	0.034 (0.036)	0.036 (0.032)	0.062** (0.025)	-0.016 (0.021)	-0.0093 (0.021)	-0.0038 (0.020)
Male		-0.091*** (0.019)	-0.097*** (0.015)		-0.085*** (0.012)	-0.086*** (0.012)
Birth order		-0.24*** (0.014)	-0.064*** (0.010)		-0.067*** (0.014)	-0.051*** (0.013)
Number of observations				27,075		
Families (N)				3,007		
Cognitive stimulation						
Ever a mental cond.	-0.38*** (0.054)	-0.32*** (0.051)	-0.24*** (0.047)	-0.18*** (0.037)	-0.16*** (0.038)	-0.15*** (0.037)
Ever a physical cond.	0.060* (0.035)	0.061* (0.032)	0.078*** (0.027)	-0.012 (0.022)	-0.0038 (0.021)	-0.0014 (0.021)
Male		-0.10*** (0.019)	-0.11*** (0.016)		-0.100*** (0.012)	-0.099*** (0.012)
Birth order		-0.24*** (0.014)	-0.077*** (0.011)		-0.089*** (0.013)	-0.080*** (0.013)
Number of observations				25,751		
Families (N)				2,979		
Emotional support						
Ever a mental cond.	-0.27*** (0.055)	-0.22*** (0.051)	-0.14*** (0.041)	-0.13*** (0.040)	-0.12*** (0.040)	-0.11*** (0.039)
Ever a physical cond.	-0.0074 (0.033)	-0.0049 (0.031)	0.023 (0.025)	-0.015 (0.024)	-0.013 (0.024)	-0.0042 (0.024)
Male		-0.041** (0.019)	-0.044*** (0.015)		-0.033** (0.014)	-0.036*** (0.014)
Birth order		-0.16*** (0.013)	-0.029** (0.012)		-0.031* (0.016)	-0.012 (0.016)
Number of observations				24,404		
Families (N)				2,974		
Year and age dummies	X	X	X	X	X	X
Child characteristics		X	X		X	X
Family characteristics			X			X

Notes: Dependent variable standardized: mean, 0; standard deviation, 1. Each column includes survey years and age dummies plus the covariates indicated in the bottom rows. Child control characteristics are low birth weight, gestational age, mother smoking and drinking during pregnancy, breast-fed, receiving Medicaid and having health insurance. Family characteristics include: Income, receiving welfare, marital status, number of children, mother's annual hours of work, if mother has a health limitation, mother's years of schooling, BMI, AFQT, locus of control and self-esteem. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment; N: number of families.

* $P < .10$, ** $P < .05$, *** $P < .01$. Standard errors in parentheses are clustered at the family level.

Table 8: Effect of having a health condition on parental investments, according to report patterns

	OLS			Family-fixed effects		
	(1)	(2)	(3)	(4)	(5)	(6)
	Total HOME score	Cognitive stimulation	Emotional support	Total HOME score	Cognitive stimulation	Emotional support
All health conditions						
Ever reported once	0.025 (0.030)	0.025 (0.032)	-0.0023 (0.032)	0.0084 (0.024)	0.0031 (0.024)	-0.00076 (0.028)
Ever reported twice or more	-0.039 (0.027)	-0.014 (0.029)	-0.042 (0.026)	-0.084*** (0.023)	-0.068*** (0.024)	-0.064** (0.025)
Number of observations	27,602	26,245	24,865	27,602	26,245	24,865
Families (N)	3,007	2,979	2,976	3,007	2,979	2,976
By nature						
Ever reported once, mental	-0.16*** (0.055)	-0.15*** (0.059)	-0.12** (0.056)	-0.089** (0.042)	-0.036 (0.044)	-0.095* (0.052)
Ever reported twice or more, mental	-0.29*** (0.055)	-0.30*** (0.065)	-0.15*** (0.056)	-0.22*** (0.050)	-0.26*** (0.052)	-0.13** (0.054)
Ever reported once, physical	0.11*** (0.032)	0.11*** (0.034)	0.050 (0.035)	0.047* (0.028)	0.041 (0.029)	0.022 (0.032)
Ever reported twice or more, physical	0.028 (0.033)	0.052 (0.037)	0.0027 (0.032)	-0.050* (0.027)	-0.040 (0.028)	-0.028 (0.032)
Number of observations	27,075	25,751	24,404	27,075	25,751	24,404
Families (N)	3,007	2,979	2,974	3,007	2,979	2,974
By type of manifestation						
Ever reported once, nonepisodic	-0.060 (0.040)	-0.079* (0.044)	-0.041 (0.044)	-0.015 (0.033)	-0.0040 (0.035)	-0.036 (0.041)
Ever reported twice or more, nonepisodic	-0.24*** (0.047)	-0.22*** (0.054)	-0.13*** (0.045)	-0.19*** (0.042)	-0.21*** (0.043)	-0.098** (0.045)
Ever reported once, episodic	0.12*** (0.035)	0.13*** (0.038)	0.059 (0.038)	0.026 (0.031)	0.017 (0.032)	0.014 (0.035)
Ever reported twice or more, episodic	0.047 (0.037)	0.059 (0.041)	0.018 (0.035)	-0.033 (0.030)	-0.023 (0.031)	-0.019 (0.035)
Number of observations	27,071	25,747	24,398	27,071	25,747	24,398
Families (N)	3,007	2,979	2,974	3,007	2,979	2,974

