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Intergenerational transmission of long-term sick leave[1]

by

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Abstract

The aim of this study is to investigate the importance of intergenerational transmission of sick leave using universal Swedish register data on the rate of sickness benefits. We find that there is a positive correlation between parents' and their children's sick leave. The child–parent correlation is of about the same magnitude irrespective of the gender of the parent and the child, but it is larger the more sick leave the parent had when observed. Furthermore, there is a positive correlation between the sick leave level of the children and that of the parents-in-law, implying that persons tend to live with a partner whose sick leave resembles that of their parents. Finally, a comparison between siblings of different birth order shows that firstborn daughters report fewer spells of sick leave than their younger siblings of the same gender. This gap only emerges in the group of daughters with parents who lack sick leave themselves, suggesting that the birth-order effect is only of importance among women with low levels of sick leave.

Keywords: Intergenerational mobility, sickness absence, sickness benefits and disability pension
JEL codes: I14, I15, I10

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1 Introduction

Equality of opportunities is a non-controversial goal in a welfare economy. One interpretation of this phrase is that the equality of opportunities increases the more a person's position is determined by her choices and personal characteristics rather than by her socioeconomic background. Intergenerational mobility – the degree of connection between parents' and their children's position in the society – in income and education is a well-studied and active research field.[6] During the last years, this research has expanded and now also includes intergenerational mobility in unemployment (e.g., Ekhaugen, 2009), social benefit dependence (e.g., Antel, 1992; Edmark and Hanspers, 2012; Gottschalk, 1996) and crime (e.g., Besemer and Farrington, 2012; Thornberry, 2009). A related area that has not yet been studied is intergenerational sickness absence mobility, i.e., whether sickness absence is transmitted from parents to their children.

An intergenerational relationship in sickness absence could be explained by several different factors, such as inheritable health, work ability, life conditions and social norms. Irrespective of the underlying causes, a strong intergenerational relationship is an indication of inequality of opportunities. In this paper, we investigate whether there is intergenerational transmission[7] of long-term sickness absence (henceforth just sickness absence or sick leave) and whether this potential intergenerational correlation varies depending on the level of sickness absence: is the intergenerational transmission larger from those with high levels of sick leave in comparison with those with lower levels? From a policy perspective, such knowledge is interesting. Are high levels of sickness absence among the parents a predictor of sickness absence among the children in the future? Could future sickness absence be mitigated by early preventative measures?

We perform the following analysis. Firstly, we investigate whether there is any correlation between parents' (observed while having their children at home) and their grown-up children's sick leave rate. Secondly, we investigate whether the inter-generational transmission differs depending on the parents' own level of sick leave. Thirdly, we investigate whether there is a correlation between the sick leave rates of

[6] For a literature review of income and schooling mobility, see, for example, Björklund and Jäntti (2009) and Holmlund, Lindahl and Plug (2011).

[7] In this study, we focus on the correlation between parents' and their children's sickness absence and we do not claim a causal relationship. However, in order to make the text clear, we use the word transmission in the meaning of intergenerational mobility.

children and their parents-in-law. If this correlation is positive, it indicates that persons tend to live with a partner who resembles their parents. Finally, in order to shed light on the importance of social factors in contrast to joint family components in the intergenerational transmission of sick leave, we compare biological siblings of the same gender but with a different birth order. We know that firstborn children in general are more prosperous on the labour market than their younger siblings and that this difference is not biologically determined.[8] Here we ask whether siblings of the same gender differ in their sickness absence depending on their birth order and whether this potential birth-order effect varies in magnitude depending on the parents' level of sick leave.

The analysis is based on register data covering all Swedish citizens in the age range of 16 to 65 years. The parents are observed between 1986 and 1991 when their children are between 10 and 19 years old. The children are observed between 2003 and 2008. By sick leave we mean the number of days' entitled sickness benefit or disability pension received from the Swedish Social Insurance.[9]

The main result is that there is a positive correlation between parents' and their children's rates of sick leave. The magnitude of this correlation is about the same irrespective of the gender of the parent and the child. The child's expected rate of sick leave increases with the parent's rate, and the intergenerational transmission is particularly strong from the parents with the highest rates of sick leave. Furthermore, there seems to be a threshold effect in the sense that if the parent takes any sick leave, the child's expected number of sick leave days is almost 50 per cent higher than if the parent lacks sick leave days. We also find a positive correlation between the children's sick leave rate and the sick leave rate of their parents-in-law, indicating that persons tend to live with a partner who resembles their parents with respect to sick leave.

Finally, we find that firstborn daughters report less sick leave than their younger siblings of the same gender. However, this sibling gap only emerges in the group of daughters with parents who lack sick leave themselves, suggesting that the birth-order

[8] Firstborn children tend to have slightly more education and a higher income than their younger siblings (Black, Devereux and Salvanes, 2011; Sulloway, 2007) and this seems not to be biologically determined (Kristensen and Bjerkedal, 2007) or affected by family breakdown (Black, Devereux and Salvanes, 2011).

[9] Sickness benefit is used more temporarily than disability pension. However, long-term sickness absence with sickness benefit often results in absence spells with a disability pension. The aim here is to capture all types of absence due to sickness rather than the type of benefit.

effect is only of importance for explaining sick leave among women with low levels of sick leave.

This paper has the following structure. Section 2 describes the potential mechanisms behind intergenerational transmission of sickness absence. Section 3 contains an overall description of the social insurance system in Sweden. Section 4 presents the empirical strategy, sections 5 to 7 present the results and section 8 concludes the paper.

