

The Intergenerational Transmission of Health in Early Childhood

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February 29, 2008

Abstract

The prevalence and importance of children's physical health problems have been increasingly recognized in recent years. Physical health problems of children such as obesity, motor impairment and asthma can lead directly to adult physical health problems, which cause social costs. This paper examines the intergenerational transmission of both maternal and paternal physical health on children's physical health in Germany. We investigate this issue using data from the German Socio-Economic Panel (GSOEP), making use in particular of new data from the mother and child questionnaire. In order to take into account the endogeneity of parental physical health, we estimate fixed effect models. Overall, we find, controlling for parental income, education and family composition, that parents who experience poor health have children with significantly poorer health. For example, the mother's and father's body mass index (BMI) are significant predictors for their children's BMI and weight.

Keywords: early childhood, health, BMI, obesity

JEL-classification: I10, I12, J20

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1 Introduction and Motivation

In recent years, there has been a growing concern about children that suffer from physical health problems. The 2004 International Obesity Taskforce report (IOTF; 2004) states that approximately 14 million children in Europe have obesity, three million of whom have adiposity. Children's physical health problems such as obesity, bronchitis, vision- and motor impairments lead directly to adult physical health problems, which generate social costs.¹ While the economics literature recognize that physical health problems can impede children's human capital formation over the whole life cycle (e.g. Currie and Stabile (2004), Case et al. (2005), or Ding et al. (2006)), the link between physical health of parents and children's physical health in early childhood has received little attention.

This paper focuses on this issue, examining the intergenerational transmission of physical health from parents to children in Germany. Parental physical health is closely linked to children's physical health for several reasons. First, there is a genetic dimension to physical health. For this reason, we observe the physical health measures of both mothers and fathers. Second, children grow up in the same environment as their parents. Thus parents have a large influence over what their children obtain in terms of health care and medical treatment (health behavior). They can invest in the health of their children through the use of inputs such as nutrition and health care, and by avoiding unhealthy behaviors such as smoking and drinking alcohol (see for example, Corman et al. (1987)). Additionally, parental health can effect child health through the labor supply and households budget constraints. Families with lower constraints may have healthier parents, who may be more able to provide medical care and nutritious food. Unhealthier parents, on the other hand, may exhibit behavior such as smoking or regular alcohol consumption that can be detrimental to child health. Finally, parent's ability to spend time with their children can also affect children's health. Mahler (2007), using SOEP data on young adults who were raised their whole childhood in a two parent family, found that a higher labor supply of the mother increases the probability of her child to be obese.

¹A considerable body of research attempts to quantify the effects of early infant health on future health, education and social outcomes, for example Almond et al. (2005).

We concentrate our analysis on the transmission process between parental health and the health of children in their first three years of life; the crucial period for children's health and skills development because of self-productivity in skill formation (see Cunha et al. (2006)). We focus on three main aspects: First, on the intergenerational transmission of both, maternal and paternal physical health on children's physical health. Second, we examine the effects of a range of parental physical health measures on a range of children's physical health measures. Finally, in order to take into account the endogeneity of parental physical health, we estimate fixed effect models.

2 Data and Sample

The data used for this study is the German Socio-Economic Panel (GSOEP). It is a representative national longitudinal data set that surveys households and individuals beginning in 1984 (see Wagner et al. (2007)). It provides an informative database with a rich set of indicators of both parent's and children's characteristics. Since 2003, detailed information on the health of children has been integrated into the GSOEP by an additional questionnaire. This questionnaire is addressed to all mothers who gave birth to a child in the year of survey or the year before. Thus the age of the child varies between 0 and 18 months. The questionnaire provides information on physical health issues of the newborns at birth (birth weight, height and congenital disorders) and three month after birth (number of doctor visits and hospitalization) as well as the mother's assessment of her child's health ("worried about my child's health").