Notes: Dependent variable standardized: mean, 0; standard deviation, 1. Each column includes survey years and age dummies plus the covariates indicated in the bottom rows. Child control characteristics are low birth weight, gestational age, mother smoking and drinking during pregnancy, breast-fed, receiving Medicaid and having health insurance. Family characteristics include: Income, receiving welfare, marital status, number of children, mother's annual hours of work, if mother has a health limitation, mother's years of schooling, BMI, AFQT, locus of control and self-esteem. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment; N: number of families.

* $P < .10$, ** $P < .05$, *** $P < .01$. Standard errors in parentheses are clustered at the family level.

Table 9: Effect of having a health condition on parental investments, by gender.

	(1)	(2)	(3)	(P-value, male = female)		
	HOME score	Cognitive stimulation	Emotional support	HOME score	Cognitive stimulation	Emotional support
Ever reported once, mental (male)	-0.073 (0.055)	0.010 (0.055)	-0.11 (0.069)			
Ever reported once, mental (female)	-0.12** (0.059)	-0.11 (0.073)	-0.082 (0.068)	0.548	0.180	0.793
Ever reported twice or more, mental (male)	-0.18*** (0.055)	-0.25*** (0.055)	-0.078 (0.062)			
Ever reported twice or more, mental (female)	-0.33*** (0.099)	-0.27** (0.118)	-0.29*** (0.088)	0.195	0.862	0.038
Ever reported once, physical (male)	0.040 (0.038)	0.023 (0.037)	0.044 (0.044)			
Ever reported once, physical (female)	0.058 (0.043)	0.066 (0.044)	-0.0063 (0.044)	0.753	0.441	0.415
Ever reported twice or more, physical (male)	-0.033 (0.033)	-0.033 (0.032)	-0.00070 (0.038)			
Ever reported twice or more, physical (female)	-0.075* (0.043)	-0.051 (0.044)	-0.067 (0.053)	0.422	0.731	0.301
Ever reported once, Non episodic (male)	0.0057 (0.043)	0.028 (0.042)	-0.039 (0.056)			
Ever reported once, Non episodic (female)	-0.043 (0.051)	-0.048 (0.057)	-0.033 (0.062)	0.460	0.278	0.944
Ever reported twice or more, nonepisodic (male)	-0.15*** (0.049)	-0.19*** (0.048)	-0.048 (0.054)			
Ever reported twice or more, nonepisodic (female)	-0.28*** (0.072)	-0.26*** (0.080)	-0.20*** (0.074)	0.137	0.465	0.079
Ever reported once, episodic (male)	0.013 (0.041)	-0.0077 (0.041)	0.044 (0.046)			
Ever reported once, episodic (female)	0.046 (0.047)	0.052 (0.047)	-0.026 (0.052)	0.595	0.325	0.313
Ever reported twice or more, episodic (male)	-0.040 (0.035)	-0.049 (0.035)	-0.0082 (0.042)			
Ever reported twice or more, episodic (female)	-0.021 (0.050)	0.022 (0.050)	-0.039 (0.058)	0.759	0.219	0.666

Notes: Dependent variable standardized: mean, 0; standard deviation, 1. Each column includes survey years and age dummies plus the covariates indicated in the bottom rows. Child control characteristics are low birth weight, gestational age, mother smoking and drinking during pregnancy, breast-fed, receiving Medicaid and having health insurance. Family characteristics include: Income, receiving welfare, marital status, number of children, mother's annual hours of work, if mother has a health limitation, mother's years of schooling, BMI, AFQT, locus of control and self-esteem. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment.