2 How sickness absence can be inherited

A reasonable determinant for explaining an intergenerational correlation in sickness absence is the health status among parents and their children. Some diseases associated with sickness absence are genetic and children may be genetically predisposed to develop them. However, most diseases have complex causes; genetic susceptibility can act in combination with environmental factors and environmental factors affect people differently depending on their genetics. For example, Hedström et al. (2011) found that the risk of developing multiple sclerosis among individuals with a specific genetic variant is heavily influenced by smoking, but for individuals without this gene variant, smoking is not nearly as important. Correspondingly, although the parent has a genetic disease, the child does not necessarily develop the same disease. Instead, the risk of developing the disease for which one has a genetic predisposition mostly depends on the environment and the environment mostly changes with time.

The causes of disease are not equal to the causes of sick leave. Most people who have a diagnosed disease are not on sick leave (Wikman, Marklund and Alexanderson, 2005) and people are eligible for sick leave benefits and allowances only if the disease or injury impairs their ability to work by at least 25 per cent. For example, the ability of a person to carry out professional work when he or she has multiple sclerosis depends on his or her functioning, the profession and the working conditions. Thus, sickness absence is one possible social consequence of disease or injury in terms of impaired work ability.[10] The medical progress and the possibilities to adjust the working environment for different types of dysfunctions are, of course, crucial for explaining the sickness absence level. Thus, the extent of intergenerational mobility in any aspect is contingent on the context in which it is studied.

[10] For a further discussion on this subject, see Marmot et al. (1995).

In addition to family-common health (the transmission of health through behaviour and genetics), there are several other channels through which sick leave can be transmitted from parent to child. One is the fact that children often inherit their parents' choice of education and occupation (e.g., Breen, 2004; Holmlund, Lindahl and Plug, 2011). Different professions (with corresponding working environments) are associated with different levels of sickness absence. In general, the longer the education required for an occupation, the lower the average level of sickness absence (Försäkringskassan, 2010). The extent to which this observation is explained by differences in work-related exposure, in possibilities of adjustments at work, or by health selection into certain occupations is unclear from the literature.

A related channel of intergenerational sickness absence transmission is the fact that many children remain in the same area where they have grown up and sickness absence in the population varies between different geographical areas. Granqvist and Olsson (2006) showed that the sickness absence culture, both in the health-care system and in workplaces, varies across local areas and local practices are determinants of sickness absence (e.g., Virtanen, 2010).

Finally, an additional explanation for a potential intergenerational correlation in sickness absence is the norms and social interactions between individuals. The attitudes towards sickness absence vary across subgroups and the members of a subgroup influence the sickness absence of other members through social interactions (Henreksson and Persson, 2004; Hesselius, Johansson and Vikström, 2008; Johansson and Palme, 2002, 2005; Lindbeck, Palme and Persson, 2004, 2007).. Family members are probably important reference persons in this context. By using Swedish register data, Andersson et al. (2011) showed that the risk of being sick listed is higher if a family member has been sick listed during the previous year.

3 Swedish sickness insurance

The Swedish social insurance system covers everyone who lives or works in Sweden. It is a state-financed programme that provides economic support to people with reduced working ability who are aged between 16 and 64 years. The sickness insurance mainly includes two types of replacements: sickness benefit and disability pension.

3.1 Sickness benefit

Sickness benefit may be granted on a part-time as well as on a full-time basis, but requires a reduced working capacity of at least 25 per cent. Since 1992, the first day within a sickness spell has been uncompensated. Thereafter, the employer pays sick pay. The time for which the employer pays sick pay has varied slightly over time, but has typically been the following 14 days since 1992. After 14 days, the Swedish Social Insurance Agency (SIA) disburses sickness benefit. For unemployed persons, the SIA starts disbursing sickness benefit from the second day onwards.

After 7 days of sick leave, a doctor's certificate is needed. Based on this certificate, the SIA formally decides whether an individual is entitled to compensation or not. When the entitled period has expired, a renewal certificate is required and the process is repeated. A person can receive sickness benefit for at most 364 days during 15 months. If a person's work capacity is still reduced after a year, he or she can apply for extended sickness benefit, which could, during the time period we study, continue without time limit.[11]

3.2 Disability pension

Disability pensions can be granted by the social insurance office if the working ability is reduced by at least 25 per cent. The disability pension could, at the time, be granted temporarily[12] or permanently up to old-age retirement, and could be given on a full-time or a part-time basis. To be eligible for the disability pension, a certificate issued by a physician must affirm the disability. However, during the study period, the disability pension was also used to reimburse individuals encountering difficulties in entering the labour market, i.e., for other reasons than pure impediments to carrying out any labour work (SOU 2000:78).

4 Empirical strategy and data

In this section, we present the empirical strategy, the data used, our definition of long-term sickness and the study population.

[11] More restrictive rules were introduced in July 2008.
[12] Since July 2008, the disability pension has only been allowed on a permanent basis (for persons above the age of 30).

4.1 Empirical strategy

The empirical strategy in this study stems from theoretical ideas about intergenerational mobility presented by Becker and Tomes (1979, 1986). The basic idea is that parents affect their children both through investments in the child's human capital and through the inheritance of "endowments". The Becker–Tomes model has been used in empirical studies of intergenerational mobility with the aim of capturing the total inheritance passed from parents to their children (see, for example, Solon, 1992; Solon et al., 1991).

In empirical studies of intergenerational mobility inspired by the Becker–Tomes model, an explicit aim is to observe the parents in a representative period of their lives and during a period when their children may be affected by their actions. We follow earlier empirical works on intergenerational mobility (see, for example, Björklund, Roine and Waldenström, 2012) and observe the parents when they are in midlife and when they have children of school age. The children are observed when they are about the same age as their parents are when they are observed.[13]

4.2 Data

The analysis is based on register data covering all Swedish citizens aged 16–65 years. The parents are observed between 1986 and 1991 when their children are between 10 and 19 years old. The children are observed between 2003 and 2008. We have annual register information on employment status, earnings and household units, i.e., we can link family members to each other. We can also link all children to their parents. In Table A 1 in the Appendix, we present the structure of attrition due to the merging process of different registers.