In 2005 an additional questionnaire on 2-3 year olds was introduced. The questionnaire contains information about child's weight, height, doctor visits, hospitalization, disorders as well as a maternal health assessment ("worried about child's health") of the 26-42 years old children. Based on these age-specific questionnaires, we observe the birth cohorts 2002, 2003 and 2004 repeatedly in 2005 and 2006.

Information on parent's physical health, education, family income and composition, health insurance and municipality are also collected in 2002-2006. In addition to the physical health (weight, height, BMI and obesity) we assess whether the parents are satisfied with their own health, how they evaluated current health situation and, in

accordance with the child data, their number of doctor and hospital visits.

We merged the child information with the parental information (different health measures, income, private health insurance, education, single parent household, municipality size and migration background). When excluding missing values, the pooled sample amounts to 411 children born between 2002 and 2004 whose mothers have been successfully interviewed again in 2005/2006.

2.1 Health measures

In our study we observe different types of health measures of the child. Besides weight, height, BMI and obesity (computed), we have information on children's doctor and hospital visits and special disorders, for example, motor impairments and asthma. In addition, the mothers were asked in both questionnaires whether they are worried about their child's health. They could specify to what extent the statement apply, ranging from "applies fully" to "does not apply". All health measures were observed repeatedly.

To evaluate overweight and obesity in early childhood the European Childhood Obesity Group (ECOG) recommend using the BMI (Poskitt; 1995). To define obesity in childhood and adolescences, rather than using fixed cut-off points in adulthood, one needs to address age and sex-specific developmental changes in BMI due to the physiological changes in body mass index that occur at different stages (Kromeyer-Hausschild et al.; 2001). In our study, we use the definition of (ECOG) to determine obesity in early childhood, which is based on gender-specific age percentiles (Poskitt; 1995).²

Table 1 reports descriptive statistics for all children's and parental health measures. In accordance with the two questionnaires (newborn and 2-3 year-olds), we distinguish summary statistics for both waves. The 3-18-month olds had an average BMI of 12.69 at birth which increased to 16.09 after two years. The share of obese children more than doubled from four percent at birth to nine percent after two years. At birth only six percent of the newborns have any disorder such as motor and visual impairments. Later on, the percentage is five times higher, in part because children had come with asthma and bronchitis. In contrast, the average

²For a detailed definition of BMI (obesity) in childhood, see Appendix.

numbers of doctor visits between the two waves remained nearly unchanged. The share of hospital visits among children decreased from seven percent at birth to two percent two years later. For our empirical estimation we computed a variable for children's medical assistance, which is the sum of the number of doctor and hospital visits within a particular period. A higher number of doctor visits thus indicates poorer child health. However, this also depends on the risk behavior of the mothers. We would expect that risk-averse mothers are more likely to consult a doctor. Second, hospitalization is often a consequence of preceding doctor visits.

The average BMI for both mothers and fathers is about 25. In our sample, 12 percent of parents are obese. Once birth-related medical care ended, the average number of doctor visits and nights spent at the hospital decreased among mothers. While the health measure "nights spent at the hospital" is observable one year before pregnancy, the variation between the means cannot be due to childbirth. The number of doctor visits is obviously higher in the year of birth than later, compared with doctor visits before and after delivery ("pregnancy effect"). We try to isolate this "pregnancy effect" to provide an unbiased health indicator based on the number of doctor visits, called permanent number of doctor visits. This is the average number of doctor visits over the period 2002-2006.

Moreover, mothers and fathers differ with respect to smoking. The share of smoking fathers is twice as high as the share of smoking mothers. But the percentage of mothers who do not smoke in the first wave is seven percent lower than two years later. It may be that mothers interrupt smoking during pregnancy and start smoking again immediately after birth. Other health measures are similar for mothers and fathers.