* $P < .10$, ** $P < .05$, *** $P < .01$. Standard errors in parentheses are clustered at the family level.

Table 10: Effect of having a child with a health condition on parental investments, by birth order.

	(1)	(2)	(3)	<i>(P-value, firstborn =later-born)</i>		
	HOME score	Cognitive stimulation	Emotional support	HOME score	Cognitive stimulation	Emotional support
Ever reported once, mental (first born)	-0.089 (0.068)	-0.099 (0.071)	-0.036 (0.082)			
Ever reported once, mental (later-born)	-0.085* (0.050)	-0.013 (0.054)	-0.11* (0.062)	0.962	0.323	0.452
Ever reported twice or more, mental (first born)	-0.12 (0.079)	-0.14* (0.076)	-0.055 (0.100)			
Ever reported twice or more, mental (later-born)	-0.26*** (0.059)	-0.32*** (0.064)	-0.15*** (0.060)	0.135	0.064	0.378
Ever reported once, physical (first born)	0.076* (0.045)	0.077* (0.043)	0.041 (0.051)			
Ever reported once, physical (later-born)	0.032 (0.036)	0.021 (0.037)	0.012 (0.040)	0.447	0.306	0.642
Ever reported twice or more, physical (first born)	-0.048 (0.039)	-0.076** (0.039)	0.017 (0.044)			
Ever reported twice or more, physical (later-born)	-0.045 (0.034)	-0.015 (0.034)	-0.048 (0.040)	0.954	0.204	0.252
Ever reported once, Non episodic (first born)	0.032 (0.056)	0.023 (0.050)	0.011 (0.070)			
Ever reported once, Non episodic (later-born)	-0.040 (0.041)	-0.023 (0.046)	-0.057 (0.051)	0.304	0.490	0.440
Ever reported twice or more, nonepisodic (first born)	-0.13** (0.063)	-0.13** (0.060)	-0.046 (0.077)			
Ever reported twice or more, nonepisodic (later-born)	-0.22*** (0.051)	-0.25*** (0.055)	-0.12** (0.052)	0.245	0.128	0.406
Ever reported once, episodic (first born)	0.059 (0.049)	0.044 (0.050)	0.064 (0.053)			
Ever reported once, episodic (later-born)	0.012 (0.039)	0.0044 (0.039)	-0.0082 (0.044)	0.446	0.513	0.281
Ever reported twice or more, episodic (first born)	-0.032 (0.042)	-0.067 (0.042)	0.014 (0.048)			
Ever reported twice or more, episodic (later-born)	-0.027 (0.037)	0.0047 (0.038)	-0.032 (0.044)	0.924	0.169	0.444

Notes: Dependent variable standardized: mean, 0; standard deviation, 1. Each column includes survey years and age dummies plus the covariates indicated in the bottom rows. Child control characteristics are low birth weight, gestational age, mother smoking and drinking during pregnancy, breast-fed, receiving Medicaid and having health insurance. Family characteristics include: Income, receiving welfare, marital status, number of children, mother's annual hours of work, if mother has a health limitation, mother's years of schooling, BMI, AFQT, locus of control and self-esteem. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment.

* $P < .10$, ** $P < .05$, *** $P < .01$. Standard errors in parentheses are clustered at the family level.

Table 11: Do families invest differentially prior to the onset of the condition?