We have information on sickness absence from population-wide registers provided by the Swedish Social Insurance Agency (SIA). These registers cover all days with sickness benefit and disability pension for all Swedes since 1986. We observe the parents when they are in their 40s and the children when they are between 27 and 36 years old.[14] The information about sick leave is added to our register information on the total population.

[13] Due to limitations in the available register data, we are not able to fulfil this criterion perfectly. In our analysis, the parents are in general about 5–10 years older than their children when observed.

[14] Since sickness absence varies across ages, we (if anything) estimate a lower bound of the true intergenerational correlation when parents and children are observed at different ages. In the analysis, we control for both the parent's and the child's age with a second-degree polynomial. The distribution of ages of parents and children is large; hence, we believe that our estimations are unbiased.

To receive information about the link between children and their parents-in-law, we proceed as follows. In the registers, we can observe which persons share households. In order to identify couples – or two adults who live together – we first exclude all the household members below 17 years old and persons who are above 16 years old but who share a household with their parents. Second, we eliminate all single households. Finally, we only keep households with two adults of different sex.[15]

4.3 Definition of sickness absence

Sick leave in this study is defined as days with sickness benefit and days with disability pension reimbursed by the SSA.[16] In order to measure sick leave in the same way over time, we start counting days from the fourth week within a given sickness spell. With respect to disability pension, we observe the first day replaced and start counting from the first day in a sickness spell with a disability pension. The annual number of days on sick leave could sum up to more than 365 days per year. The maximal number of days was set to be 365. (This concerns only around 1 per cent of the individuals in the study population; see Table 1.)

Individuals could be entitled to sickness benefits on a full-time or a part-time basis. Due to data restrictions, we focus on the number of days with sickness benefits rather than the extent of this type of benefit. When it comes to disability pensions, we make a distinction between a disability pension on a full-time basis and a disability pension on a part-time basis.[17]As a robustness test, we re-estimate all our models with alternative measures of sickness absence, such as annual prevalence of sickness absence (1/0) and the annual average number of sickness absence spells. The qualitative conclusions are the same irrespective of which measurement we use.

In order to obtain a representative picture of the level of sickness absence, we observe both parents and children during a period of six years. By doing so, we avoid occasional fluctuations in sickness absence that are not representative of the individual.

[15] Adult persons who live with a parent or who live with a sibling cannot be excluded. After our restrictions, such cases should be extremely rare; hence, we believe this part of the analysis is mainly based on adult couples.

[16] The reason for including both sickness benefit and disability pension is that a long period of sickness benefit in many cases ends up in a disability pension on a more permanent basis. Thus, by only studying persons with sickness benefit, we miss the persons who are the most absent due to sickness.

[17] For the parents with respect to disability pensions, we only have information about the status at the end of December each year. We multiply this information by 365 days to obtain an approximation of the annual average. For the children with a disability pension, we have information on a daily basis.

For each parent and child, we calculate the annual average number of days absent due to sickness over the respective observation period.[18]

In order to describe the importance of transmission depending on the level of sickness absence among the parents, we estimate the parent–child correlation in different parts of the sickness absence distribution separately. We also control for whether the parents have any sickness absence or not when estimating the transmission from parents with high levels of sickness absence.

4.4 The study population

The study population consists of 238,599 sons and 224,385 daughters and their mothers and fathers. Table 1 presents descriptive statistics of this study population.

The study population includes children between 32 and 36 years old and their parents, who are somewhat older: on average 44 and 46 years old for mothers and fathers, respectively.[19] The mothers are on average younger when entering parenthood than the fathers.

Daughters have lower labour earnings than sons; daughters' earnings are around 65 per cent of sons' (SEK 149,282 and SEK 229,474). This gender gap is somewhat larger than the average gender gap in earnings among men and women in Sweden. An explanation is that the daughters in this study are of child-bearing age.

In addition, in the parent generation, mothers have lower earnings than fathers; the mothers' labour income is on average 57 per cent of the fathers'. This can be explained by the fact that women to a larger extent than men work part-time or not at all.

Ideally we would only include those eligible for sickness benefits in our study population. However, in our data, we cannot distinguish between unemployment and voluntary non-participation in the labour force. In order to shed light on this issue, we present the share without any labour income at all (during all six years observed). This share is lowest among the daughters (3 per cent) and highest among the fathers (5 per cent). However, the large majority of people in all the groups have some labour market income during the observation period, suggesting that they are eligible for sickness benefits.

[18] To observe sickness absence during several years and calculate a mean value is analogous to how a representative income is calculated within the literature on intergenerational income mobility (see, for example, Björklund and Jäntti, 2009).

[19] The age is observed in the last year of the respective study period, namely 1991 for the parents and 2008 for the children.

In our study population, there is both a gender gap and a gap between the generations in our rate of sick leave; half of the mothers and the daughters and at least 25 per cent of the fathers and the sons have days with sickness absence.

In order to gain a better understanding of what our measure of sickness absence captures, we also present the number of days with sickness benefit and disability pension separately in Table 1 for all our sub-groups. The gender gap is particularly large among the children with respect to sickness benefit; daughters have on average twice as many days with sickness benefit as sons (18 and 7, respectively). The gender gap with respect to disability pensions is not as large; the daughters have on average 11 days per year while the sons have on average 8 days per year. Among the parents, the mothers have more days with sickness benefit but there is no gender gap with respect to disability pensions.