Further, summary statistics for the family background that are also relevant for the empirical estimation are reported in Table A.2 (see Appendix). [To be completed]

Table 1: Summary Statistics of physical health measures

	3-18 months olds		26-42 months olds	
	mean	std.dev.	mean	std.dev.
Child's physical health				
Number of doctor visits within 3 months	1.69	(3.32)	1.47	(2.16)
Hospital visits	0.07	(0.26)	0.02	(0.13)
Worried about my child's health 'no'	0.56	(0.50)	0.60	(0.49)
Disorder	0.06	(0.23)	0.30	(0.46)
BMI	12.69	(1.49)	16.09	(3.76)
Obesity	0.04	(0.20)	0.09	(0.29)
Mother's physical health				
Current doctor visits	4.76	(4.36)	2.02	(2.99)
Nights spend in hospital last year	2.70	(3.18)	1.02	(8.14)
Satisfied with own health 'very good'	0.30	(0.46)	0.28	(0.45)
Satisfied with own health 'good'	0.49	(0.50)	0.45	(0.50)
Satisfied with own health 'poor'	0.18	(0.39)	0.21	(0.40)
Satisfied with own health 'bad'	0.01	(0.10)	0.03	(0.17)
Current health status 'very good'	0.17	(0.38)	0.13	(0.34)
Current health status 'good'	0.53	(0.50)	0.51	(0.50)
Current health status 'poor'	0.23	(0.42)	0.24	(0.44)
Current health status 'bad'	0.06	(0.24)	0.10	(0.31)
Smoking	0.16	(0.37)	0.23	(0.42)
BMI	24.72	(4.55)	24.46	(4.63)
Obesity	0.13	(0.33)	0.12	(0.32)
Father's physical health				
Current doctor visits	1.11	(1.80)	1.10	(1.85)
Nights spend in hospital last year	0.46	(1.57)	0.37	(1.94)
Satisfied with own health 'very good'	0.27	(0.44)	0.25	(0.43)
Satisfied with own health 'good'	0.46	(0.50)	0.42	(0.49)
Satisfied with own health 'poor'	0.17	(0.38)	0.20	(0.40)
Satisfied with own health 'bad'	0.09	(0.29)	0.11	(0.31)
Current health status 'very good'	0.16	(0.37)	0.13	(0.33)
Current health status 'good'	0.52	(0.50)	0.48	(0.50)
Current health status 'poor'	0.21	(0.41)	0.24	(0.43)
Current health status 'bad'	0.03	(0.18)	0.06	(0.23)
Smoking	0.33	(0.47)	0.33	(0.47)
BMI	25.48	3.62	23.35	(8.54)
Obesity	0.09	(0.28)	0.12	(0.33)
Observations				411

Data Source: Sample drawn from the GSOEP 2002-2006. Own calculation.

3 Health Regression

3.1 Econometric Model

Equation (1) presents the relationship between health of parents and children:

$$Health_i = \alpha + \beta Health_j + X_j\delta + Y_i\gamma + f_i + u_i. \quad (1)$$

where $Health_i$ is a measure of child i 's physical health in early childhood, $Health_j$ denotes parental (j) physical health status (and also includes health behavior), X_j is a vector of parental characteristics that includes education, household income, family status, health insurance, nationality and municipality size, Y_i is a vector of children characteristics that includes gender, siblings and twins, f_i denotes the individual fixed effect and u_i is the error term. The coefficient on parental health β is our parameter of interest. The parameter can be used to test a variety of hypotheses. First, β provides information on whether children of parents with poor health also experience poor health in early childhood. Second, the coefficient β can be interpreted as a health gradient. A high coefficient indicates a strong transmission of health characteristics from parents to children. Finally, the coefficient β can be decomposed into the impact of mother's health and father's health on the child's health. We estimate FE models to identify β . [To be completed]

3.2 First Results

Table 2 - Table 4 report estimation results for the FE models displayed above. Table 2 presents fixed effects results for children's weight, BMI and obesity. Here, we are interested how parental physical health conditions and behavior, such as BMI, obesity and smoking transmit to children's physical health. Table 3 and Table 4 present fixed effects results for further children's health indicators, such as disorders, the assessment "worried about my child's health" and medical assistance. We investigate how child's health status in early childhood is affected by parental health status, objective health measures such as number of doctor visits and nights spent at the hospital, and subjective health measures such as parents' assessment of their current health status. All models control for equivalence income (annual), a dummy for private health insurance, parental education, child's age and municipality size.