	(1) Total HOME score	(2) Cognitive stimulation	(3) Emotional support
A. All health conditions			
Lead (to the first report)	0.0014 (0.026)	0.034 (0.028)	-0.032 (0.031)
Number of observations	26163	24883	23551
Families (N)	2976	2947	2944
C. Mental v.s physical			
Lead (to the first report) mental	-0.086 (0.054)	-0.028 (0.058)	-0.092 (0.062)
Lead (to the first report) physical	-0.014 (0.034)	0.023 (0.036)	-0.041 (0.042)
Number of observations	25767	24509	23208
Families (N)	2975	2947	2944
B. Nonepisodic vs. episodic			
Lead (to the first report) nonepisodic	-0.057 (0.046)	-0.018 (0.050)	-0.070 (0.053)
Lead (to the first report) episodic	-0.018 (0.036)	0.026 (0.038)	-0.049 (0.044)
Number of observations	25768	24510	23207
Families (N)	2975	2947	2944

Notes: Dependent variable standardized: mean, 0; standard deviation, 1. Each column includes survey years and age dummies plus the covariates indicated in the bottom rows. Child control characteristics are low birth weight, gestational age, mother smoking and drinking during pregnancy, breast-fed, receiving Medicaid and having health insurance. Family characteristics include: Income, receiving welfare, marital status, number of children, mother's annual hours of work, if mother has a health limitation, mother's years of schooling, BMI, AFQT, locus of control and self-esteem. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment; N: number of families.

* $P < .10$, ** $P < .05$, *** $P < .01$. Standard errors in parentheses are clustered at the family level.

Table 12: Child Fixed effects

	(1)	(2)	(3)
	Total HOME score	Cognitive stimulation	Emotional support
Ever a mental cond.	-0.082* (0.044)	-0.089* (0.048)	-0.060 (0.053)
Ever a physical cond.	0.056 (0.035)	0.026 (0.036)	0.061 (0.041)
N obs	27,075	25,751	24,404
N-families	3,007	2,979	2,974

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses clustered at the family level. Dep. variable standardized to mean 0 and st dev 1.

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Table 13: Alternative measure of mental health conditions: Behavioral Problem Index

	(1) Total HOME		(2) Cognitive stimulation		(3) Emotional support	
If behavior problem	-0.16*** (0.032)	-0.14*** (0.033)	-0.12*** (0.034)	-0.093*** (0.035)	-0.14*** (0.038)	-0.13*** (0.039)
Ever a mental cond.		-0.096*** (0.034)		-0.098*** (0.036)		-0.057 (0.041)
Ever a physical cond.		-0.00080 (0.022)		0.0085 (0.023)		0.0035 (0.027)
Number of observations	20717	20106	19696	19123	18662	18127
Families (N)	2882	2878	2851	2847	2840	2834

Notes: Dependent variable standardized: mean, 0; standard deviation, 1. "If behavior problem" is a dummy variable equal to 1 if the child's Behavioral Problem index falls in the top 95 percentile. Higher index score indicate greater level of behavioral problems. Each column includes survey years and age dummies plus the following child and family covariates. Child control characteristics are low birth weight, gestational age, mother smoking and drinking during pregnancy, breast-fed, receiving Medicaid and having health insurance. Family characteristics include: Income, receiving welfare, marital status, number of children, mother's annual hours of work, if mother has a health limitation, mother's years of schooling, BMI, AFQT, locus of control and self-esteem. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment; N: number of families.

* $P < .10$, ** $P < .05$, *** $P < .01$. Standard errors in parentheses are clustered at the family level.

Table 14: Disaggregating the mental health conditions

	(1)	(2)	(3)	(4)
		Total HOME		
Ever learning disability	-0.15*** (0.049)			-0.083* (0.048)
Ever attention disorder		-0.14*** (0.054)		-0.053 (0.052)
Ever other mental conditions			-0.27*** (0.056)	-0.22*** (0.053)
Ever physical conditions	-0.0068 (0.020)	-0.0097 (0.020)	-0.0034 (0.020)	0.0021 (0.020)
Number of observations	27050	27057	27063	27060
Families (N)	3007	3007	3007	3007

Notes: Dependent variable standardized: mean, 0; standard deviation, 1. Each column includes survey years and age dummies plus the following child and family covariates. Child control characteristics are low birth weight, gestational age, mother smoking and drinking during pregnancy, breast-fed, receiving Medicaid and having health insurance. Family characteristics include: Income, receiving welfare, marital status, number of children, mother's annual hours of work, if mother has a health limitation, mother's years of schooling, BMI, AFQT, locus of control and self-esteem. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment; N: number of families.