We also present the share with more than 365 days of sickness benefit plus disability pensions per year, that is, the share that has two different kinds of compensation at the same time, both on a part-time basis. This share is around 1 per cent in all the groups, which indicates that our measure of sickness absence reflects what we intend to capture, namely the number of days' absence due to sickness rather than the number of types of compensation.

Table 1 Descriptive statistics of the study population

	Mean	Median	Std dev.	Min.	Max.
***Sons*:**					
Age in 2008	34.05	34.00	1.40	32	36
Labour income	229 473	233 143	131 632	0	5 447 011
Days with s.b.	7.24	0.00	27.86	0	365
Days with d.p.	8.01	0.00	49.91	0	365
Days with s.b. and d.p.	15.14	0.00	59.28	0	365
Share having days with s.b. and d.p.>365 days	0.00	0.00	0.07	0	1
Share having days with s.b. and d.p.>0	0.25	0.00	0.43	0	1
Share without labour income	0.04	0.00	0.19	0	1
***Mothers*:**					
Age in 1991	43.59	43.00	4.90	29	65
Labour income	76 943	77 697	46 301	0	641 199
Days with s.b.	14.29	0.00	40.76	0	365
Days with d.p.	8.98	0.00	48.01	0	365
Days with s.b. and d.p.	22.69	0.00	66.98	0	365
Share having days with s.b. and d.p.>365 days	0.01	0.00	0.09	0	1
Share having days with s.b. and d.p.>0	0.44	0.00	0.50	0	1
Share without labour income	0.04	0.00	0.20	0	1
***Fathers*:**					
Age in 1991	46.17	46.00	5.35	31	65
Labour income	135 520	134 985	85 168	0	7 745 888
Days with s.b.	10.81	0.00	34.90	0	365
Days with d.p.	8.82	0.00	48.65	0	365
Days with s.b. and d.p.	19.13	0.00	63.63	0	365
Share having days with s.b. and d.p.>365 days	0.01	0.00	0.09	0	1
Share having days with s.b. and d.p.>0	0.36	0.00	0.48	0	1
Share without labour income	0.05	0.00	0.21	0	1
***Daughters*:**					
Age in 2008	34.05	34.00	1.40	32	36
Labour income	149 281	143 759	90 796	0	2 568 012
Days with s.b.	18.44	0.33	42.99	0	365
Days with d.p.	11.45	0.00	57.57	0	365
Days with s.b. and d.p.	29.52	1.00	75.02	0	365
Share having days with s.b. and d.p.>365 days	0.01	0.00	0.11	0	1
Share having days with s.b. and d.p.>0	0.52	1.00	0.50	0	1
Share without labour income	0.03	0.00	0.18	0	1
***Mothers*:**					
Age in 1991	43.56	43.00	4.90	28	65
Labour income	77 363	78 181	46 155	0	564 730
Days with s.b.	14.05	0.00	40.08	0	365
Days with d.p.	8.89	0.00	48.01	0	365
Days with s.b. and d.p.	22.39	0.00	66.39	0	365

	Mean	Median	Std dev.	Min.	Max.
Share having days with s.b. and d.p.>365 days	0.01	0.00	0.09	0	1
Share having days with s.b. and d.p.>0	0.44	0.00	0.50	0	1
Share without labour income	0.04	0.00	0.19	0	1
***Fathers*:**					
Age in 1991	46.16	46.00	5.35	29	65
Labour income	135 702	135 253	83 444	0	2 083 013
Days with s.b.	10.76	0.00	34.99	0	365
Days with d.p.	8.68	0.00	48.26	0	365
Days with s.b. and d.p.	18.96	0.00	63.31	0	365
Share having days with s.b. and d.p.>365 days	0.01	0.00	0.08	0	1
Share having days with s.b. and d.p.>0	0.36	0.00	0.48	0	1
Share without labour income	0.05	0.00	0.21	0	1

Note: "s.b." is sickness benefit and "d.p." is disability pension. Labour income is in 1980-year prices and also includes those with zero income for one or several years. "Share having days with s.b. and d.p.>365 days" is from a dummy variable indicating whether the individual's total number of days with sickness benefits and disability pension increases over 365 days per year, which could be the case if the individual has both benefits on a part-time basis.

5 Main results

The results are presented from both a descriptive analysis and regression models. We start by asking how common it is to have any absence due to sickness among children whose parents have been absent due to sickness in comparison with children whose parents who have not. Then we study how the parent–child correlation in sickness absence varies depending on the level of absence among parents and children, respectively, given that both the parent and the child has at least one day absent due to sickness.

5.1 Descriptive analysis

Table 2 shows the share of parents and children, respectively, with sick leave and the corresponding shares without. The rows in Table 2 show the parents' shares and the columns show the children's shares. The cells within the matrix present the share of the parents who have children with the same outcome. The risk ratio is the share of children with sick leave among parents with sick leave in relation to the corresponding share of children with sick leave among parents without sick leave. The risk difference is the difference between these two groups.

The most common outcome is that neither children nor parents have any sick leave. Among daughters, the second most frequent outcome is that the daughter has sick leave but not the parent. Among sons, it is the opposite; namely that the parent has sick leave but not the son. This gender difference could be explained by the fact that the children in our study population are more of a child-bearing age than the parent generation, which in turn affects daughters' sickness absence rate more than that of sons.[20]

More interestingly, among sons, it is 35 per cent more common that the son himself has sick leave if the parent has sick leave in comparison with if the parent (irrespective of the parent's gender) has not. Among daughters, the corresponding difference is smaller: about 18 to 14 per cent depending on the gender of the parent. The absolute differences in sick leave between children who have and who have not a parent with his or her own sick leave are about 8 percentage points in all the sub-groups.