The estimation results for children's observable health indicators show that the mother's BMI has a negative impact on the child's weight and BMI, while the father's high BMI leads to higher weight and BMI of the child. Our results indicate that whether a child is obese does not depend on the parent's BMI. The results of Table 2 indicate that the transmission process differs between mother and father. And in our sample, the health gradient is larger for the father's physical health than for the mother's physical health.

With respect to smoking, our results show that paternal smoking reduces BMI within the child's first three years of life. However, we find no impact of maternal smoking on weight and BMI.

The results in Table 3 indicate that poor maternal health (nights spend in the hospital) increases the probability of the child having a disorder. Further, the more nights a mother spend in hospital the more she is worried about children's health. The reverse is true for the father's doctor visits and the assessment of children's health.

Finally, in Table 4 we investigate the transmission of health in early childhood based on a subjective parental health indicator. The overall pattern of these health measures shows that good maternal health decreases the probability of child's disorder and increases the subjective health indicator of the child. Non of the models identifies a significant impact of father's self-assessed health on his child's health. [To be completed]

Table 2: Fixed Effects Results (1)

Child's health	weight	BMI	obesity
Mother's BMI	-0.02** (0.009)	-0.14 (0.14)	0.002 (0.01)
Father's BMI	0.05*** (0.017)	0.59** (0.26)	0.002 (0.02)
Mother obese	-0.02 (0.09)	1.26 (1.35)	0.11 (0.10)
Father obese	0.007 (0.07)	-1.27 (1.09)	0.09 (0.08)
Mother smoking	0.05 (0.07)	-0.05 (1.006)	0.02 (0.08)
Father smoking	-0.002 (0.06)	-1.41* (0.85)	0.006 (0.07)
Equivalence income	-6.90e-07 (1.10e-06)	9.02e-06 (1.68-e -04)	2.02e-06 (1.29e-06)
Private insurance	0.003 (0.12)	0.50 (1.76)	-0.18 (0.14)
Mother's occupational degree	-0.06 (0.15)	0.50 (2.71)	-0.04 (0.21)
Father's occupational degree	0.03 (0.06)	-1.42 (0.99)	-0.18** (0.08)
Mother's university degree	0.28 (0.31)	1.01 (4.65)	0.08 (0.36)
Father's university degree	0.02 (0.18)	-0.41 (2.79)	-0.04 (0.21)
Child's age	0.05*** (0.0007)	0.13*** (0.01)	0.001* (0.0008)
Municipality	0.03 (0.02)	0.75** (0.35)	-0.015 (0.03)
Observations	404	402	402

Data Source: Sample drawn from the GSOEP 2003-2006. Standard Errors are in parentheses:
 ***significant at 1% level; **significant at 5% level; * significant at 10% level. Own calculation.

Table 3: Fixed Effects Results (2)

Child's health	disorder	worried about child's health	medical assis- tance
Mother's Doctor visits	-0.0002 (0.005)	0.03 (0.25)	-0.02 (0.12)
Father's Doctor visits	-0.01 (0.01)	0.82* (0.49)	0.18 (0.23)
Mother's Nights spend in hospital	0.005* (0.0027)	-0.22* (0.13)	0.02 (0.12)
Father's Nights spend in hospital	0.007 (0.01)	0.08 (0.50)	-0.30 (0.24)
Mother smoking	0.16* (0.09)	4.60 (4.47)	0.84 (2.54)
Father smoking	0.16* (0.09)	-7.14* (4.25)	-3.90* (2.26)
Equivalence income	3.22e-08 (1.64e-06)	-0.00004 (0.00007)	-0.00002 (0.00004)
Private insurance	0.04 (0.18)	-4.47 (8.62)	-2.14 (4.34)
Mother's occupational degree	-0.20 (0.26)	7.95 (12.09)	-0.33 (6.53)
Father's occupational degree	0.05 (0.10)	0.45 (4.90)	3.01 (2.51)
Mother's university degree	-0.27 (0.50)	26.89 (23.29)	-0.60 (10.82)
Father's university degree	0.29 (0.29)	16.77 (13.99)	8.29 (6.58)
Child's age	0.009*** (0.001)	-0.04 (0.05)	-0.08*** (0.03)
Municipality	0.03 (0.03)	-0.89 (1.63)	-0.30 (0.79)
Observations	411	410	410