* $P < .10$, ** $P < .05$, *** $P < .01$. Standard errors in parentheses are clustered at the family level.

Table 15: Disaggregating the mental health conditions

	(1)	(2)	(3)
	Total HOME score	Cognitive stimulation	Emotional support
Ever learning disable	0.029 (0.060)	0.040 (0.067)	0.040 (0.073)
Ever ADHD	-0.028 (0.065)	-0.10 (0.069)	0.048 (0.080)
Ever other mental	-0.19** (0.084)	-0.096 (0.092)	-0.24*** (0.093)
Ever a physical cond.	0.058 (0.035)	0.027 (0.036)	0.062 (0.041)
N obs	27050	25727	24383
N-families	3007	3007	3007

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses clustered at the family level. Dep. variable standardized to mean 0 and st dev 1.

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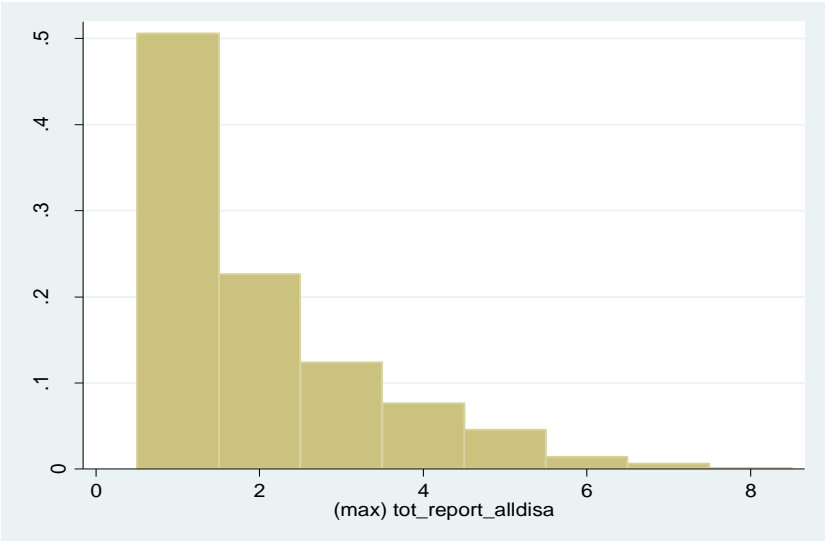
Table 16: The importance of family investment responses: Test scores

	PPVT	PIAT ₃ , reading	PIAT ₃ , reading	PIAT ₃ , math
Ever a mental cond.	-0.62*** (0.081)	-0.64*** (0.091)	-0.52*** (0.090)	-0.53*** (0.066)
Ever a physical cond.	-0.089* (0.049)	-0.061 (0.055)	-0.036 (0.055)	-0.066* (0.039)
HOME_t-1	0.026* (0.016)	0.0025 (0.017)	0.027** (0.012)	0.038*** (0.011)
Ever a mental*HOME_t-1		0.11** (0.063)	0.11*** (0.047)	0.098** (0.042)
ever a physical*HOME_t-1		0.11*** (0.039)	0.067** (0.026)	0.018 (0.026)
Number of observations	8594	12569	11141	12599
Families (N)	2500	2325	2299	2328

Notes: Dependent variable standardized test scores: mean, 0; standard deviation, 1. Each column includes survey years and age dummies plus the following child and family covariates. Child control characteristics are low birth weight, gestational age, mother smoking and drinking during pregnancy, breast-fed, receiving Medicaid and having health insurance. Family characteristics include: Income, receiving welfare, marital status, number of children, mother's annual hours of work, if mother has a health limitation, mother's years of schooling, BMI, AFQT, locus of control and self-esteem. AFQT: Armed Forces Qualification Test; BMI: Body Mass Index; HOME: Home Observation for Measurement of Environment; HOME_t-1 correspond to lagged HOME score; N: number of families.

* $P < .10$, ** $P < .05$, *** $P < .01$. Standard errors in parentheses are clustered at the family level.

Figure 1: Number of reports conditional on having a health condition.



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