To sum up, there is a clear overrepresentation of children with sick leave among parents with sick leave, suggesting that there is a threshold effect. If the parent has sick leave, there is a positive probability that the child also has sick leave.

Table 2 Share with and without sickness absence among grown-up children, depending on whether their parents have sickness absence or not

		Daughters				
Mothers		No absence	Absence	Total	Risk ratio[1]	Risk difference[2]
	No absence	28.77	27.27	56.03		
	Absence	18.79	25.18	43.97	1.18	0.09***
	Total	47.56	52.44	100.00		
		Sons				
Mothers		No absence	Absence	Total	Risk ratio	Risk difference
	No absence	43.64	12.08	55.72		
	Absence	31.34	12.94	44.28	1.35	0.08***
	Total	74.98	25.02	100.00		
		Daughters				
Fathers		No absence	Absence	Total	Risk ratio	Risk difference
	No absence	31.93	31.76	63.69		
	Absence	15.63	20.68	36.31	1.14	0.07***
	Total	47.56	52.44	100.00		
		Sons				
Fathers		No absence	Absence	Total	Risk ratio	Risk difference
	No absence	49.51	14.04	63.55		
	Absence	25.47	10.98	36.45	1.36	0.08***
	Total	74.98	25.02	100.00		

Note: 1) and 2): The risk ratio for sickness absence is calculated in the following way (exemplified by mothers and daughters): (25.18/43.97) / (27.27/ 56.03) and the corresponding risk difference is calculated as: (25.18/43.97)–(27.27/ 56.03). The statistical significance of the risk difference (based on the number of days absent) is indicated by *** and refers to p<0.01.

[20] Giving birth is associated with a peak in sickness absence.

The number of days absent due to sickness

In this section, we ask whether the overrepresentation of children with sickness absence among parents with sickness absence is equally distributed across the number of days absent due to sickness. To this purpose, we focus on the parents and their children who have days absent due to sickness.

Table 3 presents the sickness absence rate in five equally large groups ranked after their average number of days absent due to sickness within the respective generation and gender. Group 1 consists of the 20 per cent with the lowest rate of sick leave and group 5 consists of the 20 per cent with the highest rate of sick leave. Mothers' and fathers' shares are given in the rows and daughters' and sons' shares in the columns. If there was no correlation between parents' and their children's rate of sick leave, the expected share in each cell would be 20 per cent. A higher share in a cell indicates overrepresentation and, correspondingly, a lower share indicates underrepresentation. Table 3 shows that there is a strong overrepresentation of sick leave among children of parents with a high absence rate of sick leave. Parents in group 5 have about 10 percentage points more children who also belong to group 5 in their generation. Interesting to note is that the opposite does not hold; the children of parents in group 1 are rather equally distributed across all the groups. Thus, the transmission of sick leave is most pronounced among parents with the highest rate of sick leave. This pattern is about the same across genders. Thus, there is no gender differential in the magnitude of the transmission of sick leave among parents with a higher rate of sick leave as there is with respect to the margin "having sick leave or not" (c.f. Table 2).

Table 3 Shares of children and parents in different quantiles in respective distribution of sickness absence, divided by gender

	Group	1	2	3	4	5	
	Percentile:	**0–20**	**20–40**	**40–60**	**60–80**	**80–100**	
Mothers		*Daughters*					**Total**
	1	19.70	19.97	20.69	20.60	19.03	100.00
	2	20.02	20.48	19.91	19.64	19.95	100.00
	3	19.03	18.56	19.49	21.32	21.60	100.00
	4	16.45	18.14	18.95	21.12	25.34	100.00
	5	15.36	16.35	16.97	21.07	30.26	100.00
Mothers		*Sons*					
	1	20.30	20.12	19.83	19.71	20.05	100.00
	2	19.78	20.44	19.98	20.72	19.08	100.00
	3	19.60	19.35	20.26	20.39	20.39	100.00
	4	18.50	18.72	19.16	21.06	22.55	100.00
	5	16.25	17.23	17.87	21.42	27.23	100.00
Fathers		*Daughters*					
	1	20.12	19.81	19.61	20.35	20.11	100.00
	2	19.43	19.00	19.87	19.91	21.79	100.00
	3	19.11	18.85	19.17	19.85	23.02	100.00
	4	17.56	18.22	18.91	20.54	24.77	100.00
	5	16.39	17.09	17.45	20.91	28.16	100.00
Fathers		*Sons*					
	1	19.84	19.69	20.36	21.00	19.11	100.00
	2	19.16	21.03	19.96	19.96	19.89	100.00
	3	19.16	20.29	20.05	19.99	20.51	100.00
	4	18.44	18.69	19.55	20.97	22.35	100.00
	5	16.73	16.30	18.26	20.51	28.21	100.00

5.2 Regression models

The model we estimate with OLS is the following:

$$y_{ci} = \alpha + \beta Y_{pi} + \varepsilon_i \qquad (1)$$

where y is the annual number of days absent due to sickness of the son (daughter) in family i and Y is the corresponding measure for his (her) father (mother). This model estimates the intergenerational transmission of sick leave. We use the average annual sickness absence over the observed six years throughout and we control for the ages of the fathers (mothers) and sons (daughters) linearly and quadratically in all of our regressions. The parameter β captures the marginal magnitude of the transmission in terms of annual days absent.

In order to obtain easily interpretable estimates we estimate OLS regression models. To mitigate the large variation in sickness absence across the population, we control for whether the parent has sickness absence or not in several model specifications; however, we start by presenting the average estimated mobility.