Data Source: Sample drawn from the GSOEP 2003-2006. Standard Errors are in parentheses:
 ***significant at 1% level; **significant at 5% level; * significant at 10% level. Own calculation.

Table 4: Fixed Effects Results (3)

Child's health	disorder	worried about child's health	medical assistance
Mother's Current health status			
very good	-0.28*** (0.09)	9.07** (4.31)	-3.81* (2.24)
good	-0.27*** (0.08)	5.94 (3.79)	-1.86 (1.99)
not good	-0.25*** (0.08)	5.36 (3.74)	-2.30 (1.96)
Father's Current health status			
very good	0.001 (0.08)	-2.40 (3.74)	0.20 (1.89)
good	-0.01 (0.05)	-2.71 (2.45)	0.22 (1.23)
not good	-0.01 (0.05)	-2.71 (2.45)	0.22 (1.23)
Mother smoking	0.12 (0.09)	5.27 (4.43)	1.30 (2.47)
Father smoking	0.18** (0.09)	-6.55 (4.22)	-3.06 (2.22)
Equivalence income	2.72e-07 (1.64e-06)	-0.00001 (0.00007)	-0.00002 (0.00004)
Private insurance	-0.005 (0.18)	-4.18 (8.70)	-2.73 (4.38)
Mother's occupational degree	-0.27 (0.25)	9.06 (11.59)	1.51 (6.20)
Father's occupational degree	0.06 (0.10)	-0.44 (4.87)	2.46 (2.47)
Mother's university degree	-0.28 (0.50)	26.66 (23.32)	0.18 (10.80)
Father's university degree	0.28 (0.30)	18.82 (13.97)	6.63 (6.56)
Child's age	0.009*** (0.001)	-0.03 (0.05)	-0.08*** (0.03)
Municipality	0.04 (0.03)	-1.17 (1.63)	-0.27 (0.79)
Observations	411	410	410

Data Source: Sample drawn from the GSOEP 2003-2006. Standard Errors are in parentheses: ***significant at 1% level; **significant at 5% level; * significant at 10% level. Reference category is very bad. Own calculation.

4 Conclusion

[To be completed]

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A Appendix

Table A.1: Definitions of obesity for relevant age groups

age in years	BMI girls	BMI boys
0	4.16	4.31
0.5	9.05	9.94
1	11.89	12.78
1.5	13.77	14.49
2	15.32	15.84
2.5	16.81	17.06
3	18.38	18.49
3.5	20.02	20.14

Table A.2: Summary Statistics of family characteristics

	3-18 months olds		26-42 months olds	
	mean	std.dev.	mean	std.dev.
Equivalence income (annual)	34337.17	(21820.8)	36445.74	19394.88
Mother's education				
No degree	0.14	(0.35)	0.14	(0.35)
Occupational degree	0.66	(0.48)	0.68	(0.47)
University degree	0.21	(0.41)	0.20	(0.40)
Father's education				
No degree	0.09	(0.28)	0.10	(0.30)
Occupational degree	0.57	(0.50)	0.62	(0.49)
University degree	0.26	(0.44)	0.25	(0.43)
Single parent household	0.08	(0.26)	0.10	(0.30)
Private health insurance	0.13	(0.33)	0.10	(0.30)
Migration	0.15	(0.35)	0.16	(0.36)
Municipality	4.10	(1.88)	4.15	(1.77)
Rural Area	0.54	(0.50)	0.53	(0.50)
Observations				411

Data Source: Sample drawn from the GSOEP 2003-2006. Own calculation.