5.2.1 Average transmission

Table 4 presents estimates of the average marginal transmission of sick leave (model 1), separately by the gender of the parent and the child. From mothers to daughters the interpretation of this estimate is that for every additional day the mother is absent, the daughter's absence increases by 0.115 days. If we extrapolate this result, we can say that if a mother increases her absence by 10 days, her daughter's absence increases by 1.15 days. Ten days corresponds to about half of the average number of days absent due to sickness among mothers and just over one day corresponds to about 4 per cent of the average number of days absent due to sickness among daughters. (The average days are presented in Table 1.) Again, if we extrapolate, the interpretation is as follows: a mother with about 50 per cent more sickness absence than the average mother's level has on average a daughter with about 4 per cent more sickness absence than the average daughter's level. The corresponding transmission from parents to daughters is somewhat smaller than the corresponding transmission to sons, irrespective of the gender of the parent.

Table 4 Average intergenerational transmission of sickness absence days

Dependent variable: the child's average sickness absence days 0–365				
	Daughter		*Son*	
From mother	0.115***		0.0663***	
	(0.00238)		(0.00182)	
From father		0.0880***		0.0682***
		(0.00255)		(0.00195)
Observations	224, 385	224, 385	238, 599	238, 599
R-squared	0.0166	0.0081	0.0106	0.0072

Note: We start counting the number of days absent with sickness benefits from the fourth week and with disability pension from the first day within a sickness absence spell. In all the models, we control for both the child's and the parent's age and age squared. Standard errors are in parentheses. Statistical significance: *** p<0.01.

Transmission depending on the parent's sickness absence level

In the following analysis, we study whether the transmission from parent to child depends on the level of sickness absence among the parents. The focus is on investigating how the expected number of days absent due to sickness among children varies depending on the parent's level of sickness absence. That is, we allow for different marginal transmission rates depending on the parent's position in the sickness absence distribution among parents. The model we estimate is the following:

$$y_{ci} = \alpha + \mu_1 D_{1pi} + \mu_2 D_{2pi} + \mu_3 D_{3pi} + \mu_4 D_{4pi} + \mu_5 D_{5pi} + \varepsilon_i, \quad (2)$$

where dummy variables (*D*) that take the value one if parent (*p*) in family (*i*) belongs to the first to the fifth quintile, respectively, in the sickness absence distribution among parents. The reference group is parents without any sickness absence. The parameters $\mu_1 - \mu_5$ tell us how many more days a child with a parent with sickness absence in quintiles 1–5 (among parents with the same gender and with sickness absence) is absent due to sickness in comparison with children with parents without sickness absence (the reference category). These estimates are presented in the second column in Table 5. For reference, we also display, in the top panel of Table 5, the average number of days absent due to sickness among daughters and sons with a mother or a father, respectively, without any sickness absence.

From Table 5, we confirm the result from the corresponding descriptive analysis presented in Table 3, namely that the transmission seems to increase with the rate of sick leave among the parents. Children of parents *without* any sick leave have about half the rate of sick leave as the average daughter and son. This result suggests that there is a threshold effect; if the parent has sick leave, the child's expected rate of sick leave increases.

The child's expected number of days absent increases somewhat with the parent's level, but the general message is that the average transmission is about the same up to the parent category corresponding to sickness absence in the sixtieth percentile. For sickness absence levels above the sixtieth percentile, the transmission is almost twice as large as the transmission in the fortieth to the sixtieth percentile. For children of parents in the eightieth to one-hundredth percentiles, the expected number of days absent due to sickness is twice as large as among children with parents without sickness absence. The overall conclusion is that the average transmission is driven by parents with the highest levels of sickness absence.

Table 5 Transmission of sickness absence days depending on the parent's sickness absence level

	From mother		From father	
	Daughter	*Son*	*Daughter*	*Son*
Average number of days absent due to sickness among children with a mother or a father without sickness absence[1]	13.74***	7.337***	12.02***	7.514***
	(0.316)	(0.242)	(0.327)	(0.250)
	(1)	(2)	(3)	(4)
Dependent variable: the child's average sickness absence days 0–365				
Parent is in p. 0–20, among parents with sickness absence[2)]	5.580***	2.937***	5.280***	3.112***
	(0.572)	(0.440)	(0.611)	(0.472)
Parent is in p. 20–40, among parents with sickness absence	6.320***	3.144***	7.587***	3.661***
	(0.562)	(0.431)	(0.619)	(0.471)
Parent is in p. 40–60, among parents with sickness absence	8.941***	5.082***	9.893***	4.926***
	(0.568)	(0.435)	(0.608)	(0.470)
Parent is in p. 60–80, among parents with sickness absence	17.19***	7.737***	14.53***	8.481***
	(0.568)	(0.437)	(0.618)	(0.470)
Parent is in p. 80–100, among parents with sickness absence	27.74***	15.82***	21.86***	16.28***
	(0.570)	(0.437)	(0.628)	(0.480)
Observations	224,385	238,599	224,385	238,599
R-squared	0.017	0.008	0.011	0.007

Note: 1) This estimate is the reference value in a model only controlling for whether the parent has sickness absence or not and, thus, no age controls. 2) This variable is an interaction between a dummy variable taking the value 1 if the parent has sickness absence and a dummy variable taking the value 1 if the parent is in the x percentile among parents with sickness absence. The reference group is parents without any sickness absence. We start counting the number of days absent due to sickness from the fourth week within a sickness absence spell. Standard errors are in parentheses. Statistical significance: *** p<0.01. We start counting the number of days absent with sickness benefits from the fourth week and with disability pension from the first day within a sickness absence spell. In all the models, we control for both the child's and the parent's age and age squared. Standard errors are in parentheses. Statistical significance: *** p<0.01.

6 Correlations between children and parents in-law

So far, we have estimated the transmission from parents to their own children. However, many people live in households with a partner. For the socioeconomic status of the household, it also matters how much the partner is absent due to sickness. Thus, the intergenerational transmission might be even lower at the household level if there is a positive correlation in sickness absence between a child and his or her parents-in-law.

We know that there are positive correlations between couples with respect to education, income, intelligence, physical conditions and health, which are all explanatory factors for the sickness absence level. Furthermore, the results from intergenerational income mobility studies show that there is a gender difference in this respect; daughters to a higher degree than sons tend to live in households with incomes more similar to their parents (Chadwick and Solon, 2002; Hirvonen, 2008). In order to shed light on the intergenerational transmission in sickness absence at the household level, we estimate the correlation between the children and their parents-in-law. That is, we estimate model (1) but the parent's sickness absence level is replaced by the corresponding parent-in-law. The results are presented in Table 6.

We do find a positive correlation between children and their parents-in-law. As is the case with respect to income, the correlation is strongest between sons and their parents-in-law, implying that daughters to a higher degree than sons tend to live with a partner with a sickness absence level more similar to that of their own parents. The correlations between daughters and their parents-in-law are also positive and significant, but weaker than the corresponding correlations regarding sons.

To conclude, people tend to live in a household with a sickness absence level reminiscent of the sickness absence level in the household in which they grew up. This result suggests that the intergenerational sickness absence transmission at the household level is higher than the corresponding transmission estimated at the individual level.

Table 6 Intergenerational correlation between child and parents-in-law

Dependent variable: the child's average sickness absence days 0–365				
	Daughter		*Son*	
	From mother-in-law	From father-in-law	From mother-in-law	From father-in-law
Sickness absence days	0.0345***	0.0286***	0.0906***	0.0383***
	(0.00323)	(0.00348)	(0.00527)	(0.00553)
Observations	30,428	30,428	31,529	31,529
R-squared	0.006	0.004	0.012	0.005

Note: We start counting the number of days absent with sickness benefits from the fourth week and with disability pension from the first day within a sickness absence spell. In all the models, we control for both the child's and the parent-in-law's age and age squared. Standard errors are in parentheses. Statistical significance: *** p<0.01.

7 Sibling comparisons

In order to shed light on the importance of social factors in the context of sickness absence, we compare the sickness absence between siblings with the same biological parents. More precisely: we compare the sickness absence level among firstborn children and their younger siblings of the same gender.

There is a large literature showing that firstborn children are more successful on the labour market than their younger siblings (see, e.g., Devereux, Black and Salvanes, 2005; Sulloway, 2007). Furthermore, this difference cannot be biologically determined; rather, it seems as if it is the social rank within the family during childhood that explains the difference (Black, Devereux and Salvanes, 2011; Kirstensen and Bjerkedal, 2007).[21] Our conclusion is, hence, that any potential difference in sickness absence between firstborn children and their younger siblings stems from social factors rather than a difference in genetic predisposition to health problems.

In order to follow the preceding analysis, we relate the potential difference in sickness absence between siblings to the level of sickness absence among their parents. We ask whether the importance of social rank for explaining any potential sibling differences in sickness absence varies depending on whether the parents have any sickness absence or not. The results from this analysis shed some light on the importance of social factors for explaining sickness absence. An earlier result in this paper has shown that children with parents with sickness absence in general are more absent due to sickness themselves than children with parents without sickness absence.

[21] By comparing siblings in families in which one sibling has died with families in which all the biological siblings have grown up together, the authors show that it is the social order among the siblings rather than the birth order itself that matters for explaining differences in IQ performance between the siblings.

If the sibling difference due to social rank varies in importance depending on the level of sickness absence within the family, we gain a hint about the relative importance of joint family components versus social rank during childhood for explaining sickness absence.

All the comparisons are made between siblings of the same gender. The reason is that sickness absence differs between genders and the birth order may depend on the gender composition among the siblings. For example, the sibling space in age, the number of siblings within the family and the socioeconomic status may all vary depending on the gender of the first child.

To enable precise estimates of sibling differences, we need a larger data set than the one used in the previous analysis. The following analysis is based on all parents and their biological children who are aged between 16 and 65 during the observation period 2003 to 2008.[22] The children in this sample are born between 1958 and 1988 and the children and their parents are observed during the same time period.[23]

7.1 Descriptive statistics

The study population is presented in Table 7. Firstly, as expected, children of parents with sickness absence have on average more sickness absence than children of parents without sickness absence. Secondly, firstborn children are on average more absent due to sickness than their younger siblings. This difference can be explained by the fact that firstborn children on average are older when observed. Finally, most parents have been absent due to sickness; about two-thirds of all children have parents with their own sickness (here we compare the number of observations in the two samples presented in Table 7).[24]

[22] The corresponding estimates for the previously used sample are similar in sign and magnitude but they are unprecisely estimated.

[23] The reason why we include the parents in this analysis is that we want to distinguish between children of parents who have been absent due to sickness themselves and children of parents who have not. Thus, in this analysis, it is not equally important as in the previous analysis to observe parents and their children at the same age.

[24] According to our definition, we only require that one parent in the parent couple has at least one day absent due to sickness.

Table 7 Sickness absence divided by birth order and whether the parents have sickness absence or not

	Daughters		**Sons**	
	Firstborn	*Younger siblings*	*Firstborn*	*Younger siblings*
Children of parents with sickness absence				
Sickness absence	27.48	21.11	14.13	12.97
Standard deviation	*74.23*	*65.02*	*56.61*	*53.89*
Age	32.56	28.46	32.46	28.40
Standard deviation	*5.50*	*5.28*	*5.47*	*5.26*
Observations	71 403	105 859	79 873	118 370
Children of parents neither of whom has sickness absence				
Sickness absence	14.46	11.11	8.26	6.44
Standard deviation	*52.79*	*46.85*	*44.15*	*37.86*
Age	31.24	27.39	31.25	27.40
Standard deviation	*5.22*	*4.88*	*5.19*	*4.88*
Observations	29 329	41 791	33 404	47 053

7.2 Empirical modelling and results

The first (basic) model we estimate is the following:

$$y_{ci} = \alpha + \beta D_{ci} + \varepsilon_{i,} \quad (3)$$

where y_{ci} is the annual average number of days absent due to sickness by child c in family i. D is a dummy variable that takes the value 1 if the child is the firstborn in the family. This model generates the average difference between the firstborn and the later-born children of the same gender. The second model we estimate is:

$$y_{ci} = \alpha + \beta D_{ci} + \gamma_i + \varepsilon_{i,} \quad (4)$$

where we have added family fixed effects captured by the parameter γ. That is, we also control for joint family components explaining sickness absence, implying that we explore the variation between biological siblings. In this estimation we, hence, control for unobserved heterogeneity across parents, for example, the number of children within the family and the parents' sickness absence level. Finally, the last model we estimate is:

$$y_{ci} = \alpha + \beta D_{ci} + \beta D_{ci} * D_{pi} + \gamma_i + \varepsilon_{i,} \quad (5)$$

where we interact the firstborn dummy with a parent dummy that takes the value 1 if parent p in family i has sickness absence and 0 otherwise. The term β now captures whether there is a difference in the sibling difference depending on whether the parents have been absent due to sickness or not. In all the models, we control for the children's age and age squared.

The results are presented in Table 8. From the estimates generated by the first model (column 1), we learn that firstborn children report less sickness absence than their younger siblings of the same gender. When we control for family fixed effects (in the second model), the transmission is somewhat smaller, but still significant. From the estimate presented in column 3, we can learn that the gap in sickness absence depending on birth order only emerges in the group of daughters with parents who lack sickness absence. For boys, the corresponding effect is not statistically significant. Thus, the birth-order effect seems only to be of importance among daughters and in families without sickness absence. This result suggests that the higher intergenerational transmission from parents with higher levels of sickness absence is driven to a larger extent by joint family components than the corresponding lower transmission from parents with lower levels of sickness absence to whom social rank during childhood seems to matters.

Table 8 Difference in sickness absence between first- and later-born siblings of the same gender, separately depending on whether either parent has sickness absence or not

Dependent variable: the child's average sickness absence days 0–365				
Model		1	2	3
Daughters				
Firstborn (=1, otherwise 0)		-2.599***	-1.806***	-3.831***
		(0.276)	(0.525)	(0.648)
Parent-couple fixed effects[1]		No	Yes	Yes
If either parent has sickness absence (=1, otherwise 0)*firstborn (=1, otherwise 0)				2.911***
				(0.697)
Observations				248 382
Sons				
Firstborn (=1, otherwise 0)		-1.262***	-1.192***	-0.786
		(0.211)	(0.406)	(0.506)
Parent-couple fixed effects[1]		No	Yes	Yes
If either parent has sickness absence (=1, otherwise 0)*first born (=1, otherwise 0)				-0.586
				(0.536)
Observations				278 700

Note: 1) Parent-couple fixed effect means that we control for the specific level of sickness absence among the biological parents – each parent couple, except for one couple, has its own indicator taking the value one, and zero otherwise. We start counting the number of days absent with sickness benefits from the fourth week and with disability pension from the first day within a sickness absence spell. In all the models, we control for the child's age and age squared. Standard errors are in parentheses. The standard errors are clustered at the parent-couple level. Statistical significance: *** p<0.01.

8 Concluding discussion

The main conclusion is that there is intergenerational transmission of sick leave and that this transmission is stronger the more sick leave the parents have. That is, the parental heritage is of greater importance for explaining higher levels of sickness absence than lower levels.

We also find that people tend to live in a household with a rate of sick leave that is reminiscent of the rate of sick leave in their parental household. In accordance with earlier literature about intergenerational mobility, this phenomenon seems to be particularly strong among daughters (Hirvonen, 2008). This result suggests that the intergenerational mobility of sick leave is even lower at the household level than the mobility at the individual level on which we mainly focus in this study.

Earlier research has shown that firstborn children tend to be more successful on the labour market and the explanation seems to be the social rank within the family during childhood (e.g., Kristensen and Bjerkedal, 2007). We show that firstborn daughters as adults tend to have higher levels of sickness absence than their younger biological siblings, but only if the parents had low levels of sick leave during their childhood. Among sons and in families in which the parents had high levels of sick leave, we find no difference in sick leave among siblings as adults. Thus, the social rank among siblings in this context only matters among women without a large transmission of sick leave from their parents.

To conclude, this study has shown that there is intergenerational transmission of sick leave and that this transmission is particularly strong from parents with a high rate of sick leave. To understand the mechanisms behind the intergenerational transmission of sick leave, more analyses are needed.

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Appendix

Table A 1 Structure of attrition for generating the study population

Register	Condition	Observations
Multi-generation register	The number of children born in the years 1972–1977 for whom we can identify a mother and a father in the multi-generation register	672 457
LOUISE	Children should be living in Sweden between 2003 and 2008	564 564
SYSS	The children should have a mother aged 16–65 who was living in Sweden in the years 1986–1991	491 590
SYSS	The children should have a father aged 16–65 who was living in Sweden in the years 1986–1991	470 564
	The children should have both a father and a mother aged 16–65 who were living in Sweden in the years 1986–1991 Study population	462 984
	Two adults living together in a household (single households are removed) and the other partner is not the individual's biological mother or father	
	Study population for the assortative mating analysis	62 036

Source: Socialförsäkringsdatabasen, IFAU.

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